

University of Wollongong - Research Online

Thesis Collection

Title: Fisheries data requirements under international law: achieving long-term conservation and sustainable use of tuna fisheries in the western central Pacific Ocean

Author: Lara Manarangi-Trott

Year: 2008

Repository DOI:

Copyright Warning

You may print or download ONE copy of this document for the purpose of your own research or study. The University does not authorise you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site.

You are reminded of the following: This work is copyright. Apart from any use permitted under the Copyright Act 1968, no part of this work may be reproduced by any process, nor may any other exclusive right be exercised, without the permission of the author. Copyright owners are entitled to take legal action against persons who infringe their copyright. A reproduction of material that is protected by copyright may be a copyright infringement. A court may impose penalties and award damages in relation to offences and infringements relating to copyright material.

Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.

Unless otherwise indicated, the views expressed in this thesis are those of the author and do not necessarily represent the views of the University of Wollongong.

Research Online is the open access repository for the University of Wollongong. For further information contact the UOW Library: research-pubs@uow.edu.au

University of Wollongong Theses Collection

University of Wollongong Theses Collection

University of Wollongong

Year 2008

Fisheries data requirements under
international law: achieving long-term
conservation and sustainable use of tuna
fisheries in the western central Pacific
Ocean

Lara Manarangi-Trott
University of Wollongong

Manarangi-Trott, Lara, Fisheries data requirements under international law: achieving long-term conservation and sustainable use of tuna fisheries in the western central Pacific Ocean, PhD thesis, Australian National Centre for Ocean Resources and Security, University of Wollongong, 2008. <http://ro.uow.edu.au/theses/118>

This paper is posted at Research Online.
<http://ro.uow.edu.au/theses/118>

NOTE

This online version of the thesis may have different page formatting and pagination from the paper copy held in the University of Wollongong Library.

UNIVERSITY OF WOLLONGONG

COPYRIGHT WARNING

You may print or download ONE copy of this document for the purpose of your own research or study. The University does not authorise you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site. You are reminded of the following:

Copyright owners are entitled to take legal action against persons who infringe their copyright. A reproduction of material that is protected by copyright may be a copyright infringement. A court may impose penalties and award damages in relation to offences and infringements relating to copyright material. Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.

**FISHERIES DATA REQUIREMENTS UNDER
INTERNATIONAL LAW: ACHIEVING LONG-TERM
CONSERVATION AND SUSTAINABLE USE OF TUNA
FISHERIES IN THE WESTERN CENTRAL PACIFIC
OCEAN**

A thesis submitted in fulfilment of the
requirements for the award of the degree

DOCTOR OF PHILOSOPHY

from

UNIVERSITY OF WOLLONGONG

by

**LARA MANARANGI-TROTT,
BSc(Hons 1) – Biological Environments (Marine) (UNSW)**

**AUSTRALIAN NATIONAL CENTRE FOR OCEAN
RESOURCES & SECURITY (ANCORS),
FACULTY OF LAW
2008**

CERTIFICATION

I, Lara Manarangi-Trott declare that this thesis, submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the Australian Centre for National Ocean Resources & Security, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Lara Manarangi-Trott

8 October 2008

Abstract

There currently is a breadth of literature outlining and justifying international best practices for regional fisheries management organisations (RFMOs) to ensure that highly migratory and shared fish stocks under their purview, such as tuna, are effectively conserved and managed. Most of this literature has noted the link between quality data and the formulation of scientific advice, which subsequently underpins the development and implementation of fishery conservation and management measures. However, the literature to date has not evaluated how tuna RFMOs can effectively balance the diverse capabilities of their members, including developing States, so that the best quality data can support scientific analyses on impacts of fishing. This thesis examines and analyses the implementation of international legal requirements, and application of international best practices, for fisheries data by a relatively young tuna RFMO: the *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPFC). The WCPFC was established following the adoption of the *Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks* and is responsible for ensuring the long-term conservation and sustainable use of 50% of current global principal market tuna catch. Approximately 20% of global tuna resources are taken in the exclusive economic zones (EEZs) of Pacific Islands States, and Pacific Island States therefore have a vested interest in ensuring that the best quality fisheries data underpins scientific advice. This thesis reviews the innovative and collective approaches established by Pacific Island States and their contribution towards WCPFC data practices. Also examined are the future implications of WCPFC data practices for Pacific Island States.

International law requires States to provide fisheries data to tuna RFMOs. Scientific analyses of impacts of fishing require fisheries data covering characteristics of tuna and the surrounding ecosystem, the catch and effort of the fisheries, the characteristics of the fisheries themselves and their response to fishing. Consistent with a sustainable and responsible approach to fisheries management, data should also cover species that are not targeted but may be impacted on by the fisheries, or that are dependent on or found in association with tunas. To ensure the best quality data can support scientific analyses on impacts of fishing, tuna RFMOs need: to establish: databases to compile these data; to establish integrated data verification schemes to check that data is complete and accurate; and arrangements to share fisheries data must include the requirement to maintain confidentiality. At the global level, data on tuna

fisheries is compiled by the Food and Agriculture Organisation of the United Nations and institutional arrangements have been established to cross-check with data compiled at the regional level by tuna RFMOs.

Pacific Island States have established practices to collect and share data on fishing activities in their EEZ, data needed to support stock assessment, vessel and gear information, and data on non-target species. These same data collection practices for Pacific Island States have formed the foundation of WCPFC data practices. The use of existing regional arrangements and standards has enabled the WCPFC to meet international legal requirements and to make significant progress towards achieving international recommended best practices for tuna RFMOs. However, there are gaps in the implementation of data requirements by WCPFC members, and progress can be made to further improve the quality of data, notably more complete coverage and improved accuracy.

This thesis concludes that if the WCPFC is to receive the best quality data, it is contingent on: first, coastal States, particularly Pacific Island States, continuing to take responsibility for leading the establishment and implementation of effective WCPFC data practices; second, the WCPFC establish a process to regularly assess WCPFC members data provision to the WCPFC; and third, the WCPFC continue progress to establish an integrated WCPFC verification scheme. Additionally, the Joint Tuna RFMO process could also be used to maintain pressure for the WCPFC to adopt best practice standards for tuna RFMOs. Ultimately, the achievement of long-term conservation and sustainable use of tuna fisheries in the western and central Pacific Ocean will depend on sufficient political will by all WCPFC members to heed scientific advice, and take effective conservation and management action in accordance with the precautionary approach.

Acknowledgements

This PhD candidature has been quite a journey for me, in personal and professional growth. At times it has felt as though the journey had overtaken the writing of this thesis. The journey has been quite an adventure, and has given me many experiences, professional opportunities and friends. This thesis is very much a product of my growth and experiences over the last six years, and is an interlude in my journey.

To *Professor Martin Tsamenyi*, for his unfailing belief in me from the day my PhD candidature commenced through to the completion of this thesis. Martin has continued to encourage and support my professional growth throughout my PhD candidature. Thanks also to the *University of Wollongong*, for the opportunity to undertake my PhD studies through a University Postgraduate Award (1 March 2002 – 3 August 2005).

To the Government of the Cook Islands, particularly the *Ministry of Marine Resources*, with whom I was employed at the commencement of this journey. Also to the *Ministry of Foreign Affairs*, for granting me the honour and opportunity to represent my country. Particular thanks to, A'lava "Navy" Epati, Ian Bertram, Carl Hunter, Josh Mitchell and Peter W. Graham, for their support and friendship through my PhD journey. From 2001, I was fortunate to have the opportunity, as a member of the Cook Islands delegation, to participate in sessions of the Preparatory Conference for the WCPFC; and subsequently the WCPFC; as well as associated meetings of the *Pacific Island Forum Fisheries Committee*. The experience and insights from participating in these meetings as a country delegate were invaluable to this thesis, and this thesis is far richer because of these. Through these meetings, I also had the opportunity to build up professional experience that has already served me well in my journey post-PhD. Also to the *Human Resources Development Department of the Cook Islands*, for awarding a study assistance grant towards the completion of my studies, particularly to *Mrs Mii Rairi*.

To my colleagues at the *Pacific Islands Forum Fisheries Agency (FFA)*, who have made me part of the family and to whom I hope this thesis will explain my absence from the office. Also to my colleagues in the worlds of *FFA*, *SPC* and *WCPFC*, who have assisted me in numerous ways through my journey and have become close friends. In particular, to *Tanielu Su'a* Director General of FFA, who encouraged and supported my study leave from FFA to complete this thesis. I believe that without his support this thesis may not have been completed.

To my fellow students and friends at the *Centre for Maritime Policy*, now known as *ANCORS*, with whom I shared the challenge that was writing and completing a thesis. Particular thanks to *Myree Mitchell*, for her support and friendship. Also to *Chris, Ria, Vina, Julia, Manu, DikDik* and *Mary Ann* who all demonstrated to me that completing a thesis successfully was possible.

To Coledale Ave folk, particularly *Glen* and *Cassandra Cahill* who gave us a second home and took us in as a part of the family and *Grant Little* who was an especially good mate. I will always have very fond memories, particularly of Sharky Beach where I learnt to surf. To *Patricia Morton*, who shared many long walks on the beach with *Mako*, and a close and understanding friendship. She is my favourite surf buddy. To the friends we have made in Honiara, particularly *Jimmy* and *Dinah* who cared for *Mako* during the final months to complete this thesis. To *Dr. Antony Lewis*, who was unwittingly adopted by me as my co-supervisor for his significant expertise in fisheries science and tuna matters. Tony became one of the cornerstones in my thesis-writing support team and also became part of our family. To *Mum, Dad* and *Charles*, who have always believed in me and taught me that anything was possible. They have always been only a phone call or plane flight away. To *James*, who is seen by many to be my "rock" because of his unwavering support and care for me, particularly during the completion of this thesis. James is my best-friend and soul mate.

This thesis is for them, they have been there for me through this journey.

Contents

ABSTRACT	iii
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vii
LIST OF FIGURES AND TABLES	xii
LIST OF ABBREVIATIONS AND SPECIAL NAMES	xiv
INTRODUCTION	1
CHAPTER 1. TUNA AND BILLFISH, THE FISHERIES FOR THEM AND FISHERIES CONSERVATION AND MANAGEMENT	17
1.1 Tuna and billfish species.....	17
1.2 The fisheries for tuna and billfish since 1950.....	27
1.3 Impacts of fishing for tuna and billfish.....	37
1.4 Achieving long-term conservation and sustainable use of tuna fisheries through fisheries management.....	46
Conclusion.....	59
CHAPTER 2. INTERNATIONAL LEGAL FRAMEWORK FOR DATA ON TUNA FISHERIES: PART I. FISHERIES DATA THAT TUNA RFMOs ARE TO COLLECT	61
2.1 Background and overview.....	62
2.2 Analysis of international legal framework for data on tuna fisheries.....	72
2.3 Catch and effort data to be provided to tuna RFMOs.....	79
2.4 Collection of other data and information by tuna RFMOs.....	90
Conclusion.....	107

CHAPTER 3. INTERNATIONAL LEGAL FRAMEWORK FOR DATA ON TUNA FISHERIES: PART II. ARRANGEMENTS REQUIRED IN TUNA RFMOS FOR FISHERIES DATA	109
3.1 Compiling data on tuna fisheries.....	110
3.2 Verifying data on tuna fisheries.....	114
3.3 Maintaining confidentiality of data on tuna fisheries and sharing data.....	121
3.4 Arrangements required at the global level for data on tuna fisheries.....	126
3.5 Special requirements of developing States.....	128
Conclusion.....	131
CHAPTER 4. GLOBAL INSTITUTIONAL FRAMEWORK FOR DATA ON TUNA FISHERIES: THE ROLE OF THE FOOD AND AGRICULTURE ORGANISATION OF THE UNITED NATIONS	133
4.1 Overview.....	134
4.2 Compiling global fisheries data.....	139
4.3 Verifying global fisheries data.....	148
4.4 Disseminating global fisheries data.....	152
4.5 Quality of global fisheries data.....	154
Conclusion.....	167
CHAPTER 5. WESTERN CENTRAL PACIFIC OCEAN TUNA FISHERIES AND PACIFIC ISLAND STATES: AN OVERVIEW OF CHALLENGES FOR FISHERIES DATA	169
5.1 Characteristics of the Pacific Island region and Pacific Island States.....	169
5.2 The tuna fisheries of the western and central Pacific Ocean.....	175
5.3 Importance of tuna fisheries to Pacific Island States.....	189
5.4 The challenges of fisheries data practices for western and central Pacific Ocean tuna fisheries.....	195
Conclusion.....	198

CHAPTER 6. ANALYSIS OF PACIFIC ISLAND STATE PRACTICES FOR DATA ON TUNA FISHERIES	201
6.1 Regional institutions and instruments that have assisted Pacific Island States.....	202
6.2 Collection of data on tuna fisheries by Pacific Island States.....	217
6.3 Analysis of arrangements post-collection of data on tuna fisheries in Pacific Island States.....	243
Conclusion.....	258
CHAPTER 7. ANALYSIS OF WCPFC PRACTICES FOR COLLECTION OF DATA ON TUNA FISHERIES	261
7.1 Background to WCPFC and practices for data on tuna fisheries..	262
7.2 Overview of WCPFC decisions for collection of data on tuna fisheries.....	281
7.3 Catch and effort data to be provided to WCPFC.....	285
7.4 Collection of other data and information by WCPFC.....	306
Conclusion.....	325
CHAPTER 8. ANALYSIS OF WCPFC PRACTICES FOR COMPILATION, VERIFICATION, EXCHANGE AND DISSEMINATION OF DATA ON TUNA FISHERIES	329
8.1 Compiling data on tuna fisheries.....	330
8.2 Verifying data on tuna fisheries.....	340
8.3 Maintaining confidentiality of data on tuna fisheries and sharing data.....	366
Conclusion.....	382
CHAPTER 9. DISCUSSION AND CONCLUSIONS	385
9.1 International legal requirements and standards to ensure best data are available for conservation and management of tuna stocks.....	386
9.2 Report card for the WCPFC relative to international legal requirements and international standards.....	388
9.3 Report card for Pacific Island States as WCPFC members.....	393

9.4 Future prospects for long-term conservation and sustainable use of tuna fisheries in the western and central Pacific Ocean, based on available data.....	396
Conclusion.....	398
BIBLIOGRAPHY	401
I. General References.....	402
II. Laws, Policies, Guidelines and Resolutions.....	413
III. International and Regional Organisation Reports.....	418
APPENDIX	425
Appendix 1: LOS Convention Annex I: Highly Migratory Species	427
Appendix 2: UN Fish Stocks Agreement Annex I: Standard requirements for the collection and sharing of data	431
Appendix 3: Summary of the development of tuna fisheries globally, and development of key international legal and institutional arrangements for the conservation and management of tuna and billfish stocks	437
Appendix 4: Memorandum of Understanding between the Pacific Islands Forum Fisheries Agency and the Secretariat of the Pacific Community concerning collaboration in the Development, Conservation and Management of the Tuna and related Resources of the Western and Central Pacific. (3rd Revision 2007)	439
Appendix 5: The Agreement on the Exchange of Tuna Fisheries Data between IATTC and SPC-OFP, as at March 2003	451
Appendix 6: WCPFC Decision on Scientific Data to be provided to the Commission	453
Appendix 7: WCPFC Decision on Annual Report to the Commission	459
Appendix 8: Detailed analysis of the WCPFC response to data requirements as set out in UN Fish Stocks Agreement, Annex I	463
Appendix 9: Information package and terms of reference for the WCPFC Independent Review of Scientific Structure and Function	473
Appendix 10: WCPFC Conservation and Management Measures for Commission Vessel Monitoring System (CMM 2007-02)	477

Appendix 11: WCPFC Conservation and Management Measure for the Regional Observer Programme (CMM 2007-01)	481
Appendix 12: Excerpt from Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean. Annex III: Terms and Conditions for Fishing	491
Appendix 13: WCPFC Rules and Procedures for the Protection of, Access to, and Dissemination of, Data compiled by the Commission	493

Figures and Tables

Figure A.	A schematic diagram illustrating the role of data in tuna RFMOs, based on Annex I of the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement, Annex I).	8
Figure 1-1.	Catch of tuna and billfish, cumulative by category, in metric tonnes.	30
Figure 1-2.	Catch of tuna and billfish, cumulative by oceans, in metric tonnes.	30
Figure 1-3.	Global catches of principal market tunas, cumulative by oceans, in metric tonnes.	34
Figure 1-4.	Percent composition of global catches of principal market tunas by species.	34
Figure 1-5.	Catches in metric tonnes of principal market tunas by ten main fishing fleets by oceans from 1950-2005.	36
Figure 1-6.	Summary of available information on the current status of principal market tuna stocks as determined by the relevant RFMO in 2007.	39
Figure 1-7.	Map to illustrate the approximate mandated area for the five tuna RFMOs.	52
Figure 4-1.	A schematic illustration of practices for global fisheries data effected through the FAO.	138
Figure 4-2.	FAO Major Fishing Areas for Statistical Purposes.	142
Figure 4-3.	The approximate boundaries of the 51 Longhurst Areas or global biogeochemical provinces, based on pelagic ecology and oceanography.	144
Figure 4-4.	Illustration to compare the FAO major areas for statistical purposes (61, 67, 71, 77, 81, 87) with areas of competence of Inter-American Tropical Tuna Commission (IATTC) and Commission for the Conservation of Highly Migratory Fish Stocks of the Western and Central Pacific Ocean (WCPFC).	146
Figure 4-5.	Schematic timeline that illustrates the time lag between catch in 2001 to dissemination as year 2001 global fisheries data by FAO.	153
Figure 5-1.	Map of the Pacific Islands region.	170
Figure 5-2.	Catches of principal market species of tuna, including bluefin tunas, by ocean in 2005.	176
Figure 5-3.	Catches of principal market species of tuna, excluding the bluefin species, in the Pacific Ocean in 2005.	178

Figure 5-4.	WCPO catches of the four principal market tuna species combined over time by gear type, in metric tonnes.	180
Figure 5-5.	Percent composition of WCPO catches of four principal market tuna species over time.	180
Figure 5-6.	Distribution of catches for skipjack tuna, yellowfin tuna and bigeye tuna in the WCPFC Convention Area from 1999-2005.	186
Figure 7-1.	Illustration of the WCPFC Convention Area and the WCPFC Statistical Area.	270
Figure 7-2.	Schematic to illustrate the WCPFC decision “Scientific data to be provided to the Commission.”	294
Table 1-1.	Categories of tunas and billfishes used in this thesis. Generally the common names are used, but the scientific names are given here for reference.	15
Table 1-2.	Life History of selected tunas and billfishes.	24
Table 1-3.	Average prices for principal market tunas, generally from the Japanese and Bangkok markets, price range over the 2000-2006.	32
Table 1-4.	Ten-year average catches of principal market tuna species by ten main fishing fleets and as a percentage of total global catch (1994-2005).	35
Table 1-5.	Summary of most recent available information to tuna RFMOs for the stock status of billfish stocks, by ocean.	43
Table 1-6.	Membership of tuna RFMOs and cooperating non-parties.	54
Table 2-1.	Summary of data required by tuna RFMOs, other than WCPFC, to be submitted by contracting parties that relate to non-target, dependent or associated species and implementation of the precautionary approach.	105
Table 5-1.	Pacific Island States country profile summaries, including recent average (2000-2004) catches of the four principal market tuna species in national waters of Pacific Island States and an estimated value.	172
Table 5-2.	Catches of four principal market tuna species by ten main fishing fleets and as a percentage of total catch for WCPFC Statistical Area in 1985, 1995 and 2005.	183
Table 5-3.	Summary of the main characteristics of the Principal Market Tuna Species in the WCPO tuna fisheries.	190
Table 6-1.	Three-year summary (2003 – 2005) of the average coverage of total catches in the western and central Pacific Ocean by logsheet data held by SPC-OFP, by fleet.	224
Table 6-2.	Average percent coverage of total catches within western and central Pacific Ocean tuna fisheries by data held by SPC-OFP (2003-2005).	233

Abbreviations and Special Names

Ad hoc Task Group [Data]	A subsidiary body of the WCPFC that was established in 2006 to identify types of data that must be treated as confidential and to develop draft rules and procedures to govern the security and confidentiality of data collected and held by the Commission.
CCSBT	Commission for the Conservation of Southern Bluefin Tuna.
CCMs	Used in the WCPFC, and refers to Commission Members, Cooperating Non-Members and participating Territories collectively.
CMM	Conservation and Management Measures, binding decisions taken by a Commission.
Code of Conduct	FAO Code of Conduct for Responsible Fisheries.
COFI	Committee on Fisheries.
Commission	The decision-making body of a tuna RFMO.
CPUE	Catch per Unit of Effort.
CWP	Coordinating Working Party on Fishery Statistics.
EEZ	Exclusive Economic Zone.
EPO	Eastern and Central Pacific Ocean (refers to the oceanic waters east of 150°W).
FAO	Food and Agriculture Organisation of the United Nations.
FAO Compliance Agreement	Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas of 24 November 1993, entered into force from 24 April 2003.
FAO Guidelines-Sea Turtles	FAO Guidelines to reduce sea turtle mortality in fishing operations, endorsed by COFI in 2005, for voluntary implementation by States and RFMOs.
FAO Strategy on Improving Information in Fisheries	Strategy for Improving Information on Status and Trends of Capture Fisheries, adopted by FAO Conference in 2003.
FADs	Fish Aggregation Devices.
FIDI	FAO Fisheries Information, Data and Statistics Unit.
FFA	Pacific Islands Forum Fisheries Agency (formerly the South Pacific Forum Fisheries Agency), established by the South Pacific Forum Fisheries Agency Convention of 10 July 1979.
FFA/SPC memorandum of understanding	Memorandum of Understanding between the Pacific Islands Forum Fisheries Agency and the Secretariat of the Pacific Community concerning Collaboration in the Development, Conservation and Management of the Tuna and related Resources of the Western and Central Pacific, of 18 November 2007.
FFA Minimum Terms and Conditions of Fishing	The Harmonised Minimum Terms and Conditions for Foreign Fishing Vessel Access, as amended by FFC34 held 24-28 November 1997.
FFC	Forum Fisheries Committee, governing body of FFA.
FIGIS	Fisheries Global Information System.
FIRMS	Fisheries Resource Monitoring System.
FSM	Federated States of Micronesia Arrangement for Regional Fisheries Access of 30 November 1994.
Arrangement FTP	A common abbreviation which stands for File Transfer Protocol, and refers to a system that enables the transfer of files across a computer network.
GDP	Gross Domestic Product.

Heads of Fisheries	Governing body of SPC.
IATTC	Inter-American Tropical Tuna Commission.
ICCAT	International Commission for the Conservation of Atlantic Tunas.
IOTC	Indian Ocean Tuna Commission.
IPOA-IUU	International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing, adopted by the FAO Conference in 2001.
IPOA-Seabirds	International Plan of Action for reducing incidental catch of seabirds in longline fisheries, adopted by the FAO Conference in 1999.
IPOA-Sharks	International Plan of Action for the conservation and management of sharks, adopted by the FAO Conference in 1999.
ISC	International Committee for Scientific Research on tuna and tuna-like species in the North Pacific.
IUU Fishing	Illegal, Unregulated and Unreported Fishing.
kg	Kilogram.
LOS Convention	United Nations Convention on the Law of the Sea of 10 December 1982.
MHLC	Multilateral High-Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western Central Pacific.
Mt	Metric Tonne.
MULTIFAN-CL	A length-based, age-structured analytical model for fisheries stock assessment which makes use of catch, effort and catch composition data. This is the fisheries stock assessment model commonly used for WCPO tuna stock assessments.
Multilateral Treaty on Fisheries	Treaty on Fisheries Between the Government of Certain Pacific Islands States and the Government of the United States of America and its subsidiary agreements, of 15 June 1993.
Nauru Agreement	Nauru Agreement concerning Cooperation in the Management of Fisheries of Common Interest of 11 February 1982.
Niue Treaty	Niue Treaty on Cooperation in Fisheries Surveillance and Law Enforcement in the South Pacific Region of 9 July 1992.
Northern Committee	A subsidiary body of the Commission established pursuant to Article 11(7) of the WCPF Convention, and provides advice and recommendations for conservation and management of highly migratory fish stocks mostly found in the area north of 20N.
Pacific Islands region	Pacific Islands region (is a sub-area of the western and central Pacific Ocean and refers to the EEZs of the 14 Pacific Island States and surrounding high seas).
Pacific Island States	The fourteen independent island countries within the WCP region: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.
Palau Arrangement	Palau Arrangement for the Management of the Western Pacific Purse Seine Fishery of 2 October 1992.
PrepCon	The Preparatory Conference for the Establishment of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean.
PrepCon Science Working Group	Working Group II on the scientific structure of the Commission and the provision of interim scientific advice (a subsidiary body of PrepCon).
PNA Group	Parties to the Nauru Agreement: a subregional group within the WCP region, namely Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands and Tuvalu.
Principal market tunas	Refers to skipjack (<i>Katsuwonus pelamis</i>), yellowfin (<i>Thunnus albacares</i>), albacore (<i>T. alalunga</i>), and bigeye (<i>T. obesus</i>) tuna species.

Principal market tunas, including bluefin tunas	Refers to skipjack (<i>Katsuwonus pelamis</i>), yellowfin (<i>Thunnus albacares</i>), albacore (<i>T. alalunga</i>), bigeye (<i>T. obesus</i>) tuna species, as well as southern bluefin (<i>T. maccoyii</i>), Atlantic bluefin (<i>T. thynnus</i>) and Pacific bluefin (<i>T. orientalis</i>) tuna species.
rete	A specialized feature of the circulatory systems for tuna and billfishes that enables thermoregulation. It is understood that the level of development of the rete is positively correlated with the ability of a species to withstand the sudden temperature changes from rapid dives to depth, and to swim at fast speeds.
RFMOs	Regional Fisheries Management Organisations.
SCTB	Standing Committee on Tuna and Billfish.
SC	Scientific Committee of the WCPFC, subsidiary body of the Commission established pursuant to Article 11 of the WCPF Convention.
SIDS	Small-island Developing States.
SPC	Secretariat of the Pacific Community (formerly the South Pacific Commission), established by the Agreement establishing the South Pacific Commission of 6 February 1947.
SPC-OFP	Oceanic Fisheries Programme of the Secretariat of the Pacific Community.
TCC	Technical and Compliance Committee of the WCPFC, subsidiary body of the Commission established pursuant to Article 11 of the WCPF Convention.
TUFMAN	Tuna Fishery Data Management System, fisheries database software developed by SPC-OFP for Pacific Island States.
tuna and billfish	Collectively refers to species of principal market tunas, bluefin tunas and billfish.
UN	United Nations.
UN Fish Stocks Agreement	Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, of 4 December 1995.
VDS	Vessel Days Scheme of the Parties to the Nauru Agreement.
VMS	Vessel Monitoring System.
WCPF	Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western Central Pacific Ocean, of 5 September 2000.
Convention	
WCPFC	Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western Central Pacific Ocean.
WCPFC-IATTC memorandum of understanding	Memorandum of Understanding between the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean and the Inter American Tropical Tuna Commission.
WCPFC-SPC memorandum of understanding	Memorandum of Understanding between the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean and the Secretariat of the Pacific Community.
WCPFC Convention Area	Refers to the area of competence of the WCPF Convention as described in Article 3 of the WCPF Convention. Article 3 describes a line, and by definition the Convention Area comprises all waters of the Pacific Ocean bounded to the south and to the east by this line. Note that there is no specified boundary to the north and west.
WCPFC Statistical Area	Noting the lack of north and west boundary, the WCPFC Statistical Area is an area that has been formally adopted by the Commission for “statistical purposes” only. This includes a specific line between Australia and Indonesia.
WCPO	Western and Central Pacific Ocean (refers to the oceanic waters west of 150°W).

Introduction

Tuna fisheries are among the most valuable commercial fisheries in the world (US \$7.8 billion in 2002) and they also contribute to global food supply (5–7% of total global fisheries capture production).¹ The four principal market tuna species, by weight, are yellowfin (*Thunnus albacares*), albacore (*T. alalunga*), bigeye (*T. obesus*) and skipjack (*Katsuwonus pelamis*). Tuna fishing is conducted by persons and companies of many nations utilising vessels at multiple scales; tuna fishing vessels range from large-scale industrial purse seiners and longliners that have the potential to fish all oceans in one year, to the small artisanal canoe powered by paddle or sail. Markets for tuna products also have an international if not global character; from the sashimi markets of Tokyo to the fish markets of small villages.

Tunas are fascinating creatures that are highly developed for life as an apex-predator in the upper layers of the open ocean: tunas have streamlined bodies and other adaptations enabling blinding bursts of speed as well as the capacity for long distance travel, such as hydrodynamic shape, slotted gliding fins, huge heart and blood supply, powerful musculature, and even mammal-like internal thermoregulation.² Tunas are highly mobile, moving within and amongst waters under national jurisdiction, and to the high seas. Growing to almost 700 kg in weight in some cases, and uniquely able to inhabit the nutrient-poor blue waters of the open sea, tunas are the lords of the oceanic realm: “All the sea is their native country. They are wandering fish.”³

Globally there are increasing concerns for the long-term conservation and sustainable use of tuna fisheries in all oceans. Total catches of the principal market tunas has increased from approximately four hundred thousand metric tonnes in 1950 to

¹ FAO Fisheries Department, *The State of World Fisheries and Aquaculture 2004* (Rome: The Food and Agriculture Organisation of the United Nations, 2004), p9.

² J. D. Altringham and R. E. Shadwick, "Chapter 8: Swimming and Muscle Function," in *Tuna: Physiology, Ecology and Evolution*, ed. B. A. Block and E. D. Stevens, *Fish Physiology Series* (San Diego, California: Academic Press, 2001), M. W. Westneat and S. A. Wainwright, "Chapter 7: Mechanical Design for Swimming : Muscle, Tendon and Bone," in *Tuna: Physiology, Ecology and Evolution*, ed. B. A. Block and E. D. Stevens, *Fish Physiology Series* (San Diego, California: Academic Press, 2001).

³ Quote by Fray Martin Sarmiento 1757, translated in: J. Joseph, W. Klawe, and P. Murphy, *Tuna and Billfish - fish without a country*, 2nd ed. (La Jolla, California: Inter-American Tropical Tuna Commission, 1980), p1.

4.1 million metric tonnes in 2004.⁴ With the ten-fold increase in catches over the last five decades, most of the stocks of principal market tunas are showing indications of being fully or over-exploited and this trend has been worsening over time.⁵ Thus, the status of the stocks, and the international nature of the tuna species and the fisheries that target them, necessitates an international effort to conserve and manage tuna species. Such international efforts are governed by international law; primarily through binding treaties and non-binding instruments adopted by States for highly migratory fish stocks.⁶ Increasingly the poor management record signalled by the declining status of many tuna stocks has led to international pressure to improve the effectiveness of tuna regional fisheries management organisations (tuna RFMOs),⁷ for the long-term conservation and sustainable use of tuna fisheries as well as for healthy marine ecosystems.⁸

⁴ FAO Fisheries and Aquaculture Information and Statistics Service, *Capture production 1950-2005. FISHSTAT Plus - Universal software for fishery statistical time series [online or CD-ROM]* (Version 2.3. 2000) Food and Agriculture Organization of the United Nations, Data: Capture Production 1950-2005 released March 2007 [cited January 1 2008]; available from <http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp>.

⁵ FAO Fisheries Department, *The State of World Fisheries and Aquaculture 2006* (Rome: The Food and Agriculture Organisation of the United Nations, 2006), p56.

⁶ The term “highly migratory species” is defined in the United Nations Convention on the Law of the Sea Annex I by a list of seventeen groups of species which includes the four principal market tunas as well as bluefin tunas and billfishes, as well as other species that were at the time thought to be highly migratory (the list of highly migratory species is provided in Appendix 1 herein). The two principal binding treaties for the conservation and management of highly migratory fish stocks are: United Nations Convention on the Law of the Sea of 10 December 1982, entered into force from 16 November 1994 (1982) 21 *ILM* 1261; and the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, of 4 December 1995, entered into force from 11 December 2001 (1995) 34 *ILM* 1542. The principal non-binding instrument is the FAO Code of Conduct for Responsible Fisheries, of 31 October 1995.

⁷ At the time of writing this thesis, there were five tuna RFMOs that together covered the range of the four principal market tunas: The *Inter-American Tropical Tuna Commission* (IATTC) covers the tuna stocks of the eastern Pacific Ocean; the *International Commission for the Conservation and Management of Atlantic Tuna* (ICCAT) covers the highly migratory fish stocks of the Atlantic Ocean; the *Indian Ocean Tuna Commission* (IOTC) covers the highly migratory fish stocks of the Indian Ocean; the *Commission for the Conservation and Management of Highly Migratory Fish Stocks of the Western and Central Pacific Ocean* (WCPFC) covers the highly migratory fish stocks of the western central Pacific Ocean; and the *Commission for the Conservation and Management of Southern Bluefin Tuna* (CCSBT) covers southern bluefin tuna species throughout its range. (See Figure 1-7. Map to illustrate the approximate mandated area for the five tuna RFMOs).

⁸ The objective of the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, of 4 December 1995, entered into force from 11 December 2001 (1995) 34 *ILM* 1542 is set out in Article 2: “The objective of this Agreement is to ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks through effective implementation of the relevant provisions of the Convention.”

The role of fisheries data

Any effort to conserve and manage tuna fisheries needs to be informed by science. One of the key scientific inputs to ensure the effective conservation and management of tuna fisheries, and indeed for any fishery, is quality fisheries data. Before the types of fisheries data that are required for scientific analyses of impacts of fishing are discussed, it is important to highlight the difference between *data* and *information*.

Data are the raw materials, direct measurements or observations, which are used in the formulation of information for managers and decision-makers. The definitions used by Larry English highlights the difference between the terms data and information...

Data: The representation of facts. The raw material from which information is produced when it is put in a context that gives it meaning.

Information: Data in context. The meaning given to data or the interpretation of data based on its context. The finished product as a result of the interpretation of data.⁹

Similarly Jordan and Miller consider that data are observations or measurements that are valid only at the time, place and conditions under which the observation or measurement are made. Whereas scientific facts (that is knowledge or information) are statements, made on the basis of data, about some fundamental quality or quantity of the universe that are true regardless of when or where the observations or measures are made.¹⁰ Drawing these two similar definitions of data together into a marine context, the 'Data and Information Systems' chapter of the Final Report of the United States Commission on Ocean Policy defines fisheries data as referring to "direct measurements collected during scientific research, observing, monitoring, exploration, or marine operations."¹¹ Whereas fisheries information, "includes both synthesized products developed through analyses of original data using statistical methods, interpolations, extrapolations, and model simulations, and interpreted products developed through incorporation of data and synthesized products with additional information that provides

⁹ L. P. English, *Improving Data Warehouse and Business Information Quality: Methods for Reducing Costs and Increasing Profits* (New York: John Wiley & Sons, Inc., 1999), p468, p476.

¹⁰ C. F. Jordan and C. Miller, "Chapter 3: Scientific Uncertainty as a Constraint to Environmental Problem Solving: Large-Scale Ecosystems," in *Scientific Uncertainty and Environmental Problem Solving*, ed. J. Lemons (Massachusetts, USA: Blackwell Science Inc, 1996), p96.

¹¹ *An Ocean Blueprint for the 21st Century: Final Report of the US Commission on Ocean Policy - Pre-Publication Copy*, (Washington, D.C.: U.S. Commission on Ocean Policy, 2004), Chapter 28, p347.

spatial, temporal, or issue-based context.”¹² This thesis will differentiate between the terms data and information in a manner consistent with these definitions.

The technical jargon that is used to describe the degree or standard of excellence of data is the term “quality”. This means that “quality data” refers to the data being accurate and of utility to fisheries managers for the purposes that they intend. Put simply, quality data are “The right data, with the right completeness, in the right context, with the right accuracy, in the right format, at the right time, at the right place, for the right purpose.”¹³ Similarly in respect of information, the International Council for the Exploration of the Sea considers that information is of quality when the four ‘Rs’ are met; namely (a) Relevant: information is appropriate in scope, precision, accuracy, coverage and completeness; (b) Responsive: information analysis is appropriate to the task; (c) Right: information results include estimates of confidence and risk; and (d) Respected: information is objective (satisfied by the above), transparent and communicated to and accepted by stakeholders.¹⁴

There are four basic data requirements for scientific analyses of impacts of fishing.¹⁵ First, catch and effort data which are catch statistics by species, representing removals from the fish stock caused by fishing, as well as data on the fishing effort that produced these catches.¹⁶ Second, are data that support stock assessments such as samples of the composition of the catch by size and species, and other kinds of data that provide information on the biology and life history of the species, as well as the relationship between the fish and their physical and biological environments.¹⁷ Third, are detailed data on vessel and fishing operational characteristics, which are required to standardise fishing effort.¹⁸ Fourth, data should cover target species and species that are not targeted but may be impacted on by the fisheries, or that are dependent on or found

¹² Ibid.

¹³ L. P. English, *Improving Data Warehouse and Business Information Quality: Methods for Reducing Costs and Increasing Profits* (New York: John Wiley & Sons, Inc., 1999), p31.

¹⁴ D. W. Evans, *Status and trends reporting in fisheries: A review of progress and approaches to reporting the state of world fisheries*, *FAO Fisheries Circular 967* (Rome: FAO, 2001), p5.

¹⁵ Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, of 4 December 1995, entered into force from 11 December 2001 (1995) 34 *ILM* 1542, Annex I (reproduced as Appendix 2 herein). Also see J. Joseph and J. W. Greenough, *International Management of Tuna, Porpoise and Billfish - Biological, Legal and Political Aspects* (Seattle: University of Washington Press, 1979), p23, P. Sparre and S. C. Venema, *Introduction to tropical fish stock assessment. Part 1. Manual*, *FAO Fisheries Technical Paper 306.1 Rev 2* (Rome: FAO, 1998), 344-347.

¹⁶ Ibid.

¹⁷ Ibid.

¹⁸ Ibid.

in association with target species.¹⁹ These four types of data will collectively be referred to as *fisheries data* or as *data on tuna fisheries* by this thesis.

Fisheries data are considered to be the building block, upon which information and scientific advice are based, which are in turn provided to fisheries managers for their consideration in adopting decisions for conservation and management of fisheries. Quality fisheries data are accurate, timely and provide near to complete coverage across the range of all fishing activities.²⁰ In tuna RFMOs, data underpin the scientific advice on impacts of fishing to the Commission, the decision-making body. The Commission takes into account the best available scientific advice when decisions are made to adopt conservation and management measures for tuna fisheries. Therefore, in the interests of effective long-term conservation and sustainable use of tuna fisheries it is essential that the best quality fisheries data must be available to tuna RFMOs.

Tuna fisheries of the western and central Pacific Ocean

Pacific Island States²¹ are small-island developing States with vast ocean areas under their jurisdiction, often harbouring large tuna resources. They rightly consider the tuna stocks of the western and central Pacific Ocean to be a resource of significant current and future potential. More than 20% of the global tuna catch is currently taken within waters under the national jurisdiction of Pacific Island States.²² The tuna fisheries of the western and central Pacific Ocean are valued at 11% of the combined gross domestic product of Pacific Island States, as well as producing spin-off economic

¹⁹ Ibid.

²⁰ Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, of 4 December 1995, entered into force from 11 December 2001 (1995) 34 *ILM* 1542, Annex I. Increasingly, there is a growing recognition that Illegal, Unregulated and Unreported Fishing (IUU Fishing) creates unknown gaps and errors in fisheries data, and compromises the quality and reliability of the fisheries data. The topic of IUU fishing is a substantive discrete topic, opening up a whole new area of inquiry beyond the scope of this thesis, which concerns fisheries data requirements. See generally: High Seas Task Force, *Closing the net: Stopping illegal fishing on the high seas* (France: Governments of Australia, Canada, Chile, Namibia, New Zealand and the United Kingdom, WWF, IUCN, and the Earth Institute at Columbia University, 2006).

²¹ The term Pacific Island States refers to the following fourteen independent countries: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

²² A. Langley, P. Williams, and J. Hampton, *The Western and Central Pacific Tuna Fishery: 2005 overview and status of stocks, Tuna Fisheries Assessment Report No.7* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2006), WCPFC, *DRAFT: Western and Central Pacific Fisheries Commission Tuna Fishery Yearbook 2006* Western and Central Pacific Fisheries Commission, 2007 [cited 1 December 2008]; available from <http://www.wcpfc.int/statistics/bulletins.htm>.

benefits such as employment and export earnings.²³ However, with the primary responsibility for the conservation and management of tuna resources occurring within their waters, Pacific Island States face significant challenges in managing their tuna fisheries owing to their small isolated nature, small populations, undeveloped economies, large ocean areas under their national jurisdiction and high dependence on revenue obtained from fishing access fees. The current and future potential of these tuna fisheries to Pacific Island States and because tuna fisheries in the western and central Pacific Ocean tuna fisheries supply over half of the world's tuna catch, further demands efforts to ensure the long-term conservation and sustainable use of these tuna fisheries. The success of these efforts will in large measure depend on the collection, verification and sharing of fisheries data underpinning the conservation and management of these fisheries. Individually, Pacific Island States have an obligation to meet international legal obligations and international standards, such as those relating to the collection, verification and sharing of fisheries data relevant to the conservation and management of tuna fisheries. The nature of small-island developing Pacific Island States necessitates developing innovative, collective approaches for Pacific Island States to be able to overcome their individual but common challenges, and to ultimately ensure that tuna fisheries management in their region is effective.

Additionally, the effective conservation and management of tuna stocks requires the cooperation of all States involved in fisheries for those stocks, not just the coastal States. Accordingly in 1994, Pacific Island States initiated what was to be the first of seven meetings with other States involved in western central Pacific tuna fisheries to negotiate a formal treaty for the conservation and management of the relevant fish stocks, these were called the Multilateral High Level Conference.²⁴ At the conclusion of the seventh session of the Multilateral High Level Conference some six years later, in September 2000, the participating States adopted the Convention for the Conservation and Management of Highly Migratory Fish Stocks of the Western and Central Pacific Ocean.²⁵ In 2004, the *Commission for the Conservation and Management of Highly Migratory Fish Stocks of the Western and Central Pacific Ocean* (WCPFC) was

²³ R. Gillett et al., *Tuna: A Key Economic Resource in the Pacific Islands*, ed. A. D. Bank (Manila, Philippines: Asian Development Bank, 2001), p5.

²⁴ S. Tarte, "Negotiating a Tuna Management Regime for the Western and Central Pacific: the MHLC Process 1994-1999," *The Journal of Pacific History* 34, no. 3 (1999): 273-280.

²⁵ Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean of 5 September 2000, entered into force from 19 June 2004 (2000) *ATNIF No.11* (WCPF Convention).

established and held its inaugural regular annual session. The WCPFC brings together distant-water fishing nations, large south-east Asian coastal States, Pacific Island States and other coastal States, some twenty-six members in all, with very diverse interests and aspirations in tuna fisheries.

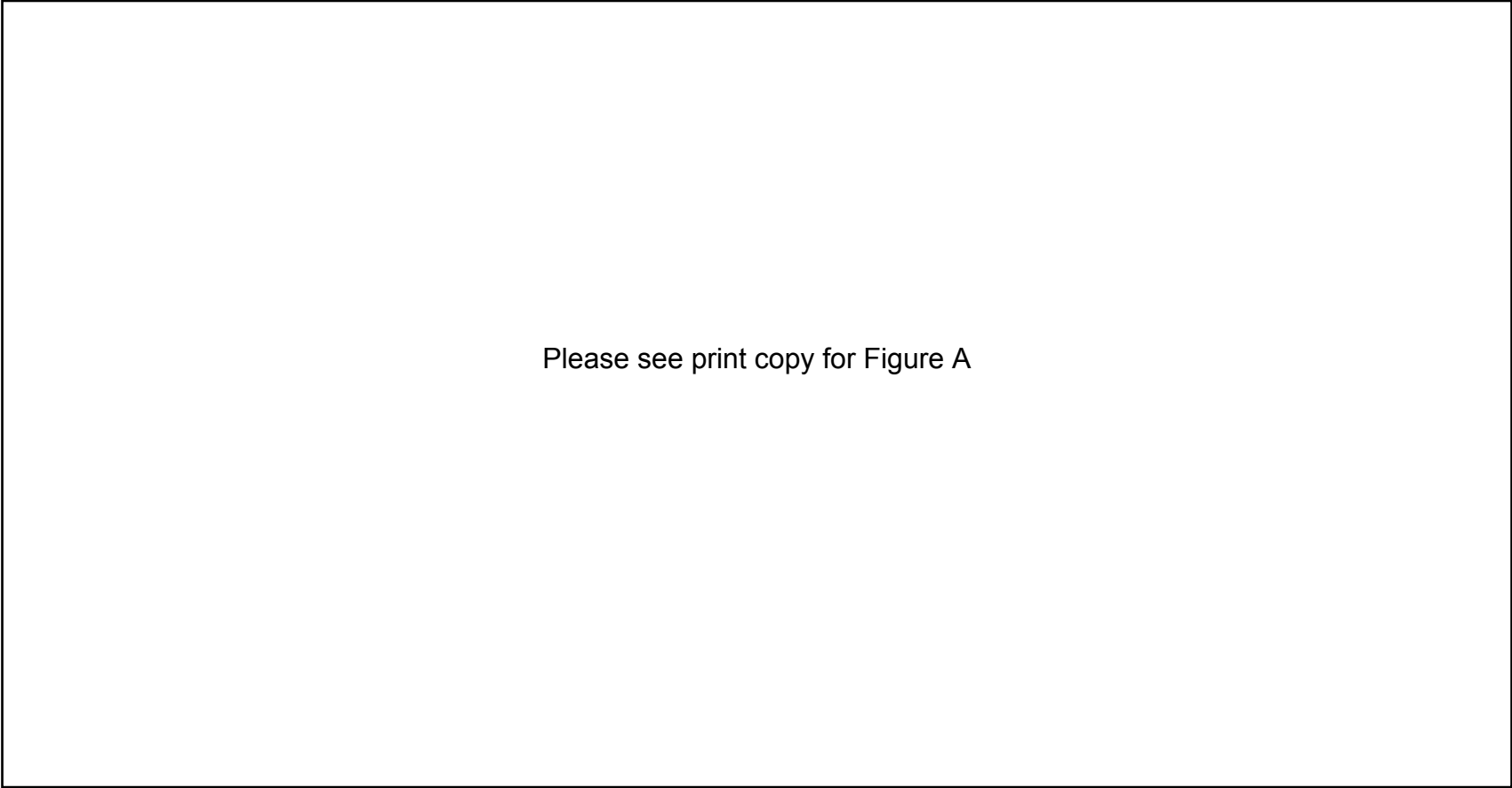
Over the following four years the WCPFC commenced the establishment of arrangements to ensure the collection, verification, exchange and dissemination of data on fisheries for highly migratory fish stocks. To be effective, these arrangements should as a minimum meet international obligations and best practice standards, not undermine previously-applied data standards and practices in the region, and not be unduly burdensome on developing States, particularly small-island developing States.²⁶ Ultimately, fisheries data practices in the WCPFC must ensure that the best scientific evidence is available to underpin conservation and management decisions that will be made by the Commission. These WCPFC decisions will be seeking to achieve the objective of the Convention: which is “to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the western and central Pacific Ocean.”²⁷ The continued development of the WCPFC fisheries data practices is anticipated to present evolving challenges for Pacific Island States. And yet somehow these challenges have to be overcome for the objective of the Convention to be achieved.

Thesis

The aim of this research is to analyse fisheries data requirements under international law and the effectiveness of the data practices that implement these data requirements for tuna fisheries in the western and central Pacific Ocean. The success of the fisheries data practices in the western and central Pacific Ocean will in large measure determine whether effective long-term conservation and sustainable use of tuna fisheries in the western and central Pacific Ocean is achieved. Indeed, it is essential that this is achieved, because Pacific Islands States depend on the economic returns from the tuna resources in their waters.

²⁶ Ibid., Articles 5(b), 5(i), 8, 10(1e), 23(2), and 30.

²⁷ Ibid., Article 2.



Please see print copy for Figure A

Figure A . A schematic diagram illustrating the role of data in tuna RFMOs, based on Annex I of the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement, Annex I).

Scope and Limitation

This thesis only analyses fisheries data requirements under international law and the practices to implement these fisheries data requirements at international and regional levels. It will not assess the individual domestic legislative implementation of fisheries data requirements.

Analytical Framework

In order to support the thesis, a multidisciplinary desktop study has been conducted that incorporates aspects of fisheries science, international law and policy. The effectiveness of data practices for tuna fisheries in the western and central Pacific Ocean was assessed through comparison to international legal obligations, standards of international best practice and scientific requirements. Challenges and requirements for practical implementation of fisheries data practices, particularly by Pacific Island States, were also considered.

International efforts to conserve and manage tuna stocks requires States to cooperate to provide fisheries data to tuna RFMOs and arrangements will need to be established in tuna RFMOs for these data.²⁸ The fisheries data practices in tuna RFMOs that underpin scientific advice to the Commission on the impacts of tuna fishing were analysed in this thesis utilising a framework. The framework was based on the provisions of Annex I Standard Requirements for the Collection and Sharing of Data, of the *Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks* (UN Fish Stocks Agreement).²⁹ A schematic diagram that illustrates the data practices that are required to ensure quality fisheries data is available to tuna RFMOs is shown in Figure A.

The framework for the analyses was comprised of two parts. The first part analysed the fisheries data practices to ensure the tuna RFMO collects the fisheries data which are necessary for scientific analyses of impacts of fishing. The tuna RFMO must

²⁸ UN Fish Stocks Agreement, Annex I Article 2(c).

²⁹ UN Fish Stocks Agreement Annex I Standard Requirements for the Collection and Sharing of Data, is reproduced herein as Appendix 2.

adopt standards that specify the fisheries data that Commission members are to be provided to tuna RFMOs.³⁰ International legal requirements and regional practices for Commission members to provide certain data to tuna RFMOs, were analysed in this thesis by each of the four types of fisheries data in turn: catch and effort data; other data to support stock assessments; vessel-related data and information; and data on non-target, dependent and associated species.³¹ The collection of these four types of fisheries data ensures that the tuna RFMO has available the range of data on tuna fisheries which are necessary to support scientific analyses of impacts of fishing.³²

The second part analysed the fisheries data practices to be established in tuna RFMOs for handling the fisheries data that are received from Commission members. There are three steps which follow the receipt of fisheries data from Commission members in tuna RFMOs, these steps are illustrated in Figure A. First, all types of fisheries data must be compiled in the database of the tuna RFMO. Databases must store data securely to maintain confidentiality and enable efficient access to data so that data can be effectively used in scientific analyses of impacts of tuna fishing.³³ Second, data verification programmes should be used to improve the quality of fisheries data that are available to a tuna RFMO. Verification involves crosschecking multiple sources of data to fill in gaps in time series of data, to identify errors and anomalies, and to detect and adjust for sources of bias in data.³⁴ Data verification programmes contribute to improving the completeness and accuracy of data on tuna fisheries. There are many possible arrangements that could be used to verify data on tuna fisheries, and many of these tools also are used in tuna RFMOs for compliance and fisheries monitoring purposes.³⁵ Four possible verification programmes that could be used in tuna RFMOs include: (a) vessel monitoring systems (VMS) to check vessel positions;

³⁰ UN Fish Stocks Agreement, Annex I Article 2(d). In addition to Commission members providing fisheries data, the tuna RFMO should request non-members or non-participants in the tuna RFMO to provide data concerning relevant fishing activities by vessels flying their flag.

³¹ Ibid., Articles 1(1), 3 and 4.

³² J. Joseph and J. W. Greenough, *International Management of Tuna, Porpoise and Billfish - Biological, Legal and Political Aspects* (Seattle: University of Washington Press, 1979), p23, P. Sparre and S. C. Venema, *Introduction to tropical fish stock assessment. Part 1. Manual*, *FAO Fisheries Technical Paper 306.1 Rev 2* (Rome: FAO, 1998), 344-347.

³³ UN Fish Stocks Agreement, Annex I Article 7(1). Also see FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998*, *FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), p63.

³⁴ UN Fish Stocks Agreement, Annex I Article 6. Also see Ibid., p76.

³⁵ M. W. Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007).

(b) regional observer programmes to check the impacts of fishing on target species and the marine ecosystem; (c) documentation schemes to check the catches from the point of harvest through to their markets; or (d) port monitoring schemes to check catches at the point of landing.³⁶ Third, any dissemination and exchange of data held by the tuna RFMO, must be subject to rules and procedures that maintain the confidentiality of fisheries data.³⁷ Together, these three steps for handling fisheries data in tuna RFMOs ensure that the best available (most complete coverage and most accurate) fisheries data, underpin the scientific advice which is considered by tuna RFMOs in taking conservation and management measure decisions for tuna fisheries. These conservation and management decisions for tuna fisheries, must seek to achieve the objective of the UN Fish Stocks Agreement and the WCPF Convention, to ensure “*the long-term conservation and sustainable use*” of highly migratory fish stocks.³⁸

Thesis structure

This introductory chapter highlighted the sustainability concerns for tuna fisheries globally, and the importance of western and central Pacific Ocean tuna fisheries internationally and to Pacific Island States. It has established that fisheries data is a key input in scientific advice on impacts of fishing on tuna species and the ecosystem, which underpins decision-making in tuna RFMOs to achieve long-term conservation and sustainable use of tuna fisheries. In the chapters that follow, a background on the challenge of achieving long-term conservation and sustainable use in tuna fisheries will be provided; the international legal framework for fisheries data will be reviewed; and some regional practices for fisheries data that respond to this challenge will be presented.

Chapter 1 provides an overview of the tuna and billfish species that are targeted by tuna fisheries, pertinent information on the global fisheries for these species and impacts of tuna fishing on these species. The Chapter discusses the objectives of contemporary fisheries management, and introduces the tuna RFMOs which are responsible for conserving and managing tunas and billfishes. This broad overview of tunas, tuna fisheries and the fisheries management framework for these fisheries, which

³⁶ UN Fish Stocks Agreement, Annex I Article 6. Also see Ibid.

³⁷ UN Fish Stocks Agreement, Annex I Article 7(1).

³⁸ UN Fish Stocks Agreement, Article 2 and WCPF Convention, Article 2.

is contained in Chapter 1, provides the necessary context to understand the evolution of international legal requirements as well as drivers for regional practices for data on tuna fisheries.

Chapters 2 and 3 provide an analysis of the international legal framework for fisheries data in the context of tuna fisheries management. Chapter 2 traces the background to the relevant international legal instruments, both binding treaties and non-binding instruments, which comprise the international legal framework for data on tuna fisheries. In Chapter 2, international legal requirements specifically related to the types and standards of fisheries data that tuna RFMOs require to effectively support scientific analyses of fishing will be analysed. The analyses will compare international legal requirements for fisheries data, with scientific uses of these data and practices in tuna RFMOs. In accordance with the analytical framework for this thesis outlined previously, international legal requirements for the four groups of fisheries data will be analysed in turn: catch and effort data; other data to support stock assessments; vessel-related data and information; and data on non-target, dependent and associated species. The collection of these four types of fisheries data ensures that the tuna RFMO has the range of data on tuna fisheries which are necessary for scientific analyses of impacts of fishing. Chapter 3 analyses international legal requirements for the data practices that are recommended and required in tuna RFMOs for handling of fisheries data. The approaches to implement these requirements in tuna RFMOs, except for the WCPFC, will be examined. The practices for handling fisheries data include: (a) a database to compile different types of fisheries data; (b) verification programmes to improve the quality of fisheries data available to the tuna RFMO; and (c) rules and procedures to maintain the confidentiality of fisheries data and where appropriate, to facilitate the exchange and dissemination of fisheries data and information on impacts of tuna fishing. Together, these arrangements for handling fisheries data in tuna RFMOs ensure that the best available (most complete coverage and most accurate) fisheries data, underpin the scientific advice which is considered by Commissions when taking conservation and management measure decisions for tuna fisheries.

Chapter 4 completes the analysis of the international legal framework for tuna fisheries data. The Chapter examines the global institutional framework for fisheries data, particularly the role of the Food and Agriculture Organisation of the United Nations (FAO) in compiling and disseminating fisheries data. The analysis shows that the best available data on tuna fisheries at the global level is of a less than ideal quality,

but that concerted efforts are being made to improve the availability of data on tuna fisheries as well as the availability of information on the impacts of fishing.

Chapter 5 provides a profile of the tuna fisheries of the western and central Pacific Ocean and outlines the significance of these fisheries internationally and to Pacific Island States. In this Chapter, particular attention is paid to Pacific Islands States not only because of their economic dependence on these tuna fisheries, but also because of the contribution of the tuna catches taken in their exclusive economic zones (EEZs) to the global supply of tuna products. It is necessary for Pacific Island States that the long-term conservation and sustainable use of tuna fisheries in the western and central Pacific Ocean is achieved. One of the key scientific inputs to ensuring effective conservation and management of these tuna fisheries is quality fisheries data. However, as small-island developing States, Pacific Islands States must overcome challenges to meet international and regional obligations for fisheries data.

Chapter 6 documents and analyses the pre-existing practices that Pacific Island States have established to collect, compile, verify and maintain the confidentiality of data on tuna fisheries. It will be shown that the practices in Pacific Island States, supported by regional institutions, have been successful in collecting fisheries data, covering tuna fishing activities that occur in Pacific Island States EEZs. Additionally, Pacific Island States have established cooperative arrangements with other fishing States to ensure the availability of data covering the range of western and central Pacific Ocean tuna fisheries which were used to support scientific analyses of impacts of tuna fishing. Accordingly, through these practices, quality information and scientific advice on impacts of tuna fishing and prospects for the long-term conservation and sustainable use of tuna fisheries in the western and central Pacific Ocean has been available for fisheries managers.

Chapters 7 and 8 analyse the data practices that have been established in the *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPFC). The WCPFC data practices are assessed using the findings, first from the analyses of international legal requirements for fisheries data and data practices implemented in other tuna RFMOs in Chapters 2 and 3; and second from the analyses of the pre-existing practices in Pacific Island States in Chapter 6. As a context for the analyses, Chapter 7 will trace the background to the WCPFC and the WCPFC data practices, as well as discuss the unique features of the WCPFC compared to other tuna RFMOs. Chapter 7 analyses the fisheries data

practices that have been established by the WCPFC to collect the fisheries data required to support scientific analyses of impacts of western and central Pacific tuna fisheries. Chapter 8 analyses the progresses made to establish practices to compile, verify, exchange and disseminate data on tuna fisheries held by the WCPFC, and ultimately to ensure that the best available (most complete coverage and accurate) fisheries data underpins the scientific advice that is considered by the Commission when conservation and management decisions are made in the WCPFC. Chapters 7 and 8 will also analyse any implications of WCPFC data practices to Pacific Island States.

The final Chapter synthesises the results of the research and concludes that the WCPFC data practices meet international legal requirements and international best practice in tuna RFMOs. The significant progress in the WCPFC over its first five years, have been largely because the WCPFC has utilised and built upon pre-existing arrangements and standards for fisheries data in Pacific Island States. Accordingly, the fisheries data that was available to the WCPFC, at the time of writing this thesis, was assessed to be adequate to underpin scientific analyses of impacts of fishing. There are still some gaps in the implementation of requirements for WCPFC members to provide fisheries data to the WCPFC, and progress can be made to further improve the quality of fisheries data, notably more complete coverage and improved accuracy. Pacific Island States, in spite of their considerable hardships are doing well in meeting requirements to provide fisheries data to the WCPFC and in leading the implementation of WCPFC practices to verify fisheries data. Indeed, Pacific Island States are doing considerably better than most other coastal States in the WCPFC. The chapter recommends that Pacific Island States, because of their vested interest in effective long-term conservation and sustainable use of tuna fisheries of western and central Pacific Ocean, must continue to take a lead role in strengthening the WCPFC data practices to further improve the coverage and accuracy of fisheries data. Achieving the ultimate objective of the long-term conservation and sustainable use of tuna fisheries in the western and central Pacific Ocean, even with the best quality fisheries data, will still require the effective application of the precautionary approach and ultimately sufficient political will so that the WCPFC can effectively respond to the scientific advice, which is underpinned by these fisheries data.

Significance of the Research

The thesis is significant for four reasons. First, it will make a significant contribution to the growing literature on recommended best practices for tuna RFMOs to ensure effective conservation and management of tuna fisheries. The academic literature on the subject has so far focussed on *inter alia* general practices, conservation and management measure practices, allocation practices, compliance and enforcement practices, decision-making practices and institutional practices. Most of this literature has simply noted that effective arrangements for collection and reporting of fisheries data to the tuna RFMO are necessary for monitoring and assessing impacts of tuna fishing. This thesis is one of the first detailed studies to document the fisheries data practices of tuna RFMOs and to analyse the effectiveness of these practices to meet international legal requirements and scientific needs. The thesis provides intellectual input into the implementation of fisheries data requirements under international law, particularly by tuna RFMOs. The findings of this thesis could serve as a basis to elaborate recommended best practices for fisheries data arrangements in tuna RFMOs.

Second, the thesis makes a significant contribution to the literature on the WCPFC; the only tuna RFMO with an in force constituting treaty that implements the provisions of the *Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*. The thesis is the first comprehensive study to analyse the effectiveness of the fisheries data practices of the WCPFC, in meeting international legal requirements as well as requirements for scientific analyses of impacts of fishing. The conclusions drawn from these analyses are timely, because the WCPFC is moving from transitional to longer-term institutional arrangements for fisheries data and scientific structure. The recommendations will assist the WCPFC to improve the quality of fisheries data, which will ultimately underpin efforts to ensure the long-term conservation and sustainable use of tuna fisheries in the western and central Pacific Ocean.

Third, the thesis makes a significant contribution to the literature on forms of assistance for developing States to be able to overcome fisheries management challenges. Gaining knowledge on how developing States can be assisted with their fisheries management

challenges provides useful lessons for other tuna RFMOs. This thesis expands this knowledge in two ways. First, it analyses the innovative and collective approaches established by Pacific Island States to overcome challenges to collect and share fisheries data covering fishing activities in their national waters. Second, this thesis documents how the WCPFC has effectively balanced the diverse capabilities of its members, including developing State members, so that the best quality data is available for scientific analyses of impacts of tuna fishing.

Fourth, the thesis makes a significant contribution to improving understanding amongst WCPFC members of the international and regional requirements for tuna fisheries management, as well as the necessity to collect quality fisheries data on western and central Pacific Ocean tuna fisheries. Only through the concerted efforts all States that participate in western and central Pacific Ocean tuna fisheries, can the quality of fisheries data be improved, so as to better support scientific analyses of impacts of tuna fishing on tuna stocks and the marine ecosystem.

Chapter 1. Tuna and billfish, the fisheries for them and fisheries conservation and management

This Chapter reviews the most recent data and information on tuna and billfish fisheries and the impacts of tuna fishing. The focus of this Chapter is necessarily global. A global context is relevant to the development of international law for the conservation and management of tuna and billfish fisheries, as well as the parallel developments in the practices of tuna regional fisheries management organisations (RFMOs), both are analysed in subsequent Chapters of this thesis. The Chapter will comprise four parts. First, the available information on the characteristics of tuna and billfish species, which are of concern to the present thesis, will be examined. Second, the available information on the history and development of tuna fisheries will be reviewed. Third, the most current scientific advice on impacts of tuna fishing on target tuna and billfish stocks, as well as the marine ecosystem, will be reviewed. Finally, the role of tuna RFMOs in ensuring the long-term conservation and sustainable use of tuna fisheries will be examined.

1.1 Tuna and billfish species

Within this Chapter four categories will be used to facilitate description of global and regional trends in fisheries of tuna and billfish: principal market tunas; bluefin tunas; billfishes; and other smaller and less heavily exploited species. These categories and the species or groups of species they comprise are listed in Table 1-1. It is the former three categories that are the focus of the present thesis, and it is these three categories that will be collectively referred to as “tuna and billfish” or “tunas and billfishes”.

The principal market tunas, bluefin tunas and other smaller and less heavily exploited species listed in Table 1-1 are classified into the taxonomic family of Scombridae, which includes the ‘true tunas’ (yellowfin, albacore, bigeye and three species of bluefin tuna), skipjack and other less familiar species such as the blackfin tuna, the longtail tuna, kawakawa, the frigate mackerel, and the bullet tuna. Billfish are classed in the families of Istiophoridae (marlin, spearfish and sailfish) and Xiphiidae

Table 1-1. Categories of tunas and billfishes used in this thesis. Generally the common names are used, but the scientific names are given here for reference.

Categories		Species or Genus (Common and <i>Scientific</i> names)	
Tuna and billfishes	Principal market tunas:	yellowfin	<i>Thunnus albacares</i>
		albacore	<i>Thunnus alalunga</i>
		bigeye	<i>Thunnus obesus</i>
		skipjack	<i>Katsuwonus pelamis</i>
	Bluefin tunas: ¹	Southern bluefin	<i>Thunnus maccoyii</i>
		Atlantic bluefin	<i>Thunnus thynnus</i>
		Pacific bluefin	<i>Thunnus orientalis</i>
	Billfishes:	swordfish	<i>Xiphias gladius</i>
		Indo-Pacific blue marlin	<i>Makaira mazara</i>
		Atlantic blue marlin	<i>Makaira nigricans</i>
		black marlin	<i>Makaira indica</i>
		striped marlin	<i>Tetrapturus audax</i>
		Atlantic white marlin	<i>Tetrapturus albidus</i>
		spearfishes	other <i>Tetrapturus</i> spp.
		Atlantic sailfish	<i>Istiophorus albicans</i>
		Indo-Pacific sailfish	<i>Istiophorus platypterus</i>
Other smaller and less heavily exploited species:		blackfin tuna	<i>Thunnus atlanticus</i>
		longtail tuna	<i>Thunus tonggol</i>
		little tunas, kawakawa, black skipjack	<i>Euthynnus</i> spp.
		frigate mackerel, bullet tuna	<i>Auxis</i> spp.
		slender tuna	<i>Allothunnus fallai</i>
		bonitos	<i>Sarda</i> spp.
		wahoo	<i>Acanthocybium solandri</i>
		Spanish mackerel, king mackerel, seerfish, sierra	<i>Scomberomorus</i> spp.
		butterfly kingfish	<i>Gasterochisma melampus</i>

(swordfish).² Owing to tunas and billfishes having similar migratory behaviour and morphological links, they are often classed together within the sub-order of

¹ Note the three bluefin tunas species are commonly considered as principal market tunas, mainly because of the significantly high prices commanded by these species in markets. However the present thesis considers the three bluefin tuna species in a separate group from other principal market tunas (bigeye, yellowfin, skipjack and albacore). In the western and central Pacific Ocean, it is the four tuna species listed in Table 1-1 that are the principal market tunas of interest to the *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPFC), but two of the three bluefin species are caught in the region. Southern bluefin tuna are under the mandate of the *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT). The spawning grounds for Pacific bluefin tuna is within the area of the WCPFC, and the catch taken in the western and central Pacific Ocean is under the mandate of the WCPFC. However a lesser quantity of Pacific bluefin is harvested in the WCPFC relative to the four species listed above.

² I. Nakamura, *FAO Species Catalogue: Vol 5. Billfishes of the World. An annotated and illustrated catalogue of marlins, sailfishes, spearfishes and swordfishes known to date, FAO Fish. Synop. (125) Vol.*

Scombroidei (within the larger order Perciformes).³ This section will only be a brief outline of the biology of tuna and billfishes, focussing primarily on the principal market tunas, bluefins and the billfishes.⁴

General features of the species

Tunas and billfishes live in the tropical and temperate waters of the Atlantic, Pacific and Indian Oceans. They are pelagic in nature, which means that they inhabit the open seas, wandering mostly within the mixed layer of the water column. The mixed layer is the layer just below the surface of the water column, which is churned and mixed by wind to create a relatively uniform temperature of water that ranges from 10–150 m in depth depending on the meteorologic and oceanographic conditions, the water depth and the season. Below the mixed layer is a small zone of water marked by a sudden change in temperature and salinity called the thermocline, which separates the mixed layer from the colder deeper nutrient rich waters. Most tunas and billfishes are confined to waters above the thermocline, although some tunas and billfishes have the ability to dive to depths well below the thermocline in search and pursuit of food.⁵ As adults, all tunas and billfishes are high-level apex predators, actively predating on fish, squid and

⁵ (Rome: FAO, 1985), p3. "The term "Billfishes" has been widely accepted by both, commercial and sports fishermen as well as scientists, to apply to the large fishes of the families Xiphiidae and Istiophoridae, characterized by the prolongation of the upper jaw, much beyond the lower jaw into a long rostrum which is flat and swordlike (swordfish) or rounded and spearlike (sailfishes, spearfishes and marlins)."

³ B. B. Collette, C. Reeb, and B. A. Block, "Chapter 1: Systematics of the Tunas and Mackerels (scombridae)," in *Tuna: Physiology, Ecology and Evolution*, ed. B. A. Block and E. D. Stevens, *Fish Physiology Series* (San Diego, California: Academic Press, 2001), J. Joseph, W. Klawe, and P. Murphy, *Tuna and Billfish - fish without a country*, 2nd ed. (La Jolla, California: Inter-American Tropical Tuna Commission, 1980), p3.

⁴ For further information and detail a good overview of tunas for the layperson is the book by J. Joseph, W. Klawe, and P. Murphy, *Tuna and Billfish - fish without a country*, 2nd ed. (La Jolla, California: Inter-American Tropical Tuna Commission, 1980)., more comprehensive reviews, recent and historical, of tuna biology are B. A. Block and E. D. Stevens, eds., *Tuna: Physiology, Ecology and Evolution*, vol. 19, *Fish Physiology Series* (San Diego, California: Academic Press, 2001), G. D. Sharp and A. E. Dizon, eds., *The Physiological Ecology of Tunas, Proceedings of the Tuna Physiological Workshop held at the National Marine Fisheries Service Southwest Fisheries Center at La Jolla, California Jan 10-15 1977* (New York: Academic Press, 1978). The two volumes of the FAO Species Catalogues for Scombrids and Billfishes are also useful reference guides: B. B. Collette and C. E. Nauen, *FAO Species Catalogue: Vol 2. Scombrids of the World. An annotated and illustrated catalogue of tunas, mackerels, bonitos and related species known to date*, *FAO Fish. Synop. (125) Vol. 2* (Rome: FAO, 1983), I. Nakamura, *FAO Species Catalogue: Vol 5. Billfishes of the World. An annotated and illustrated catalogue of marlins, sailfishes, spearfishes and swordfishes known to date*, *FAO Fish. Synop. (125) Vol. 5* (Rome: FAO, 1985). As well as A. D. Lewis, "Population Genetics, Ecology and Systematics of Indo-Australian Scombrid Fishes, with particular reference to skipjack tuna (*Katsuwonus pelamis*)" (Doctor of Philosophy, Australian National University, 1981).

⁵ J. Joseph, W. Klawe, and P. Murphy, *Tuna and Billfish - fish without a country*, 2nd ed. (La Jolla, California: Inter-American Tropical Tuna Commission, 1980).

crustaceans. However their highly versatile and opportunistic feeding behaviour and ontogenetic changes in their feeding habits mean that over their life history, tunas and billfishes occupy more trophic levels than almost any other group of fishes.⁶

The patterning and coloration of tunas and billfishes that is darker on top and lighter on the bottom with shaded patterning provides camouflage from predators and prey and may also act as a communicator to other members of the same school. Tunas and billfishes have bodies and fins that are streamlined for rapid swimming and hydrodynamic efficiency.⁷ Internally, tunas and billfishes have adaptations to enable them to swim long distances and exhibit startling bursts of speed. Their circulatory system is an efficient thermo-regulator that includes a *rete mirabile* (or rete), which conserves and dissipates heat as is required, and which enables them to maintain speed over long distances and to dive to great depths.⁸ Tunas and billfishes maintain high metabolic rates and relative to other fish they have a very efficient uptake of oxygen from the water through their gills.⁹ However, many tunas and billfishes have lost many of the structures that other fish species use to pump water over their gills, so tuna and billfish must swim constantly with their mouth open to maintain oxygen flow to their

⁶ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p4.

⁷ J. D. Altringham and R. E. Shadwick, "Chapter 8: Swimming and Muscle Function," in *Tuna: Physiology, Ecology and Evolution*, ed. B. A. Block and E. D. Stevens, *Fish Physiology Series* (San Diego, California: Academic Press, 2001), M. W. Westneat and S. A. Wainwright, "Chapter 7: Mechanical Design for Swimming : Muscle, Tendon and Bone," in *Tuna: Physiology, Ecology and Evolution*, ed. B. A. Block and E. D. Stevens, *Fish Physiology Series* (San Diego, California: Academic Press, 2001).

⁸ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p4. Tuna and billfish have specialised counter-current heat exchange systems called *rete mirabile*. The rete enables tuna and billfish to regulate their temperature despite the ambient water temperature, the development of the rete varies among species and determines the range of water temperatures that each species of tuna can tolerate. For example yellowfin, which are predominately tropical in distribution have a much less advanced rete than do bluefin tunas, which range from tropical through to sub-polar regions. Behavioural adaptations also enable bigeye and bluefin tuna to venture well below the mixed layers of the ocean to depths in excess of 500m, whereas yellowfin are confined largely to the top 200m of the water column. For more information on the endothermy of tuna see R. W. Brill and P. G. Bushnell, "Chapter 3: The Cardiovascular System of Tunas," in *Tuna: Physiology, Ecology and Evolution*, ed. B. A. Block and E. D. Stevens, *Fish Physiology Series* (San Diego, California: Academic Press, 2001), J. B. Graham and K. A. Dickson, "Chapter 4: Anatomical and Physiological Specializations for Endothermy," in *Tuna: Physiology, Ecology and Evolution*, ed. B. A. Block and E. D. Stevens, *Fish Physiology Series* (San Diego, California: Academic Press, 2001).

⁹ R. W. Brill and P. G. Bushnell, "Chapter 3: The Cardiovascular System of Tunas," in *Tuna: Physiology, Ecology and Evolution*, ed. B. A. Block and E. D. Stevens, *Fish Physiology Series* (San Diego, California: Academic Press, 2001), J. B. Graham and K. A. Dickson, "Chapter 4: Anatomical and Physiological Specializations for Endothermy," in *Tuna: Physiology, Ecology and Evolution*, ed. B. A. Block and E. D. Stevens, *Fish Physiology Series* (San Diego, California: Academic Press, 2001).

body.¹⁰ The musculature of tunas and billfishes enable both continuous swimming and short bursts of speed without fatigue, and tunas and billfishes have been described as both sprinters and marathon runners.¹¹

Female tuna produce about 100,000 eggs per kilogram of body weight per spawning and cast them into the mixed layer; the egg to body weight ratio for billfish is slightly lower than that for tunas.¹² All of the principal market tunas and bluefins spawn in warm tropical waters.¹³ Fertilisation occurs in the water after the eggs are cast. The majority of eggs do not survive to the adult stage because they are preyed upon as eggs, as larva and as juveniles by a range of different predators within the food webs of the pelagic marine ecosystem.¹⁴ Potentially as an adaptation to promote survival, tunas exhibit strong schooling behaviour especially in the earlier stages of their life until maturity; schooling is less prevalent with increasing size in most species, except during spawning.¹⁵ Schooling occurs with similar sized tunas, and juvenile tropical tunas of different species are common in the same school as juveniles, but less so as adults. Little information exists on the schooling behaviour of billfishes, although sailfish have been observed in small groups.¹⁶

From a scientific perspective, tagging studies have shown that all tuna and billfishes are capable of large movements (>1000 nm).¹⁷ The general patterns of

¹⁰ R. W. Brill and P. G. Bushnell, "Chapter 3: The Cardiovascular System of Tunas," in *Tuna: Physiology, Ecology and Evolution*, ed. B. A. Block and E. D. Stevens, *Fish Physiology Series* (San Diego, California: Academic Press, 2001), J. B. Graham and K. A. Dickson, "Chapter 4: Anatomical and Physiological Specializations for Endothermy," in *Tuna: Physiology, Ecology and Evolution*, ed. B. A. Block and E. D. Stevens, *Fish Physiology Series* (San Diego, California: Academic Press, 2001).

¹¹ J. Joseph, W. Klawe, and P. Murphy, *Tuna and Billfish - fish without a country*, 2nd ed. (La Jolla, California: Inter-American Tropical Tuna Commission, 1980), 8-9. Joseph et. al. gave the examples of the wahoo that will for a short time swim at speeds over 75 km/h and the sailfish which has been recorded travelling in excess of 110 km/h for a short time, "a burst of speed unknown in any other fish." Joseph et al. also stated that the slowest that many tuna can swim exceeds one body length per second and estimated that at that speed, a fish measuring one metre could cross the Atlantic Ocean in less than two months.

¹² Ibid., p4. Joseph et al. gave an example, a 50 kg northern bluefin (probably an Atlantic bluefin) would spawn approximately five million eggs per year. If all the eggs were fertilised and survived to their full size of 500 kg this female bluefin tuna and the male that fertilised the eggs would produce 2.5 million Mt of tuna, a significant proportion of the global catch of all tuna. However the situation in reality is guessed to be that the majority of these eggs do not survive to adulthood, but to maintain the population size at least two offspring from the million of eggs produced would have to survive to maturity.

¹³ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p5.

¹⁴ Ibid.

¹⁵ Ibid., p4.

¹⁶ Ibid., p6.

¹⁷ J. Gunn and B. A. Block, "Chapter 5: Advances in Acoustic, Archival and Satellite Tagging of Tunas," in *Tuna: Physiology, Ecology and Evolution*, ed. B. A. Block and E. D. Stevens, *Fish Physiology Series* (San Diego, California: Academic Press, 2001).

movement vary significantly among species, and within species among different stages of the life history. For example bluefin tuna species are characterised by long-distance, directed migrations throughout life, whereas skipjack despite the capacity to move long distances tend to be more limited. Most of what is known about the movements and migrations of tunas and billfishes is derived from conventional tagging and recapture experiments that tend to have a degree of bias because such experiments are largely restricted to areas where commercial fisheries operate.¹⁸ Additionally, more recent applications of archival and pop-up tag technology, which record details of the migration and behaviour rather than just the release and capture, have demonstrated some previously undescribed patterns of migration and movement in these species, such as cyclic migrations and seasonal movements into unfished areas.¹⁹

As a result of such tagging studies that have demonstrated the capability of tunas and billfishes to move large distances, they are often described as “highly migratory species”. This term has a unique status in international law, having been defined in the *United Nations Convention on the Law of the Sea* (LOS Convention).²⁰ Annex I of the LOS Convention defines highly migratory species as referring to seventeen groups of fish which require international efforts by coastal and fishing States to conserve and manage the stocks.²¹ The majority of the species listed in LOS Convention Annex I as highly migratory species are tunas and billfishes, and includes all of the principal market tunas.²² At the time the LOS Convention was negotiated the understanding was

¹⁸ Ibid.

¹⁹ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p6, J. Gunn and B. A. Block, "Chapter 5: Advances in Acoustic, Archival and Satellite Tagging of Tunas," in *Tuna: Physiology, Ecology and Evolution*, ed. B. A. Block and E. D. Stevens, *Fish Physiology Series* (San Diego, California: Academic Press, 2001).

²⁰ United Nations Convention on the Law of the Sea of 10 December 1982, entered into force from 16 November 1994 (1982) 21 *ILM* 1261 (LOS Convention, Article 64) ‘1. The coastal State and other States whose nationals fish in the region for the highly migratory species listed in Annex I shall cooperate directly or through appropriate international organizations with a view to ensuring conservation and promoting the objective of optimum utilization of such species throughout the region, both within and beyond the exclusive economic zone. In regions for which no appropriate international organization exists, the coastal State and other States whose nationals harvest these species in the region shall cooperate to establish such an organization and participate in its work. 2. The provisions of paragraph 1 apply in addition to the other provisions of this Part.’

²¹ This list is reproduced herein as Appendix 1.

²² The others groups listed in LOS Convention, Annex I as highly migratory fish species are marine mammals, oceanic sharks, pomfrets, dolphin-fish and sauries. As an aside, the content of this list has been questioned particularly that the list is based on a FAO fisheries classification from 1975, current early on in negotiations of the LOS Convention and more recent taxonomic references might be more appropriate. For example see A. Serdy, "One fin, two fins, red fins, bluefins: some problems of nomenclature and taxonomy affecting legal instruments governing tuna and other highly migratory species," *Marine Policy* 28 (2004): 235-247.

that these groups of species were “believed to undertake extensive migrations and that carry individuals through many coastal zones as well as the high seas throughout their life.”²³ However despite the demonstrated capability for large-scale movements, there also is scientific evidence of some substantial residence times of principal market tunas, particularly skipjack and yellowfin within exclusive economic zones (EEZs) in the western central Pacific Ocean.²⁴ Such research led scientists to question the appropriateness of the inclusion of skipjack and yellowfin under the category of “highly migratory species”, and hence whether there was a need for wide-scale international efforts towards conservation and management of these species.²⁵ However, findings from more recent tagging studies suggest that a combination of international efforts with national management efforts in EEZs for skipjack and yellowfin is appropriate.²⁶ It would seem that the phrase “highly mobile” is perhaps more appropriate than the phrase “highly migratory” to describe the movements of principal market tunas.²⁷

Life history traits of the species

The growth rates, maximum age and maximum size vary among species of tuna and billfish. Although most tunas and billfishes are hatched in tropical waters, the distribution of the adult feeding ground also varies among species. The most current information on life history traits of selected tunas and billfishes are listed in Table 1-2.

²³ J. Joseph, "The management of highly migratory species - some important concepts," *Marine Policy* (1977): 275-288, p277.

²⁴ R. Hilborn and J. Sibert, "Is international management of tuna necessary?," *Marine Policy* (1988): 31-39, R. Hilborn, "Letter to the editor: International management of tuna," *Marine Policy* (1989): 166, J. Sibert and J. Hampton, "Mobility of tropical tunas and the implications for fisheries management," *Marine Policy* 27 (2003): 87-95.

²⁵ R. Hilborn and J. Sibert, "Is international management of tuna necessary?," *Marine Policy* (1988): 31-39, R. Hilborn, "Letter to the editor: International management of tuna," *Marine Policy* (1989): 166.

²⁶ J. Sibert and J. Hampton, "Mobility of tropical tunas and the implications for fisheries management," *Marine Policy* 27 (2003): 87-95. This research was based on tagging studies in the western central Pacific region and the analyses suggested that skipjack and yellowfin are likely to be exposed to fishing in more than one EEZ during an individuals lifetime, and as a result some form of international cooperation for tuna conservation and management would be appropriate. However the results also suggest that Pacific Island countries can implement effective domestic management policies to promote conservation and sustainable utilization of tuna stocks within their EEZs. Hence the conclusion that conservation and management efforts in the western central Pacific Ocean utilising a combination of national and international efforts would be appropriate for the long-term sustainability and optimum utilisation of tuna stocks in the western central Pacific Ocean.

²⁷ A. Lewis, Fisheries Consultant, Personal Communication by Email, Wed, 6 July 2005, J. Sibert and J. Hampton, "Mobility of tropical tunas and the implications for fisheries management," *Marine Policy* 27 (2003): 87-95.

Table 1-2. Life History of selected tunas and billfishes²⁸

Species	Length at maturity (cm)	Weight at maturity (kg)	Age at maturity (year)	Max length (cm)	Max weight (kg)	Max age (year)	Spawning duration (months)	Min SST (°C)	Swim-bladder ²⁹
yellowfin	105	25	2.8	170	176	10	6	18	Single chamber
bigeye	115	31	3.5	180	225	15	3	16	Single chamber
skipjack	45	1.7	1.5	75	23	4-5	12	20	Only as juveniles
albacore	90	4.5	15	120	80	10	3	15	Single chamber
Atlantic bluefin	115	27.5	4.5	295	685	20	1.5	11	Single chamber
Southern bluefin	147	65	8-12	220	220	22-40	6	9	Single chamber
swordfish	175	70	5	290	650	17	3	15	Single chamber
Atl. white marlin	130	20	3	260	-	15	4	20	Multi-small chambered
Atlantic sailfish	130	16	3	255	-	18	2	22	Multi-small chambered

Generally smaller species of tuna and billfish are shorter-lived, faster growing and reach a smaller maximum size, than do larger species of tuna and billfish. For example skipjack are shorter lived and reach a smaller maximum size than yellowfin, bigeye and bluefin tuna respectively. It is worth noting that the understanding of tuna and billfish is far from complete, and relative to other commercially harvested fish species of similar

²⁸ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001).data from table on 6-7 The explanations of the terms were as follows:

Spawning duration: number of months per year during which spawning occurs

Length, weight and age at maturity: from literature

Maximum length, weight and age: maximum length and weight from catch-at-length data collected during historical period (99% of distribution); maximum age from tagging (time at liberty + estimated age at release). For southern bluefin the maximum age was estimated using hard parts, the maximum observed from tagging is 22 years.

Minimum SST: minimum sea surface temperature from literature.

²⁹ B. B. Collette, "Chapter 1: The Tunas: II. Adaptations and Systematics of the Mackerels and Tunas," in *The Physiological Ecology of Tunas*, ed. G. D. Sharp and A. E. Dizon, *Proceedings of the Tuna Physiology Workshop held at the National Marine Fisheries Service Southwest Fisheries Center at La Jolla, California, January 10-15 1977* (New York: Academic Press, 1978), I. Nakamura, *FAO Species Catalogue: Vol 5. Billfishes of the World. An annotated and illustrated catalogue of marlins, sailfishes, spearfishes and swordfishes known to date*, FAO Fish. Synop. (125) Vol. 5 (Rome: FAO, 1985). 'A swimbladder can counteract the weight of the fish in the water as can the pectoral fins if they are extended as lifting hydrofoils in swimming.' (Collette, p19) Thus the presence of a swimbladder reduces the minimum speed required to maintain hydrostatic equilibrium enabling a greater size to be attained, but reduces the ability of the fish to undertake rapid vertical movements. (A. D. Lewis, "Population Genetics, Ecology and Systematics of Indo-Australian Scombrid Fishes, with particular reference to skipjack tuna (*Katsuwonus pelamis*)" (Doctor of Philosophy, Australian National University, 1981), p36.)

commercial importance much less is known about the biology, ecology and physiology of tuna and billfish species.³⁰

Yellowfin and skipjack are distributed throughout the tropical waters of the Pacific, Indian and Atlantic Oceans with a minimum sea surface temperature range of 18–31 °C.³¹ However skipjack are absent from the Black Sea and yellowfin, like albacore and bigeye, are absent from the Mediterranean Sea.³² Relative to the other commercial tunas, yellowfin and skipjack have small to medium maximum size, poorly developed retes, rapid growth, early age at first maturity, year-round spawning, short to medium life spans (<10 years) and high production to biomass ratios (see Table 1-2).³³ Yellowfin are able to attain a greater maximum size than do skipjack, because of the energetic savings from the presence of a swimbladder and larger pectoral fins.³⁴

Bluefin tunas are distributed in the temperate waters of the world's oceans. Southern bluefin are found in temperate southern waters generally south of 30 °S (in the Indian Ocean, southern part of the Pacific Ocean, southern part of the Atlantic Ocean and Southern Ocean), and one of the two northern species is found in the north Atlantic (Atlantic bluefin) and the other in the north Pacific (Pacific bluefin).³⁵ From as early as the end of their first year of life they spend the majority of their life feeding in temperate waters, but return to tropical waters to spawn (juveniles are found in waters with sea surface temperature 20–30 °C and adults tend to be found in waters of 5–20 °C).³⁶ Relative to other tunas, they are characterised by their large maximum size, well-developed retes, slow growth, later age at first maturity, seasonal spawning, long life-

³⁰ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p28. This difference is attributed to the highly mobile nature and broad distributions of tuna and billfish species, and associated complexities this creates to study these species. The international character of fisheries that catch tuna makes it difficult to monitor catches of tuna and billfish.

³¹ B. B. Collette and C. E. Nauen, *FAO Species Catalogue: Vol 2. Scombrids of the World. An annotated and illustrated catalogue of tunas, mackerels, bonitos and related species known to date*, FAO Fish. Synop. (125) Vol. 2 (Rome: FAO, 1983), Skipjack 42-44, Yellowfin 83-85.

³² Ibid.

³³ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p5.

³⁴ B. B. Collette, "Chapter 1: The Tunas: II. Adaptations and Systematics of the Mackerels and Tunas," in *The Physiological Ecology of Tunas*, ed. G. D. Sharp and A. E. Dizon, *Proceedings of the Tuna Physiology Workshop held at the National Marine Fisheries Service Southwest Fisheries Center at La Jolla, California, January 10-15 1977* (New York: Academic Press, 1978), A. D. Lewis, "Population Genetics, Ecology and Systematics of Indo-Australian Scombrid Fishes, with particular reference to skipjack tuna (*Katsuwonus pelamis*)" (Doctor of Philosophy, Australian National University, 1981).

³⁵ B. B. Collette and C. E. Nauen, *FAO Species Catalogue: Vol 2. Scombrids of the World. An annotated and illustrated catalogue of tunas, mackerels, bonitos and related species known to date*, FAO Fish. Synop. (125) Vol. 2 (Rome: FAO, 1983), 87-88, 90-92.

³⁶ Ibid.

spans (greater than fifteen years), low production to biomass ratios, regular spawning migrations and discrete spawning grounds (see Table 1-2).³⁷

Bigeye tuna and albacore tuna have a very wide distributional range: tropical, through subtropical to temperate waters throughout the world's oceans, but there is some evidence that suggests albacore may have separate northern and southern stocks in the Pacific and Atlantic Oceans.³⁸ In terms of characteristics, bigeye and albacore are intermediate to the tropical and temperate tunas.³⁹ Bigeye and albacore are intermediate in maximum size relative to the other principal market tunas, have moderately developed retes, relatively fast growth, first maturity at between two to three years of age, seasonal spawning, intermediate life spans (between ten to fifteen years), and production to biomass ratios between those of yellowfin and the bluefins (see Table 1-2).

Billfishes are also pelagic fish, inhabiting tropical and temperate waters.⁴⁰ Marlin are found through tropical and temperate waters, with seasonal latitudinal movements into temperate waters. There are two separate species of blue marlin; one is found exclusively in the Atlantic Ocean (Atlantic blue marlin) and the other is found in the Indian and Pacific Oceans (Indo-Pacific blue marlin). Striped marlin are found mainly in the tropical, subtropical and temperate waters of the Indian and Pacific Oceans. Black marlin are found throughout the tropical and subtropical waters of the Pacific and Indian Oceans generally in surface waters and often close to shore with a range of 15–30 °C, although they occasionally stray into temperate waters. Other species such as the Atlantic white marlin and Atlantic sailfish are limited in distribution to within the Atlantic Ocean.

Similarly to blue marlin, there are two separate species of sailfish: the Atlantic sailfish and the Indo-Pacific sailfish. Sailfish are widely distributed in the tropical and

³⁷ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p5.

³⁸ B. B. Collette and C. E. Nauen, *FAO Species Catalogue: Vol 2. Scombrids of the World. An annotated and illustrated catalogue of tunas, mackerels, bonitos and related species known to date*, FAO Fish. Synop. (125) Vol. 2 (Rome: FAO, 1983), Bigeye 88-90, Albacore 81-83, FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), 5-6. Bigeye are common in tropical waters and are also found in temperate waters. Albacore spends most of its life in temperate waters but does travel to warmer waters to spawn.

³⁹ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p5.

⁴⁰ Ibid., p4, I. Nakamura, *FAO Species Catalogue: Vol 5. Billfishes of the World. An annotated and illustrated catalogue of marlins, sailfishes, spearfishes and swordfishes known to date*, FAO Fish. Synop. (125) Vol. 5 (Rome: FAO, 1985).

temperate waters of their respective oceans mainly in coastal waters, and are known to descend to great depths.⁴¹ Swordfish are cosmopolitan in distribution and widely distributed in all oceans, and the adults typically migrate to temperate waters in the summer. Swordfish have a remarkable range of temperatures that they tolerate (5–27 °C, with their optimum temperature 18–22 °C).

This section has shown the principal market tunas, bluefin tunas and billfishes to be highly mobile fish species, with global distributions including in coastal waters and high seas. The next section will overview the fisheries that target these tuna and billfish stocks.

1.2 The fisheries for tuna and billfish since 1950

This section reviews available data and information on fisheries for tuna and billfish since 1950. It will comprise three parts: first, the principal commercial tuna fishing methods will be overviewed. Second, the trends in development of catches of tuna and billfish since 1950 will be examined. Third, noting that the four principal market tuna species are dominant by catch, the trends in development of catches for the four principal market tuna species will be examined.

Overview of commercial tuna fishery operation methods

Tunas and billfishes occur off the coasts of nearly all nations bordering on tropical and temperate seas, so a large number of States participate in fisheries targeting tunas and billfishes. Tunas and billfishes are harvested commercially throughout using one of three methods: pole-and-line fishing, purse seining or longlining. Recreational or sport-fishing are also valuable fisheries to local economies, as are subsistence and artisanal fishing all of which are common throughout the world. Small-scale drift gillnet fisheries for tunas and billfishes are common in the coastal waters of the Atlantic Ocean, Mediterranean Sea and Indian Ocean. The three commercial tuna harvesting methods will now be outlined.

Pole-and-line fishing from baitboats is a fishing method that nearly always requires live bait, such as anchovies, sardines or small coastal fish, which must be kept

⁴¹ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p6, I. Nakamura, *FAO Species Catalogue: Vol 5. Billfishes of the World. An annotated and illustrated catalogue of marlins, sailfishes, spearfishes and swordfishes known to date*, FAO Fish. Synop. (125) Vol. 5 (Rome: FAO, 1985).

alive aboard the fishing boat in tanks of circulating seawater.⁴² When a school of tuna are sighted, the fishermen throw the live fish overboard to attract the tuna near the boat, a process called “chumming.” As the tuna approach, they are caught with a pole and line using lures with barbless hooks. Pole-and-line fishing was common in all the tropical and temperate oceans of the world, however in recent times it is less common because of higher economics and labour costs compared to the more productive purse seine gear.⁴³

Purse seining, like pole-and-line fishing, is a surface fishery which depends on the tendency of tunas to form schools. In purse seining, the vessel encircles a school of tuna with a net that may be more than a kilometre long. The vessel then closes or purses the net by pulling a cable through the rings that are attached to the bottom edge of the net. Over time the purse seine technology has developed, increasing the strength of the nets and the hauling power of the vessels, purse seining has become a major method of fishing for tuna and tuna-like fishes throughout the world, often at industrial scales. Purse seining fisheries generally target skipjack and juvenile yellowfin, which tend to school together. However, juvenile bigeye are also commonly caught as a bycatch. In equatorial areas the southern bluefin fishery, Australia uses purse seining as its primary method to harvest juvenile bluefin before they are fattened in cages and exported.⁴⁴

Purse seine fishing can target tuna schools associated with floating objects (either flotsam or artificial fish aggregating devices (FADs)); schools associated with dolphins, whales or whale sharks; or unassociated schools. Sets on floating objects tend to catch smaller tunas and large amounts of bycatch species including billfishes, sharks, dolphinfish (*Coryphaena* spp.), wahoo (*Acanthocybium solandri*), rainbow runners (*Elagatis bipinnulatus*) and sea turtles.⁴⁵ In the eastern Pacific, medium to large

⁴² FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p37. The impact of catching small pelagic fish for bait by the pole-and-line fisheries is postulated to be negligible in coastal areas due to the large populations of those species, but it may have a larger impact on offshore islands. The use of artificial bait would allay any public concerns.

⁴³ R. Gillett and A. Langley, *Tuna for Tomorrow? Some of the Science Behind an Important Fishery in the Pacific Islands* (Noumea: Asian Development Bank and Secretariat of the Pacific Community, 2007), J. Joseph, W. Klawe, and P. Murphy, *Tuna and Billfish - fish without a country*, 2nd ed. (La Jolla, California: Inter-American Tropical Tuna Commission, 1980), 12-13.

⁴⁴ M. P. Miyake, N. Miyabe, and H. Nakano, *Historical trends of tuna catches in the world*, FAO Fisheries Technical Paper No.467 (Rome: Food and Agriculture Organisation of the United Nations, 2004), 71-73.

⁴⁵ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p36.

yellowfin tuna are commonly found in association with dolphin schools; this behaviour was exploited by purse seiners and dolphin mortality was common. However, public outrage since the mid-1960's has led to the development of techniques in the eastern Pacific which enable dolphins to escape the nets before they are hauled in, resulting in almost negligible dolphin mortality.⁴⁶ During the 1990s the proliferation of sets on FADs has substantially changed the fishing strategy of some fishing fleets, which has changed the species and size composition of the tuna catches.⁴⁷ For example more than fifty percent of the current global tuna catches by purse seiners are under FADs: large numbers of juvenile yellowfin and bigeye are taken under FADs and in some instances discarded.⁴⁸

Longlining, is a deep-water fishing technique, that targets larger tuna and most of the commercial catch of billfishes. A longline vessel sets a line that may extend for 130 kilometres on the surface of the ocean supported along its length by floats. Weights may be used to improve targeting by holding the longline at a set depth range. Dangling from the main line are about 2,000 baited hooks on branch lines. Longlines are often left to "soak" for up to twenty hours and a range of species, not just target species, can be caught on a longline, including marine mammals, seabirds and sharks.⁴⁹

⁴⁶ For further information see for example: P. Cullet and A. P. Kameri-Mbote, "Dolphin Bycatches in Tuna Fisheries: A Smokescreen Hiding the Real Issues?," *Ocean Development and International Law* 27 (1996): 333-348, C. Hedley, "The 1998 Agreement on the International Dolphin Conservation Program: Recent Developments in the Tuna-Dolphin Controversy in the Eastern Pacific Ocean," *Ocean Development and International Law* 32 (2001): 71-92, J. Joseph, W. Klawe, and P. Murphy, *Tuna and Billfish - fish without a country*, 2nd ed. (La Jolla, California: Inter-American Tropical Tuna Commission, 1980), p13 & 17.

⁴⁷ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p36.

⁴⁸ Ibid.

⁴⁹ Ibid., p35, J. Joseph, W. Klawe, and P. Murphy, *Tuna and Billfish - fish without a country*, 2nd ed. (La Jolla, California: Inter-American Tropical Tuna Commission, 1980), 13-14. In addition to large amounts of tunas and billfishes, longline fisheries also catch other teleosts, especially pomfrets (family Bramidae), escolar (family Gempylidae), and moonfish and opah (families Menidae and Lampridae), and pelagic sharks and rays, including blue (*Prionace glauca*), shortfin mako (*Isurus oxyrinchus*), oceanic whitetip (*Carcharhinus longimanus*), silky (*C. falciformes*), bigeye thresher (*Alopias superciliosus*), and pelagic thresher (*A. pelagicus*) sharks, all of which have some market value, and crocodile sharks (*Pseudocarcharias kamoharai*), velvet dogfish (family Squalidae), and pelagic stingrays (*Pteroplatytrygon violacea*) which have no market value. For various reasons, fishes other than tunas and billfishes may be retained and landed, or they may be released or discarded at sea. In some cases the fins may be removed from sharks and retained, while the rest of the shark is discarded. Fish that would normally be retained must sometimes be discarded because they are badly damaged by sharks or mammals (e.g. Orca, Pseudorca). In addition to fish, sea turtles, sea birds, especially albatrosses, and marine mammals are sometimes caught on longline gear. Sea turtles are hardy, and can usually be released alive. Albatrosses are caught mostly in temperate waters. Marine mammals are only rarely caught by longline gear.

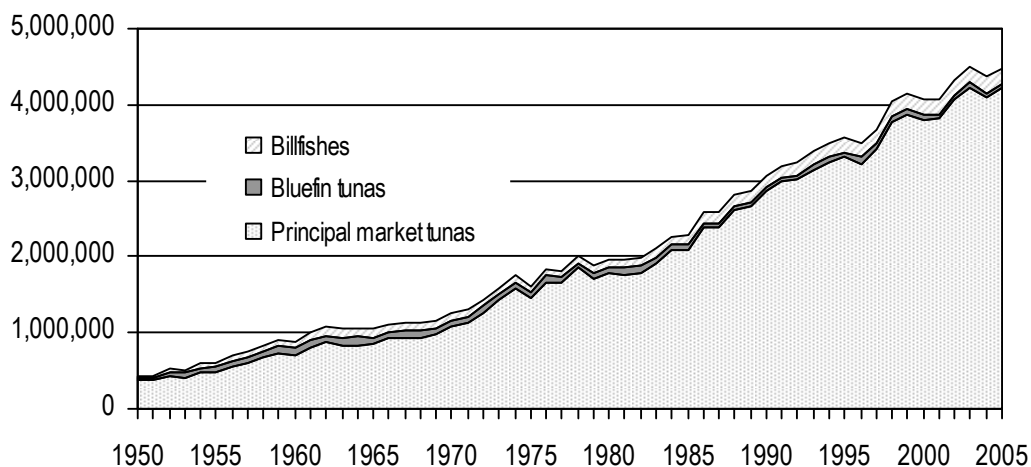


Figure 1-1. Catch of tuna and billfish, cumulative by category, in metric tonnes

[Source: FAO Fisheries and Aquaculture Information and Statistics Service, Capture production 1950-2005. FISHSTAT Plus - Universal software for fishery statistical time series [online or CD-ROM] (Version 2.3. 2000) Food and Agriculture Organization of the United Nations, Data: Capture Production 1950-2005 released March 2007 [cited January 1 2008]]; available from <http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp>.]

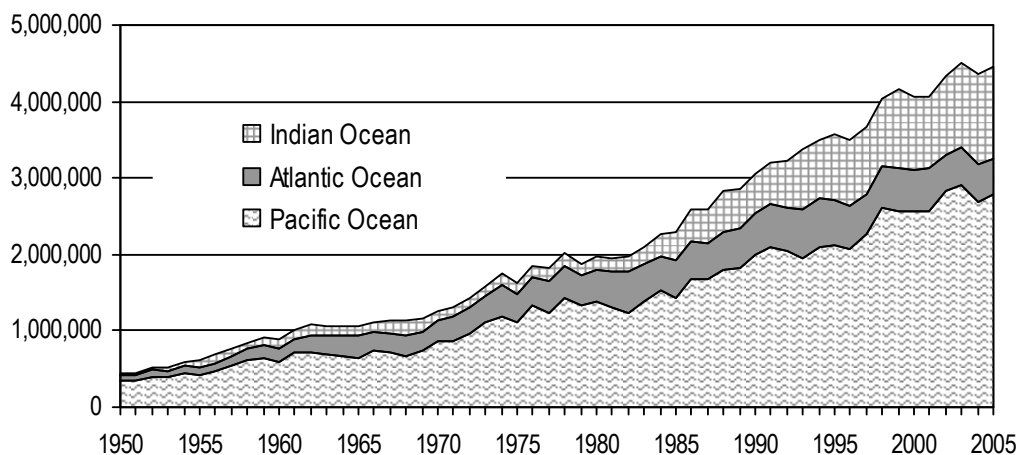


Figure 1-2. Catch of tuna and billfish, cumulative by oceans, in metric tonnes

[Source: FAO Fisheries and Aquaculture Information and Statistics Service, Capture production 1950-2005. FISHSTAT Plus - Universal software for fishery statistical time series [online or CD-ROM] (Version 2.3. 2000) Food and Agriculture Organization of the United Nations, Data: Capture Production 1950-2005 released March 2007 [cited January 1 2008]]; available from <http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp>.]

The next section will outline the trends in development of tuna and billfish fisheries at the global level.

Trends in development of fisheries for tuna and billfish

Since 1950, catches of tuna and billfishes have steadily increased from 0.43 million Mt to 4.5 million Mt, see Figure 1-1. Since 2002, global catches of tuna and billfish have remained above 4.3 million Mt. The principal market species of tuna, by weight, dominate global historical catches of tuna and billfishes: principal market species of tuna have consistently been 79–94% by weight of total global capture production of tuna and billfish for the period 1950–2003.⁵⁰ In 2004, global production of tuna and billfish species was estimated to be 4.4 million Mt; the principal market species of tuna comprised 4.1 million Mt or 94% by weight. The Pacific Ocean is where most tuna and billfish have been harvested comprising 58–79% of the global catches over the period 1950–2003 (see Figure 1-2). Most billfish catches by weight were swordfish, and the billfishes comprised 5% (0.2 million Mt) of the total catches of tuna and billfish species.⁵¹ The combined catches of the three bluefin species have consistently ranged from fifty to one hundred thousand metric tonnes from 1952–2005, but because total catches of the principal market species have increased substantially over time, the relative contribution of bluefin catches have declined (from a high of 11% in 1953 to just over 1% in 2004). Three-quarters of the bluefin catch in 2004 was Atlantic bluefin.

Tuna and billfish are not the largest component of the world fish catch by weight, comprising only between five to seven percent of total global capture fisheries production by weight over the ten years to 2005.⁵² The catches of these species make tuna and billfish among the most valuable commercial fish species. In 2000, bigeye and

⁵⁰ FAO Fisheries and Aquaculture Information and Statistics Service, *Capture production 1950-2005. FISHSTAT Plus - Universal software for fishery statistical time series [online or CD-ROM]* (Version 2.3. 2000) Food and Agriculture Organization of the United Nations, Data: Capture Production 1950-2005 released March 2007 [cited January 1 2008]; available from <http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp>.

⁵¹ The 2005 data was the most recently available but it was not used here because they are estimates based on past years data so they may be inaccurate or incomplete. This is because of delays in some national reports of official fisheries data to FAO and their subsequent inclusion into the FishStat databases. There is less of a risk of inaccurate or incomplete data in the data for 2004.

⁵² FAO Fisheries and Aquaculture Information and Statistics Service, *Capture production 1950-2005. FISHSTAT Plus - Universal software for fishery statistical time series [online or CD-ROM]* (Version 2.3. 2000) Food and Agriculture Organization of the United Nations, Data: Capture Production 1950-2005 released March 2007 [cited January 1 2008]; available from <http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp>. From 1996-2005 tuna and billfishes comprised approximately 3 % of total capture production by weight from the Atlantic Ocean, and 5–7% of total capture production weight within the Indian Ocean and 12–19% for the Pacific Ocean.

yellowfin were listed by *Food and Agriculture Organisation of the United Nations* (FAO) as the top two most valuable species globally with an estimated worth of US \$3 billion and US \$2 billion respectively.⁵³ In 2002, the total catches of tuna billfishes was over 4.3 million metric tonnes and was estimated to be 11% of the total value of landings for consumption (or about US \$7.8 billion).⁵⁴

The high collective value of tuna and billfishes is in part due to the high prices commanded by the principal market tunas and bluefin tunas, which are a significant proportion of the catch of tuna and billfish. Table 1-3 lists some recent average price ranges for tuna from different fisheries and in different forms. Bluefin tuna earn US \$30 to US \$40 per kilogram for a whole fish, and up to US \$100 per kilogram in Japan's sashimi market.⁵⁵ Yellowfin and bigeye tuna tend to earn lower prices than bluefin. For the cannery markets albacore tend to get the best price for their white meat receiving around US \$2.50 per kilogram, which is more than yellowfin and skipjack which often receive less than US \$1 per kilogram.⁵⁶

Table 1-3. Average prices for principal market tunas, generally from the Japanese and Bangkok markets, price range over the 2000-2006.⁵⁷

Skipjack	Purse seine: US \$500 – 1400 per Mt
Yellowfin	Purse seine: US \$950 – 1900 per Mt
	Longline Frozen: US \$3 – 6 per kg
	Longline Fresh: US \$6 – 8 per kg
Bigeye	Longline Frozen: US \$4 – 8 per kg
	Longline Frozen: US \$6 – 10 per kg
Albacore	US \$1700 – 2500 per Mt
Atlantic bluefin	US \$30 – 40 per kg, up to US \$100 per kg and previously up to US \$500 per kg.

⁵³ FAO Fisheries Department, *The State of World Fisheries and Aquaculture 2002* (Rome: The Food and Agriculture Organisation of the United Nations, 2002), p 8.

⁵⁴ FAO Fisheries Department, *The State of World Fisheries and Aquaculture 2004* (Rome: The Food and Agriculture Organisation of the United Nations, 2004), p 9.

⁵⁵ I. de Leiva Moreno and J. Majkowski, *Status of Tuna Stocks, SCTB17 Working Paper INF-SA-2* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2004), p6.

⁵⁶ P. Williams and C. Reid, *Overview of the Western and Central Pacific Ocean (WCPO) Tuna Fisheries - 2003, SCTB17 Working Paper GEN-1* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2004), p 12-13, 24-27, P. Williams and C. Reid, *Overview of the tuna fisheries in the Western and Central Pacific Ocean (WCPO), including economic conditions - 2007, WCPFC-SC3 GN WP-1* (Kolonias, Federated States of Micronesia: WCPFC, 2007), p15, 24-26.

⁵⁷ Most of the tuna prices came from P. Williams and C. Reid, *Overview of the tuna fisheries in the Western and Central Pacific Ocean (WCPO), including economic conditions - 2007, WCPFC-SC3 GN WP-1* (Kolonias, Federated States of Micronesia: WCPFC, 2007), p15, 24-26. Atlantic Bluefin prices came from I. de Leiva Moreno and J. Majkowski, *Status of Tuna Stocks, SCTB17 Working Paper INF-SA-2* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2004), p6.

Given the global significance of the principal market tunas by volume and value, the trends over time for this particular category will be further analysed.

Trends in development of fisheries for principal market tunas

The total catch of the principal market tunas has increased from approximately 400,000 Mt in 1950 to 4.1 million Mt in 2004. Figure 1-3 shows global catches of principal market tunas, cumulative by oceans for the period 1950–2005. Catches in the Pacific Ocean, of the principal market tunas, have been predominant throughout the period. Both the Indian and Pacific Oceans catches show marked increases in recent years, although global catches in the last two years show some stabilisation in these oceans, with possible declines in the Atlantic Ocean. Since 1989 catches of the principal market tuna species in the Indian Ocean have exceeded those of the Atlantic Ocean. The Pacific Ocean dominates catches of principal market tunas: in 2004: 63% was caught in the Pacific Ocean (2.6 million Mt), 27% in the Indian Ocean (1.1 million Mt) and 10% in the Atlantic Ocean (0.4 million Mt).⁵⁸

Skipjack is the most important principal market tuna species in terms of tonnage harvested, making up 51% of the global catch in 2004 (2.1 million Mt). Skipjack has been the most important principal market tuna species by weight throughout the period 1950–2005, see Figure 1-4, except for a few years in the late 1950s and early 1960s when yellowfin catches comprised a slightly greater proportion of the catch. Yellowfin has been the second most important principal market tuna species in terms of tonnage harvested, making up 32% of the world catch in 2004 (1.3 million Mt). Albacore was of more importance as a principal market tuna in the 1950s and 1960s, until the development of extremely cold storage in the longline industry and the subsequent change in target species from albacore to the higher value bluefin and bigeye. In 2004, albacore was 6% of global catch (245,516 Mt) of principal market tunas. Bigeye have comprised 10–12% of the total principal market tunas over the period 1966–2004, and in the early 1960s, when the extremely cold storage technology was being adopted, catches of bigeye comprised between 13–16%. In 2004, bigeye tuna comprised 11% (442,407 Mt) of global catches of principal market tunas.

⁵⁸ FAO Fisheries and Aquaculture Information and Statistics Service, *Capture production 1950-2005. FISHSTAT Plus - Universal software for fishery statistical time series [online or CD-ROM]* (Version 2.3. 2000) Food and Agriculture Organization of the United Nations, Data: Capture Production 1950-2005 released March 2007 [cited January 1 2008]; available from <http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp>.

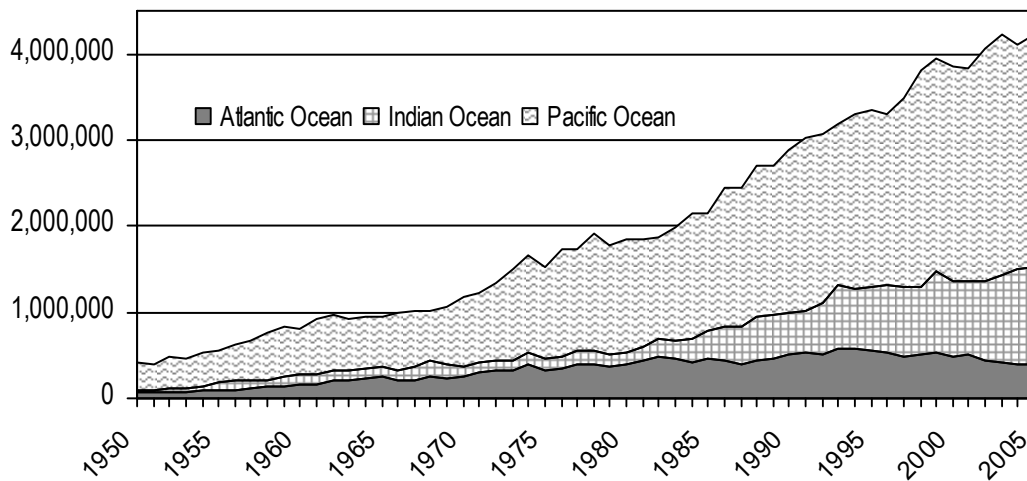


Figure 1-3. Global catches of principal market tunas, cumulative by oceans, in metric tonnes

[Source: FAO Fisheries and Aquaculture Information and Statistics Service, Capture production 1950-2005. FISHSTAT Plus - Universal software for fishery statistical time series [online or CD-ROM] (Version 2.3. 2000) Food and Agriculture Organization of the United Nations, Data: Capture Production 1950-2005 released March 2007 [cited January 1 2008]]; available from <http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp>.]

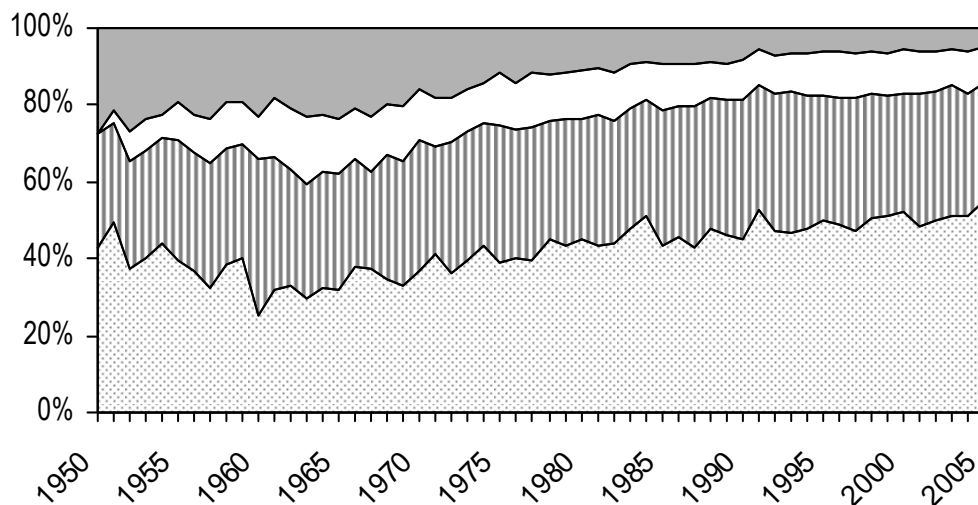


Figure 1-4. Percent composition of global catches of principal market tunas, by species

■ skipjack ■ yellowfin □ bigeye ■ albacore

[Source: FAO Fisheries and Aquaculture Information and Statistics Service, Capture production 1950-2005. FISHSTAT Plus - Universal software for fishery statistical time series [online or CD-ROM] (Version 2.3. 2000) Food and Agriculture Organization of the United Nations, Data: Capture Production 1950-2005 released March 2007 [cited January 1 2008]]; available from <http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp>.]

Purse seine fishing harvests the majority of principal market tunas by weight and catches have increased since the development of the method in the 1950–1960s to 2.2 million Mt in 2000.⁵⁹ Purse seine vessels primarily target yellowfin and skipjack for canneries. In 2000, baitboat fishing and longline fishing methods each caught 14% (approximately five hundred thousand metric tonnes) of the global total of principal market tunas. Other fishing methods, consisting of primarily artisanal methods operating in coastal inshore areas, (eg trolling, gillnet, handlines and miscellaneous unclassified gears) caught 10% of the total global catch of the principal market tuna species (approximately two hundred twenty thousand metric tonnes).⁶⁰

Tuna and billfishes are harvested by a number of countries. Historically, Japan captured the greatest quantity by weight, but recently other States have also become dominant in catches of tuna and billfish. The top ten main fishing fleets for principal market tunas are listed in Table 1-4. Figure 1-5 illustrates the growth of the ten main fishing fleets targeting principal market tunas since the 1950s. Some fleets catch the principal market tunas primarily in a single ocean, for example Philippines, Mexico, United States of America and Japan, whereas most other fleets have a trans-oceanic distribution (see Figure 1-5). The dominance of the Pacific Ocean catches is apparent.

Table 1-4. Ten-year average catches of principal market tuna species by ten main fishing fleets and as a percentage of total global catch (1994-2005).⁶¹

Japan	572,745 Mt (15%)
Chinese Taipei	419,599 Mt (11%)
Indonesia	364,808 Mt (10%)
Spain	268,711 Mt (7%)
Korea, Republic of	221,944 Mt (6%)
Philippines	208,489 Mt (6%)
United States of America	171,759 Mt (5%)
Other nei ⁶²	149,495 Mt (4%)
France	147,577 Mt (4%)
Mexico	143,237 Mt (4%)
Other	1,092,166 Mt (29%)
	<u>3,760,530 Mt</u>

⁵⁹ Based on 2000 figures that may be provisional, published in M. P. Miyake, N. Miyabe, and H. Nakano, *Historical trends of tuna catches in the world*, FAO Fisheries Technical Paper No.467 (Rome: Food and Agriculture Organisation of the United Nations, 2004), 4-5. More recent figures were not available; they are not published in the FishStat databases which focus on landings by nation rather than catches by fishing method, so alternative sources had to be sought.

⁶⁰ Based on 2000 figures that may be provisional, published in Ibid.

⁶¹ FAO Fisheries and Aquaculture Information and Statistics Service, *Capture production 1950-2005. FISHSTAT Plus - Universal software for fishery statistical time series [online or CD-ROM]* (Version 2.3. 2000) Food and Agriculture Organization of the United Nations, Data: Capture Production 1950-2005 released March 2007 [cited January 1 2008]); available from <http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp>.

⁶² Other nei: Other not elsewhere included. A category used by FAO Fishstat database.

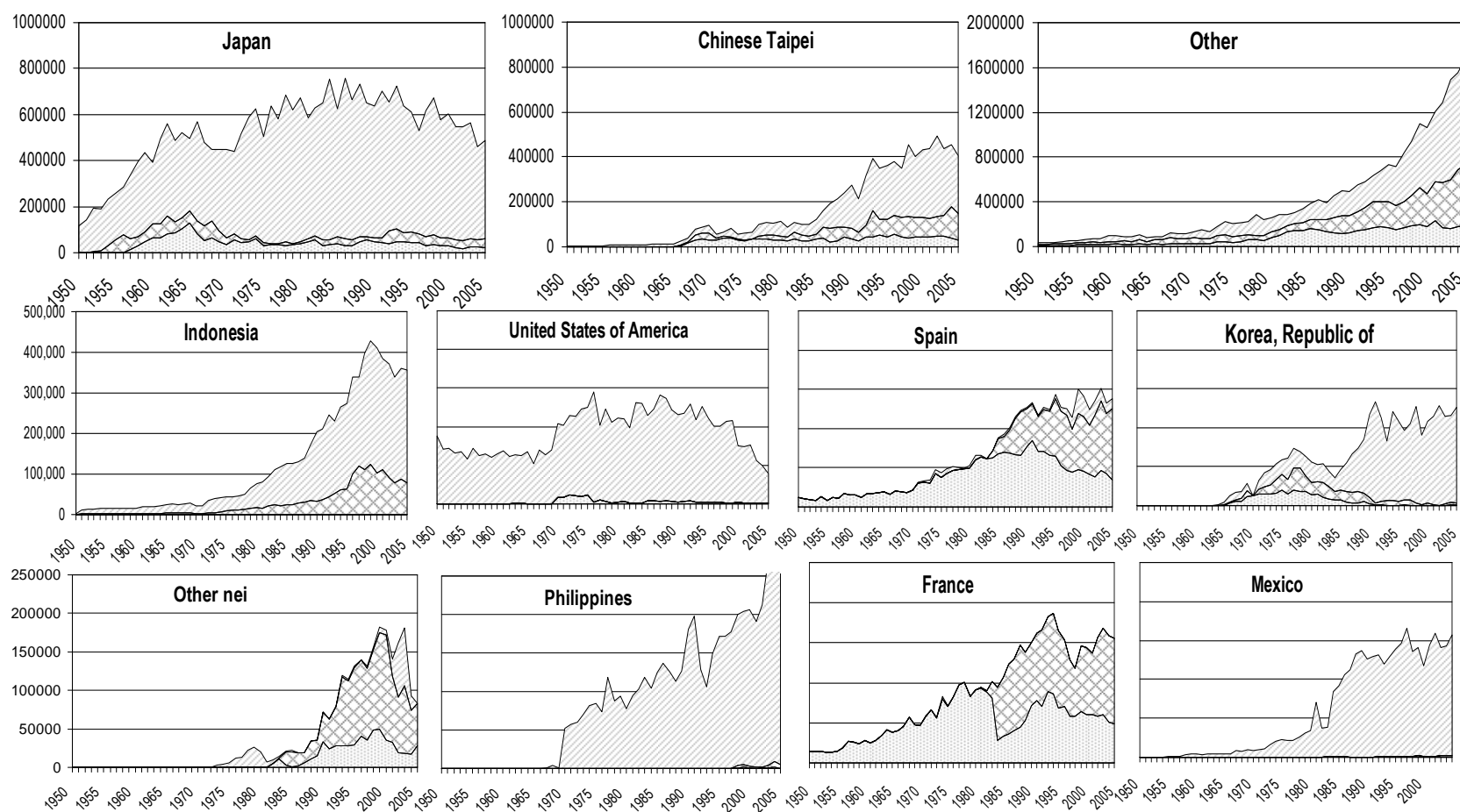


Figure 1-5. Catches in metric tonnes of principal market tunas by ten main fishing fleets by oceans from 1950-2005. [Source: FAO Fisheries and Aquaculture Information and Statistics Service, Capture production 1950-2005. FISHSTAT Plus - Universal software for fishery statistical time series [online or CD-ROM] (Version 2.3. 2000) Food and Agriculture Organization of the United Nations, Data: Capture Production 1950-2005 released March 2007]

Key: Atlantic Ocean Indian Ocean Pacific Ocean

Japan has consistently been, by volume harvested, the main fishing fleet for the principal market tunas and the majority of Japan's harvests of the principal market tunas have traditionally been and currently are from the Pacific Ocean (see Figure 1-5).⁶³ Japan's harvests of principal market tunas increased to a peak in the mid-1960's of about five hundred fifty thousand metric tonnes. Catches fluctuated but on average declined until to about four hundred ninety-five thousand metric tonnes in 1971, then gradually increased to a high of seven hundred and eighty-eight thousand metric tonnes in 1984, with the rise of purse seining. After 1984 catches steadily declined to four hundred and sixty-one thousand metric tonnes in 2004. Figure 1-5 shows that Japan's harvest of the principal market tunas by volume has been relatively consistent.

Figure 1-5, shows that increases in the total catch of the principal market tunas throughout the three oceans since the 1970s has been due to increases in the catches by other States, such as the other countries listed as the top ten main fishing fleets in 1995-2004 as well as other fishing fleets such as the China (see Figure 1-5). For example, Chinese Taipei's harvests of principal market tunas began in the 1960s and have steadily spread throughout the three oceans of the world (see Figure 1-5). The impact of the introduction of conservation and management measures for tuna in the Atlantic Ocean can be seen in Figure 1-5; for example in the last decade Korea has narrowed the focus of its fishing efforts from a global range to primarily the Pacific Ocean, while France and Spain have expanded their catches in the last two decades by expanding into the Indian Ocean and more recently into the Pacific Ocean (see Figure 1-5).

For reference, Appendix 3 provides a summary of the key historical developments in fisheries across the world for tuna and billfish. The major events in the development of contemporary legal and institutional arrangements for conservation and management of tuna and billfish fisheries are also highlighted in Appendix 3.

1.3 Impacts of fishing for tuna and billfish

Determining the impacts of fishing on tuna and billfish stocks is no easy task; every year it is the duty of the Scientific Committee, or the equivalent, of the relevant tuna RFMO to produce stock status statements for each of the tuna stocks and other species

⁶³ M. P. Miyake, N. Miyabe, and H. Nakano, *Historical trends of tuna catches in the world*, FAO Fisheries Technical Paper No.467 (Rome: Food and Agriculture Organisation of the United Nations, 2004). Prior to 1950, the United States of America in the Pacific Ocean and Spain in the Atlantic Ocean were also harvesting principal market tunas.

of interest to that tuna RFMO.⁶⁴ These stock status statements are based on the best data and scientific information currently available to the Scientific Committee or scientific secretariats and form the basis of scientific advice to the decision-making bodies, or Commissions, of the relevant tuna RFMO. The stock status statements and the scientific advice, despite being based on the best data and scientific information available, are associated with ranging degrees of uncertainty. Some of the uncertainty is inherent, because fishing operations for tuna and billfish are complex, tuna and billfish species are highly mobile and marine ecosystems are vast and poorly understood. Other uncertainties occur because of incomplete coverage by fisheries data of fishing operations, inaccuracies in fisheries data, as well as anomalies and bias in reporting of fisheries data.⁶⁵ This section summarises the most recently available advice on the status of the tuna and billfish stocks globally.

Stock status is typically determined relative to two dimensions. First, the state of the resource (commonly “B” referring to biomass level or stock size), which is the current state relative to a predetermined, overfished state.⁶⁶ Second, is the scale of fishing pressure, which is the current fishing mortality rate (commonly “F” referring to fishing mortality level) relative to a predetermined level of fishing mortality that represents overfishing.⁶⁷ The distinction between these two dimensions of stock status are necessary in scientific advice to fisheries managers because a fishery can have a favourable state, that is the stock is not overfished, but overfishing is occurring, therefore management intervention may be required otherwise continued overfishing

⁶⁴ There are two types of science arrangements for tuna RFMOs: science secretariats and multinational approaches. Examples of science secretariats include Inter-American Tropical Tuna Commission (IATTC) and Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPFC). Examples of multinational approaches where member scientists produce stock assessments collaboratively include the International Commission for the Conservation of Atlantic Tunas (ICCAT), Commission for the Conservation of Southern Bluefin Tuna (CCSBT) and Indian Ocean Tuna Commission (IOTC). Generally, the science secretariat arrangement tends to be the preferred approach over the multinational approach from a scientific point of view for reasons of the scientific objectivity whether it is real or perceived, but multinational approaches offer cost-cutting benefits to tuna RFMOs, nevertheless both types of arrangements are in practice within tuna RFMOs. (P. Ward, N. Tsirbas, and R. Kearney, *Getting Science into Regional Fisheries Management - A Global View* (Canberra, Australia: Bureau of Research Sciences, 1998), P. Ward, B. Kearney, and N. Tsirbas, "Science arrangements for the regional management of tuna fisheries," *Marine Policy* 24 (2000): 93-108.)

⁶⁵ M. P. Sissenwine and A. A. Rosenberg, "Marine Fisheries at a Critical Juncture," *Fisheries* 18, no. 10 (1993): 6-14.

⁶⁶FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, *FAO Fisheries Circular 963* (Rome: FAO, 2001), 11-12.

⁶⁷*Ibid.*

can be expected to result in an overfished state. Also when a stock is overfished, any overfishing has a great risk of stock collapse.

Stock status of principal market tuna and bluefin tuna species

Figure 1-6 summarises the most recent available information from the relevant tuna RFMOs of the stock status of the principal market tuna and bluefin tuna stocks.⁶⁸

		Stock Size (B)		
		High probability stock is not overfished	Near limits of sustainability, close monitoring is required	High probability stock is overfished
Fishing Mortality (F)	High probability overfishing is occurring	yellowfin – western central Pacific bigeye – western central Pacific		yellowfin – eastern Pacific yellowfin – Atlantic bigeye – eastern Pacific albacore – north Atlantic Atlantic bluefin – eastern Atlantic bluefin – western Southern bluefin
	Near limits of sustainability, close monitoring is required	bigeye – Indian*	yellowfin – Indian* albacore – north Pacific*	bigeye – Atlantic
	Some potential for sustainable increases in catches	Skipjack – western central Pacific albacore – south Atlantic albacore – south Pacific WITHIN SAFE LIMITS	NEAR TO SAFE LIMITS	BEYOND SAFE LIMITS

Figure 1-6. Summary of available information on the current status of principal market tuna stocks as determined by the relevant RFMO in 2007.⁶⁹ (* = stocks status is highly uncertain)

⁶⁸ Information was not available on the current stock status for Mediterranean albacore, Pacific bluefin, Indian albacore and skipjack in Indian Ocean, eastern Pacific Ocean and Atlantic Ocean.

⁶⁹ Adaptation and update of Figure 16 of I. de Leiva Moreno and J. Majkowski, "Status of Tuna Stocks. SCTB17 Working Paper INF-SA-2" (paper presented at the 17th Standing Committee on Tuna and Billfish, Majuro, Marshall Islands, August 2004), p21. Please note that the information presented here has been updated using RFMOs publication sources, and that the reference points used by each tuna RFMO may differ: CCSBT, *Report of the Twelfth Meeting of the Scientific Committee, 10-14 September 2007* (Hobart, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2007), IATTC Secretariat, *The Fishery for Tunas and Billfishes in the Eastern Pacific Ocean in 2006, IATTC-75-06* (La Jolla, California: Inter-American Tropical Tuna Commission, 2007), ICCAT, *Report of the Standing Committee on Research and Statistics (SCRS) 1-5 October 2007* (Madrid, Spain: International Commission for the Conservation of Atlantic Tunas, 2007), IOTC, *Report of the Ninth Session of the Scientific Committee, 6-10 November, IOTC-2006-SC-R[EN]* (Victoria, Seychelles: Indian Ocean Tuna Commission, 2006), WCPFC, *Summary Report of the Second Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 8-19 August 2005, WCPFC3-2006/12* (Noumea, New Caledonia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 2006), WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in*

Figure 1-6 illustrates that the majority of principal market tuna and bluefin tuna stocks are significantly impacted by fishing and have a stock status that is considered to be “beyond safe limits” of sustainability: there is a high probability that the stocks are overfished and that overfishing is occurring. These are the tuna stocks listed in the non-shaded portion of Figure 1-6, and are two of three bluefin tuna species, as well as most yellowfin and bigeye tuna stocks. Three tuna stocks (bigeye and yellowfin in the Indian Ocean and albacore in the North Pacific) are listed in Figure 1-6 as having a stock status that is considered to be “near to safe limits”, because fishing mortality levels are near limits of sustainability or stock size is estimated to be near limits of sustainability (lightly-shaded portion of Figure 1-6). It should be noted that the scientific advice for these three stocks is highly uncertain. The scientific advice to managers for the two bluefin tuna species (Atlantic and southern bluefins), yellowfin tuna species (all Oceans), bigeye tuna species (all Oceans) and north Pacific albacore is that that future increases in the catches of principal market tuna catches are not recommended; in fact future catches should not exceed current levels or should be decreased.⁷⁰

Accordingly, based on the information in Figure 1-6, further increases in catches should only be allowed for skipjack in the western central Pacific, south Pacific albacore and south Atlantic albacore. Although any potential increases in future catches should be tempered with caution in case of fishery interactions resulting in further increases in fishing mortality on stocks where catches should be decreased or remain stable. Furthermore for those stocks for which information is uncertain, consistent with the application of the precautionary approach, there should be no further increase in catches until further research determines the status of stocks with more certainty.⁷¹

the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9 (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 2007).

⁷⁰ I. de Leiva Moreno and J. Majkowski, *Status of Tuna Stocks, SCTB17 Working Paper INF-SA-2* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2004), I. de Leiva Moreno and J. Majkowski, "Status of Tuna Stocks. SCTB17 Working Paper INF-SA-2" (paper presented at the 17th Standing Committee on Tuna and Billfish, Majuro, Marshall Islands, August 2004), p 19-22, J. Majkowski, "Tuna and Tuna-like Species: Global Status of Fishery Resources - Executive Summary," in *Joint Meeting of Tuna RFMOs, January 22-26* (Kobe, Japan: 2007).

⁷¹ I. de Leiva Moreno and J. Majkowski, *Status of Tuna Stocks, SCTB17 Working Paper INF-SA-2* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2004), I. de Leiva Moreno and J. Majkowski, "Status of Tuna Stocks. SCTB17 Working Paper INF-SA-2" (paper presented at the 17th Standing Committee on Tuna and Billfish, Majuro, Marshall Islands, August 2004), p 19-22, J. Majkowski, "Tuna and Tuna-like Species: Global Status of Fishery Resources - Executive Summary," in *Joint Meeting of Tuna RFMOs, January 22-26* (Kobe, Japan: 2007).

There are significant uncertainties in the scientific advice on the status of many stocks of principal market tunas and bluefin tunas. For example, in respect of stocks of north Pacific albacore, Indian yellowfin and Indian bigeye the scientific advice is that the fisheries for these stocks should be closely monitored and where possible precautionary measures taken, because stock status information is considered by the respective tuna RFMO to be highly uncertain.⁷² Also due to a lack of estimate of both the stock size and fishing mortality, some principal market tuna stocks were not included in Figure 1-6. These include Mediterranean albacore, Pacific bluefin, Indian albacore and skipjack (Indian, eastern Pacific and Atlantic). For these six tuna stocks it is anecdotal evidence which forms the best available scientific advice to the tuna RFMO. The Indian skipjack stock is expected to probably have a stock size and a level of fishing mortality that is within safe limits.⁷³ It is possible that fishing mortality on Indian albacore is near or above the reference points, but the status of the stocks cannot be confirmed at this stage with any certainty.⁷⁴ Insufficient information was available to determine a status for Atlantic skipjack, Mediterranean albacore and Indian Ocean albacore.⁷⁵ For Pacific bluefin scientific advice recommends no further increase in fishing mortality.⁷⁶

⁷² IOTC, *Report of the Ninth Session of the Scientific Committee, 6-10 November, IOTC-2006-SC-R[EN]* (Victoria, Seychelles: Indian Ocean Tuna Commission, 2006), WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 2007).

⁷³ I. de Leiva Moreno and J. Majkowski, *Status of Tuna Stocks, SCTB17 Working Paper INF-SA-2* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2004), J. Majkowski, "Tuna and Tuna-like Species: Global Status of Fishery Resources - Executive Summary," in *Joint Meeting of Tuna RFMOs, January 22-26* (Kobe, Japan: 2007).

⁷⁴ IOTC, *Report of the Eighth Session of the Scientific Committee, 7-11 November 2005, IOTC-2005-SC-R[EN]* (Victoria, Seychelles: Indian Ocean Tuna Commission, 2005), M. e. Stocker, *Report of the Nineteenth North Pacific Albacore Workshop, November 25 - December 2 2004, WCPFC -SC1 GN IP-3* (Nanaimo, B.C. Canada: Fisheries and Oceans Canada, Pacific Biological Station, 2005).

⁷⁵ I. de Leiva Moreno and J. Majkowski, *Status of Tuna Stocks, SCTB17 Working Paper INF-SA-2* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2004), I. de Leiva Moreno and J. Majkowski, "Status of Tuna Stocks. SCTB17 Working Paper INF-SA-2" (paper presented at the 17th Standing Committee on Tuna and Billfish, Majuro, Marshall Islands, August 2004), p 19-22, J. Majkowski, "Tuna and Tuna-like Species: Global Status of Fishery Resources - Executive Summary," in *Joint Meeting of Tuna RFMOs, January 22-26* (Kobe, Japan: 2007).

⁷⁶ WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 2007).

Stock status of billfish species

The availability of information on the global stock status of billfish stocks are more limited than information for principal market tuna and bluefin tuna species. Stock assessment studies for billfish species often are conducted irregularly by various national agencies and regional organisations, particularly in regard to stocks in the Pacific and Indian Oceans.⁷⁷ Furthermore the most widely available catch and effort data on billfish is that from commercial tuna longline where billfish are incidental catch in most cases, making fishing-effort standardization problematic.⁷⁸ As a consequence, data are often incomplete and not readily available, and stock assessments are often out of date and do not match fisheries management requirements.⁷⁹ The availability of stock status information for billfish species has improved in recent times. Table 1-5 summarises what was at the time of writing this thesis, the most recent available information on the stock status of billfish stocks, by ocean.

Globally, for all blue marlin stocks scientific analyses indicate that overfishing is occurring and the stocks are not yet overfished, but the results are considerably uncertain.⁸⁰ The stock status for Atlantic white marlin is reported to be similar to Atlantic blue marlin.⁸¹ For north Pacific and south-west Pacific striped marlin stocks, the most recent scientific advice is highly uncertain but there are some indications that

⁷⁷ R. A. Skillman, "Pacific Billfishes and the Assessment Process," in *Getting Ahead of the Curve. Conserving the Pacific Ocean's Tunas, Swordfish, Billfishes and Sharks*, ed. K. Hinman (Leesburg, Virginia: National Coalition for Marine Conservation, 2000).

⁷⁸ P. Kleiber, M. G. Hinton, and Y. Uozumi, "Stock assessment of blue marlin (*Makaira nigricans*) in the Pacific using MULTIFAN-CL," *Marine and Freshwater Research* 54 (2003): 349-360, P. Ward, J. M. Porter, and S. Elscot, "Broadbill swordfish: status of established fisheries and lessons for developing fisheries," *Fish and Fisheries* 1 (2000): 317-336.

⁷⁹ R. A. Skillman, "Pacific Billfishes and the Assessment Process," in *Getting Ahead of the Curve. Conserving the Pacific Ocean's Tunas, Swordfish, Billfishes and Sharks*, ed. K. Hinman (Leesburg, Virginia: National Coalition for Marine Conservation, 2000).

⁸⁰ IATTC Secretariat, *The Fishery for Tunas and Billfishes in the Eastern Pacific Ocean in 2006*, IATTC-75-06 (La Jolla, California: Inter-American Tropical Tuna Commission, 2007), p84, ICCAT, *Report of the Standing Committee on Research and Statistics (SCRS) 1-5 October 2007* (Madrid, Spain: International Commission for the Conservation of Atlantic Tunas, 2007), 76-82, P. Kleiber, M. G. Hinton, and Y. Uozumi, "Stock assessment of blue marlin (*Makaira nigricans*) in the Pacific using MULTIFAN-CL," *Marine and Freshwater Research* 54 (2003): 349-360, Y. Uozumi, "Historical perspectives of global billfish stock assessment," *Marine and Freshwater Research* 54 (2003): 555-565, p556.

⁸¹ ICCAT, *Report of the Standing Committee on Research and Statistics (SCRS) 1-5 October 2007* (Madrid, Spain: International Commission for the Conservation of Atlantic Tunas, 2007), 76-82.

Table 1-5. Summary of most recent available information to tuna RFMOs for the stock status of billfish stocks, by ocean.⁸²

Billfish stock	Scientific advice (date for most recent scientific advice)
Atlantic Ocean billfishes	
blue marlin	Not yet overfished, but overfishing is occurring (2007)
white marlin	Not yet overfished, but overfishing is occurring (2007)
Atlantic sailfish	Highly uncertain stock status (2007)
north-Atlantic swordfish	Near overfished, rebuilding (2007)
south-Atlantic swordfish	Not overfished, not overfishing (2007)
Mediterranean swordfish	Overfished, and overfishing occurring (2007)
Pacific Ocean billfishes	
Indo-Pacific blue marlin	Close to fully-exploited, but highly uncertain (2006)
south-west striped marlin	Uncertain stock status, but some indication that stock is overfished and overfishing was occurring (2006)
north Pacific striped marlin	As a precautionary measure there should be no further increases in fishing mortality (2007)
north-eastern Pacific swordfish	Not yet overfished (2006)
south-eastern Pacific swordfish	Fully exploited and possibly overfished, recent high fishing mortality (2006)
Indo-Pacific sailfish	Highly uncertain (1994)
Indian Ocean billfishes	
Indian swordfish	Not yet overfished, but overfishing in recent years (2006)
all other billfish stocks	Highly uncertain: fishery statistics are incomplete and basic biological information was limited (1994)

the stocks are overfished and that overfishing is occurring.⁸³ Consequently, scientific advice recommends precautionary fisheries management actions be taken to not

⁸² Scientific advice for billfish stocks in the Atlantic Ocean was obtained from Ibid. ICCAT SCRS report includes a stock status statement (based on the most recent stock assessment) and any available new information for Atlantic stocks of: blue marlin (2000), white marlin (2002), sailfish/spearfish (2001), Atlantic swordfish (2002) and Mediterranean swordfish (2003). Scientific advice for billfish stocks in the Pacific Ocean was obtained from IATTC Secretariat, *The Fishery for Tunas and Billfishes in the Eastern Pacific Ocean in 2006*, IATTC-75-06 (La Jolla, California: Inter-American Tropical Tuna Commission, 2007), P. Kleiber, M. G. Hinton, and Y. Uozumi, "Stock assessment of blue marlin (*Makaira nigricans*) in the Pacific using MULTIFAN-CL," *Marine and Freshwater Research* 54 (2003): 349-360, R. A. Skillman, "Pacific Billfishes and the Assessment Process," in *Getting Ahead of the Curve. Conserving the Pacific Ocean's Tunas, Swordfish, Billfishes and Sharks*, ed. K. Hinman (Leesburg, Virginia: National Coalition for Marine Conservation, 2000), WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii*, WCPFC/4/2007/9 (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2007). Scientific advice for billfish stocks in the Indian Ocean was obtained from FAO Fisheries Department, *World review of highly migratory species and straddling stocks*, FAO Fisheries Technical Paper No. 337 (Rome: FAO, 1994), IOTC, *Report of the Ninth Session of the Scientific Committee, 6-10 November, IOTC-2006-SC-R[EN]* (Victoria, Seychelles: Indian Ocean Tuna Commission, 2006), 77-84, Y. Uozumi, "Historical perspectives of global billfish stock assessment," *Marine and Freshwater Research* 54 (2003): 555-565.

increase fishing mortality.⁸⁴ Globally, the stocks of sailfish have highly uncertain stock status.⁸⁵ The reasons for the uncertainty are attributed to incomplete fishery statistics and limited basic biological information on sailfish.⁸⁶

For swordfish stocks, the 1994 FAO World Review reported that swordfish were of particular concern globally as being in an overexploited state.⁸⁷ More recently, in 2000 Ward *et. al.* reported that the only swordfish stock for which a reliable stock assessment was available was for the north Atlantic swordfish stock which recommended that the stock was overfished but was rebuilding.⁸⁸ Further Ward *et. al.* reported that for swordfish in the south Atlantic, Mediterranean and north Pacific that stock assessments were available but there was considerable uncertainty in catch levels and the stock status.⁸⁹ Also the status of swordfish in the other major fisheries, southern-eastern Pacific, south-western Pacific and Indian Ocean were at the time unknown.⁹⁰ However, since 2000 the availability of information on swordfish stock status has improved, as a result of concerted efforts in tuna RFMOs to improve the information on stock status for swordfish stocks. In 2007, all four tuna RFMOs had received current stock assessment advice for swordfish stocks under their purview (see Table 1-5). The stock status for swordfish varies considerably between the different stocks, from within sustainable limits through to well beyond sustainable limits.⁹¹

⁸³ WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean,, 2007), p26, 29-30.

⁸⁴ Ibid.

⁸⁵ FAO Fisheries Department, *World review of highly migratory species and straddling stocks*, FAO Fisheries Technical Paper No. 337 (Rome: FAO, 1994), p34, ICCAT, *Report of the Standing Committee on Research and Statistics (SCRS) 1-5 October 2007* (Madrid, Spain: International Commission for the Conservation of Atlantic Tunas, 2007), 76-82.

⁸⁶ FAO Fisheries Department, *World review of highly migratory species and straddling stocks*, FAO Fisheries Technical Paper No. 337 (Rome: FAO, 1994), p34, ICCAT, *Report of the Standing Committee on Research and Statistics (SCRS) 1-5 October 2007* (Madrid, Spain: International Commission for the Conservation of Atlantic Tunas, 2007), 76-82.

⁸⁷ FAO Fisheries Department, *World review of highly migratory species and straddling stocks*, FAO Fisheries Technical Paper No. 337 (Rome: FAO, 1994), p 34.

⁸⁸ P. Ward, J. M. Porter, and S. Elscot, "Broadbill swordfish: status of established fisheries and lessons for developing fisheries," *Fish and Fisheries* 1 (2000): 317-336, p 329 and Table 1.

⁸⁹ Ibid.

⁹⁰ Ibid.

⁹¹ IATTC Secretariat, *The Fishery for Tunas and Billfishes in the Eastern Pacific Ocean in 2006*, IATTC-75-06 (La Jolla, California: Inter-American Tropical Tuna Commission, 2007), 82-83, ICCAT, *Report of the Standing Committee on Research and Statistics (SCRS) 1-5 October 2007* (Madrid, Spain: International Commission for the Conservation of Atlantic Tunas, 2007), 88-105, IOTC, *Report of the Ninth Annual Session of the Indian Ocean Tuna Commission, 13-18 May, IOTC-2007-S11-R[E]* (Grand Baie, Mauritius: Indian Ocean Tuna Commission, 2007), 77-84, WCPFC, *Summary Report of the Third*

Much of the scientific advice on the status of swordfish stocks is highly uncertain and scientific advice recommends that precautionary fisheries actions are taken by tuna RFMOs so as to not further increase fishing mortality on swordfish stocks.

Impacts of fishing on the marine ecosystem

The analyses in this Chapter have shown that the catches of principal market tunas, bluefin tunas and billfish species have increased significantly over the last five decades. Also shown was that at the time of writing this thesis, the most recent scientific advice estimates that the majority of principal market tunas, bluefin tunas and billfish species are being significantly impacted by fishing, but there is high uncertainty about the exact level of impact. Adult tuna and billfish are high-level apex predators in the marine oceanic ecosystem, actively predating on fish, squid and crustaceans.⁹² Accordingly it is logical to presume that the impact of the fisheries on ecosystems would be significant, given the scale and growth of tuna fisheries regionally and globally.⁹³ As the FAO notes, “the effects of annual removal of over 4 million tonnes of tunas and tuna-like fishes from pelagic ecosystems are not understood. As these species are generally highly-productive high-level predators, we would expect, on the basis of trophic models, that the effect would be significant.”⁹⁴ Given the nature of the fishing methods in tuna and billfish fisheries, it is likely tuna and billfish fisheries have the potential to significantly impact on populations of seabirds such as albatross, marine mammals such as dolphins, and sea turtles, all of which have biological and life-history characteristics that mean that even small incidences with fishing gear could have substantial impact on populations.⁹⁵ However, the level of impact of tuna fishing on the marine ecosystem is poorly understood, because there are significant gaps in empirical data on pelagic food-

Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9 (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2007), p27.

⁹² J. Joseph, W. Klawe, and P. Murphy, *Tuna and Billfish - fish without a country*, 2nd ed. (La Jolla, California: Inter-American Tropical Tuna Commission, 1980).

⁹³ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p34. ‘While we remain largely ignorant about the impacts of tuna fisheries on by-catch species and pelagic ecosystems, it is obvious that these impacts have increased very significantly over the last 50 years as tuna fisheries worldwide have expanded their catches and effort by orders of magnitude.’

⁹⁴ Ibid., p39.

⁹⁵ Ibid., p40, FAO Fisheries Department, *World review of highly migratory species and straddling stocks*, FAO Fisheries Technical Paper No. 337 (Rome: FAO, 1994), p64.

webs and catch data in tuna and billfish fisheries for non-target species.⁹⁶ In response to these uncertainties by necessity, the precautionary approach should be applied by tuna RFMOs: “the absences of adequate scientific information should not be used as a reason for postponing or failing to take conservation and management measures”.⁹⁷

1.4 Achieving long-term conservation and sustainable use of fisheries through fisheries management

The concept of *fisheries management* can be conceptualised in a broad and narrow sense. In broad terms, fisheries management can be thought to comprise all of the activities with which humans seek to rationalise the exploitation of aquatic resources.⁹⁸ Alternatively fisheries management can in a narrower sense refer to the agency control of regulations and allocation decisions within a fishery.⁹⁹ The broader perspective is consistent with the definition of fisheries management contained within the FAO Technical Guidelines on fisheries management, which describes fisheries management as: “The integrated process of information gathering, analysis, planning, consultation, decision-making, allocation of resources and formulation and implementation, with enforcement as necessary, of regulations or rules which govern fisheries activities in order to ensure the continued productivity of the resources and accomplishment of other fisheries objectives.”¹⁰⁰ Accordingly, this thesis will use the broader perspective when referring to “fisheries conservation and management”.

Fisheries management operates within a complex web of relationships between the environment, the marine ecosystem and human interventions (primarily fishing).¹⁰¹

⁹⁶ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), 39-41.

⁹⁷ Code of Conduct, 7.5 Precautionary Approach

⁹⁸ T. J. Pitcher, "Series Forward," in *Reinventing Fisheries Management*, ed. T. J. Pitcher, P. J. B. Hart, and D. Pauly, *Chapman & Hall Fish and Fisheries Series* (Dordrecht, The Netherlands: Kluwer Academic Publishers, 1998), pxxiv.

⁹⁹ Ibid.

¹⁰⁰ FAO Fishery Resources Division and Fishery Policy and Planning Division, *Fisheries Management*, vol. 4, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 1997), p7. It was also noted: “While fisheries management draws on fisheries research and analysis and, sometimes, institutionalized processes of elaboration of advice, it should not be confused with them; it encompasses but goes beyond them.”

¹⁰¹ K. L. Cochrane, "Complexity in fisheries and limitations in the increasing complexity of fisheries management," *ICES Journal of Marine Science* 56 (1999): 917-926, p919, FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), p6.: “A fishery is a

Data is the backbone to fisheries management. Data is collected and analysed to inform fisheries managers of the nature of these relationships and to gain a better understanding of their interactions.¹⁰² Fisheries management involves analysing available information to determine options for controlling the various human interventions in a fishery so that the objectives for a fishery can be achieved.¹⁰³ Best practice recommends that the management objectives for a fishery should ideally be predetermined by fisheries managers.¹⁰⁴ It is the fisheries management objectives that dictate the types of information that are required to manage that fishery and hence the data requirements for fisheries management.¹⁰⁵ Also the effectiveness of fisheries management actions can be determined from comparing estimates of the status of the fishery to the fisheries management objectives. The Code of Conduct recommends that States “should adopt measures for the *long-term conservation and sustainable use* of fisheries resources (emphasis added).”¹⁰⁶

Sustainability, that is ensuring the future availability and efficient use of a renewable resource, is a concept that is common to any form of resource management, including fisheries.¹⁰⁷ In fisheries, sustainability has been adopted as a response to fisheries management failures and fishery collapses such as those of the Grand Banks cod, often to ensure that the fishery and its economic and social spin-off benefits

complex system of interacting factors incorporating the state of the biological resource, social and institutional constraints, economic conditions and cultural beliefs.”

¹⁰² FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), p16.

¹⁰³ D. Evans and R. Grainger, "5. Gathering Data for Resource Monitoring and Fisheries Management," in *Handbook of Fish Biology and Fisheries*, ed. P. J. B. Hart and J. D. Reynolds (Oxford, United Kingdom: Blackwell Science Ltd, 2002), p101, FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999).

¹⁰⁴ J. F. Caddy and R. Mahon, *Reference Points for Fisheries Management, FAO Fisheries Technical Paper 347* (Rome: FAO, 1995), FAO, "Reference Points for Fisheries Management: their potential application to straddling and highly migratory resources. [A.CONF.164/INF/9, dated 26 January 1994]" (paper presented at the United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks, 14-31 March 1994, New York, 1994).

¹⁰⁵ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries, FAO Fisheries Circular 963* (Rome: FAO, 2001), p13.

¹⁰⁶ . Code of Conduct, Article 7.1.1 adopted by the FAO Conference on 31 October 1995, reprinted in (1995) *International Organizations and the Law of the Sea Documentary Yearbook* p700

¹⁰⁷ D. Evans and R. Grainger, "5. Gathering Data for Resource Monitoring and Fisheries Management," in *Handbook of Fish Biology and Fisheries*, ed. P. J. B. Hart and J. D. Reynolds (Oxford, United Kingdom: Blackwell Science Ltd, 2002), 84.: *Sustainability and a clear understanding of the pitfalls of overexploitation have become the driving forces of international fisheries research and fisheries management.*

continue.¹⁰⁸ In the words of Hilborn and Walters: "It is widely accepted that the fundamental purpose of fisheries management is to ensure sustainable production over time from fish stocks, preferably through regulatory and enhancement actions that promote economic and social well-being of the fishermen and industries that use the production."¹⁰⁹ But just what is sustainability and where did it originate?

Sustainability is derived from the concept of 'sustainable development' which first came on to the international agenda in 1987 through the Report of the World Commission on Environment and Development. There it was described as: "development that meets the needs of the present generations without compromising the ability of future generations to meet their own needs."¹¹⁰ However, it was not until 1992, at the United Nations Conference on Environment and Development and through the report of that conference 'Agenda 21' and the declaration of that conference 'The Rio Declaration', that sustainable development was confirmed by governments as an international priority.¹¹¹

Sustainable development is an anthropocentric, or human-oriented, concept: "Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature."¹¹² Thus, sustainability is a concept that views nature as a source of resources for human use and is concerned, not with conservation of biodiversity for reasons of preservation, but with conservation and management of resources to ensure their continuing availability to meet the needs of both present and future generations of people.¹¹³

¹⁰⁸ M. Berrill, *The Plundered Seas - can the world's fish be saved?* (San Francisco: Sierra Club Books, 1997), T. D. Smith, "Chapter 4: A History of Fisheries and their Science and Management," in *Handbook of Fish Biology and Fisheries*, ed. P. J. B. Hart and J. D. Reynolds (Oxford, United Kingdom: Blackwell Science Ltd, 2002). In many instances the protection of the resource and the ecosystem are a secondary motivation that follows on from ensuring the benefits from exploiting the resource are sustained for the benefit of people.

¹⁰⁹ R. Hilborn and C. J. Walters, *Quantitative Fisheries Stock Assessment: Choice, Dynamics and Uncertainty* (New York: Chapman and Hall, 1992), p3.

¹¹⁰ World Commission on Environment and Development, *Our common future: World Conference on Environment and Development 1987* (New York: Oxford University Press, 1989).

¹¹¹ United Nations, "Chapter 17: Protection of the Oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources," in *Report of the United Nations Conference on Environment and Development 3-14 June* (Rio de Janeiro: 1992), United Nations, "Annex I - Rio Declaration on Environment and Development," in *Report of the United Nations Conference on Environment and Development 3-14 June* (Rio de Janeiro: 1992).

¹¹² United Nations, "Annex I - Rio Declaration on Environment and Development," in *Report of the United Nations Conference on Environment and Development 3-14 June* (Rio de Janeiro: 1992), Principle 1.

¹¹³ S. M. Garcia, D. J. Staples, and J. Chesson, "The FAO Guidelines for the development and use of indicators for sustainable development of marine capture fisheries and an Australian example of their

In the context of international fisheries, sustainability has become incorporated within the concept of Responsible Fisheries: “this concept encompasses the sustainable utilisation of fishery resources in harmony with the environment; the use of capture and aquaculture practices which are not harmful to ecosystems, resources and their quality; the incorporation of added value to such products through transformation processes meeting the required sanitary standards; the conduct of commercial practices so as to provide consumers access to good quality products.”¹¹⁴ The FAO Code of Conduct for Responsible Fisheries was elaborated on the basis of this definition, to provide a necessary framework for national and international efforts to ensure sustainable exploitation of aquatic resources in harmony with the environment.¹¹⁵ The Code of Conduct describes principles and standards applicable to the conservation, management and development of all fisheries.¹¹⁶

Additionally, the Code of Conduct recommends that conservation and management measures should not only ensure the conservation of target species but also of species belonging to the same ecosystem or associated with or dependent upon the target species.¹¹⁷ This recommendation embodies the concept of Responsible Fisheries are principles for the application of the ecosystem approach to fisheries management. The 2002 Plan of Implementation of the World Summit on Sustainable Development called for, amongst other things, the application by 2010 of the ecosystem approach to fisheries management.¹¹⁸ The principles of an ecosystem approach to fisheries management are described by FAO as “an extension of the conventional principles for

application," *Ocean and Coastal Management* 43 (2000): 537-556, R. Rayfuse and M. Wilder, "Chapter 7: Sustainability, uncertainty and global fisheries," in *Ecology, Uncertainty and Policy: Managing Ecosystems for Sustainability*, ed. J. W. Handmer, T. W. Norton, and S. R. Dovers (Essex, England: Pearson Education Limited, 2001). Garcia, Staples and Chesson stress that the focus of the concept of sustainable development is on development, which is concerned with meeting human needs and aspirations (human well-being). These may include the provision of adequate food and shelter, reduced poverty, improved health and increased education worldwide (p538).

¹¹⁴ Code of Conduct for Responsible Fisheries, Annex 1, Background to the Origin and Elaboration of the Code. This was in fact the definition of Responsible Fisheries as determined at the International Conference on Responsible Fishing held in Cancùn, in May 1992 and as stated in the Declaration of Cancùn.

¹¹⁵ Code of Conduct for Responsible Fisheries, Article 1.3 & Preface (pvi)

¹¹⁶ The contribution of the FAO Code of Conduct for Responsible Fisheries to the international legal framework for conservation and management of tuna and billfish stocks will also be discussed in Chapter 2 of the present thesis.

¹¹⁷ Code of Conduct, Article 6.2.

¹¹⁸ FAO Fisheries Department, *Fisheries Management: The ecosystem approach to fisheries*, vol. 4 Suppl. 2, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 2003).

sustainable fisheries development to over the ecosystem as a whole.”¹¹⁹ The FAO definition for an ecosystem approach to fisheries is: “An ecosystem approach to fisheries strives to balance diverse societal objectives, by taking into account the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries.”¹²⁰ Essentially the application of the ecosystem approach to fisheries involves catering for ecosystem well-being, as well as human well-being through fisheries management decisions.

For instance, commonly fisheries management involves manipulating the levels of fishing mortality on target fish stocks, but consistent with the application of an ecosystem approach, fisheries management also would include minimising impacts of fishing on non-target, dependent and associated species. In general, the tools and techniques of the ecosystem-approach to fisheries management are no different to those used in traditional fisheries management, except that they will need to be applied in a manner that addresses the wider interactions between fisheries and the whole ecosystem.¹²¹ To demonstrate what it means to adopt responsible fisheries principles in fisheries management, Garcia and Grainger describe how primary fisheries management objectives can be expected to change: first, from sustaining stocks to sustaining assemblages and ecosystems; second, from maximising annual catches to maximising long-term welfare; third, from maximising employment to providing sustainable employment; fourth, from ensuring full resource use to ensuring efficient resources use (no waste); fifth, from tending to short-term interests to addressing both short- and long-term interests; and sixth, from addressing local considerations to addressing both local and global considerations.¹²² Consequently, the information requirements for fisheries management would by necessity be as broad as the objectives which the data is intended to inform.¹²³

¹¹⁹ *FAO Fisheries & Aquaculture - Ecosystem approach to fisheries management*, [website] (FAO Fishery Department, [cited February 20 2008]); available from <http://www.fao.org/fishery/topic/13261>.

¹²⁰ FAO Fisheries Department, *Fisheries Management: The ecosystem approach to fisheries*, vol. 4 Suppl. 2, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 2003).

¹²¹ *FAO Fisheries & Aquaculture - Ecosystem approach to fisheries management*, [website] (FAO Fishery Department, [cited February 20 2008]); available from <http://www.fao.org/fishery/topic/13261>.

¹²² S. M. Garcia and R. Grainger, "Fisheries Management and Sustainability: A new perspective of an old problem?," in *World Fisheries Congress: 2nd - Developing and sustaining world fisheries: the state of science and management*, ed. D. A. Hancock, et al. (Brisbane, Queensland: CSIRO, Australia, 1996), p649.

¹²³ FAO Fisheries Department, *Fisheries Management: The ecosystem approach to fisheries*, vol. 4 Suppl. 2, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 2003), p25.

Tuna fisheries conservation and management

Despite the widespread acceptance and international support for attaining long-term conservation and sustainable use in fisheries, implementation of these concepts to fisheries still remains a challenge.¹²⁴ Throughout the world, fisheries have a well-documented poor record of management and in some cases there have been collapses or failures.¹²⁵ FAO reports that out of all the marine fish stocks monitored by FAO, twenty-five percent are significantly impacted by fishing (17% are overexploited, 7% are depleted and 1% are recovering from depletion).¹²⁶

For tuna and billfish fisheries, fisheries management has additional complexities compared to other fisheries.¹²⁷ First, the characteristics of tuna and billfish species, which were examined previously in this Chapter (Section 1.1 Tuna and billfish species), complicate scientific analyses of impacts of fishing on the species. Tuna and billfish species are highly mobile, have complex life-histories and have a global distribution, so it is difficult to study the fish. Also unlike in other fisheries, the oceanic-distributions of tuna and billfish make it costly and difficult to undertake research surveys of tuna and billfish stock abundance.¹²⁸ Consequently, unlike for other fisheries, there is a heavy reliance in tuna and billfish fisheries on catch and effort data for use as indices in stock assessments. A further complexity is that gaps remain in the knowledge of the biology, physiology and ecology of tuna and billfishes, particularly with regard to natural mortalities and early life histories. Also, as was discussed in 1.2 *The fisheries for tuna*

¹²⁴ G. M. Mace and E. Hudson, J., "Attitudes toward Sustainability and Extinction," *Conservation Biology* 13, no. 2 (1999): 242-246, 244. The authors consider that "Sustainability" is a widely used but problematic concept.

¹²⁵ R. Rayfuse and M. Wilder, "Chapter 7: Sustainability, uncertainty and global fisheries," in *Ecology, Uncertainty and Policy: Managing Ecosystems for Sustainability*, ed. J. W. Handmer, T. W. Norton, and S. R. Dovers (Essex, England: Pearson Education Limited, 2001), p 140, M. P. Sissenwine and A. A. Rosenberg, "Marine Fisheries at a Critical Juncture," *Fisheries* 18, no. 10 (1993): 6-14. Rayfuse makes the case that in general the past history of 'fisheries management' did not include management nor fish, but mis-management or non-management of people.

¹²⁶ *Concern over situation of high-seas fish species: Strengthening fisheries management in international waters "a major challenge" - FAO report*, [website] (FAO Newsroom, [cited April 18 2007]); available from <http://www.fao.org/newsroom/en/news/2007/1000505/index/html>, FAO Fisheries Department, *The State of World Fisheries and Aquaculture 2006* (Rome: The Food and Agriculture Organisation of the United Nations, 2006), p7.

¹²⁷ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p28.

¹²⁸ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998*, FAO Fisheries Technical Paper 382 (Rome: FAO, 1999), p73, FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), 20-21.



Please see print copy for Figure 1-7.

Figure 1-7. Map to illustrate the approximate mandated area for the five tuna RFMOs

[Adapted from Appendix 2 In: Lodge, M. W., D. Anderson, T. Løbach, G. Munro, K. Sainsbury, and A. Willock, Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007)]

and billfish since 1950 of the present Chapter, the fisheries themselves are difficult to monitor because the fisheries are also international in character involving a number of States and fishing vessels of varying scales. The highly mobile nature of tuna and billfish species and the international and diverse nature of the fisheries that target them, necessitates that an international effort is required for the conservation and management of tuna and billfish fisheries.

The mandates of the five tuna RFMOs

Regional fisheries management organisations (RFMOs) are the primary mechanism for achieving the cooperation between all States involved in a fishery that is essential for the effective conservation and management of international fisheries.¹²⁹ RFMOs serve a critical role in providing a forum for coastal States, flag States and market States to come together and to cooperate in making decisions for the conservation and management of shared fish stocks.¹³⁰ In respect of tuna stocks, there are five tuna RFMOs that have been established which in combination, with some overlaps of jurisdiction and species, provide global coverage of the range of the principal market tuna species and bluefin tunas. The approximate areas of competence of the five tuna RFMOs are illustrated in Figure 1-7.

First, is the *Inter-American Tropical Tuna Commission* (IATTC) which was established in 1949 through adoption of the Convention for the Establishment of an Inter-American Tropical Tuna Commission to manage tuna stocks in the Eastern Pacific Ocean.¹³¹ Second, the *International Commission for the Conservation of Atlantic Tuna*

¹²⁹ Code of Conduct, Article 7.4.1: “A subregional or regional fisheries management organization or arrangement should include representatives of States in whose jurisdictions the resources occur, as well as representatives from States which have a real interest in the fisheries or the resources outside national jurisdictions. Where a subregional or regional fisheries management organization or arrangement exists and has the competence to establish conservation and management measures, those States should cooperate by becoming a member of such organization or a participant in such arrangement, and actively participate in its work.”

¹³⁰ M. W. Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007).

¹³¹ Convention for the Establishment of an Inter-American Tropical Tuna Commission of 31 May 1949, in force March 3, 1950, 80 UNTS 4 (IATTC Convention,). In 2003, the IATTC adopted the Convention for the Strengthening of the Inter-American Tropical Tuna Commission Established by the 1949 Convention between the United States of America and the Republic of Costa Rica of 14 November 2003, Accessed 24 January 2004 from <http://www.iattc.org/IATTCdocumentationENG.htm> (Antigua Convention,) as a means to strengthen the IATTC and to bring it up to date with relevant provisions of international law. The objective of the Antigua Convention is ‘to ensure the long-term conservation and sustainable use of the fish stocks covered by this Convention, in accordance with the relevant rules of

Table 1-6. Membership of tuna RFMOs and cooperating non-parties¹³²

	Commission Members	Others
IATTC (<i>est. by 1949 Convention</i>)	Costa Rica, Colombia, Ecuador, El Salvador, France, Guatemala, Japan, Mexico, Nicaragua, Panama, Peru, Spain, United States, Vanuatu, Venezuela	<i>Cooperating non-parties or Cooperating Fishing Entities: Belize, Canada, China, Cook Islands, European Community, Chinese Taipei</i>
ICCAT (<i>est. by 1966 Convention</i>)	Angola, Algeria, Barbados, Belize, Brazil, Canada, Cape Verde, China, Croatia, Republic of Egypt, European Community, France, Gabon, Ghana, Guatemala, Guinea Equatorial, Republic of Guinea, Honduras, Iceland, Ivory Coast, Japan, Republic of Korea, Libya, Mexico, Morocco, Namibia, Nigeria, Norway, Nicaragua, Panama, Philippines, Russia, Saint Vincent and the Grenadines, Sao Tome and Principe, Senegal, South Africa, Syria, Trinidad and Tobago, Tunisia, Turkey, United Kingdom, United States, Uruguay, Vanuatu, Venezuela.	<i>Cooperating Non-contracting Party, Entity or Fishing Entity: Chinese Taipei, Guyana</i>
IOTC (<i>est. by 1993 Agreement</i>)	Australia, Belize, China, Comoros, Eritrea, European Community, France, Guinea, Iran, India, Indonesia, Japan, Republic of Korea, Kenya, Madagascar, Malaysia, Mauritius, Oman, Pakistan, Philippines, Seychelles, Sri Lanka, Sudan, Tanzania, Thailand, United Kingdom, Vanuatu	<i>Cooperating Non-Contracting Party: Senegal, South Africa, Uruguay</i>
CCSBT (<i>est. by 1994 Convention</i>)	Australia, Indonesia, Japan, Republic of Korea, New Zealand, Fishing Entity of Taiwan	<i>Cooperating Non-Members: European Community, Philippines, South Africa</i>
WCPFC (<i>est. by 2000 Convention</i>)	Australia, Canada, China, Cook Islands, European Community, Federated States of Micronesia, Fiji, France, Japan, Kiribati, Korea, Marshall Islands, New Zealand, Nauru, Niue, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Chinese Taipei, Tonga, Tuvalu, United States, Vanuatu	<i>Cooperating Non-Members: Belize, Indonesia</i>

international law.' (Antigua Convention Antigua Convention, Article 2) At the time of writing, the Antigua Convention had eight ratifications, six of which are by Parties to the 1949 Convention; ratification by seven IATTC contracting parties is required for the entry into force of the Antigua Convention.

¹³² Sources: *about IOTC>structure of the commission*, [website] (IOTC, November 15 2007 [cited 15 January 2008]); available from <http://www.iotc.org/English/info/comstruct.php>, *CCSBT Commission for the Conservation of Southern Bluefin Tuna*, [website] (CCSBT, [cited 15 January 2008]); available from <http://www.ccsbt.org/docs/about.html>, *IATTC-Home*, [website] (IATTC, 26 December 2007 [cited 15 Jan 2008]); available from <http://www.iatcc.org/HomeENG.htm>, *ICCAT Contracting Parties*, [website] (ICCAT, 10 October 2007 [cited 15 January 2008]); available from <http://www.iccat.int/contracting.htm>, *WCPFC* [website] (WCPFC, [cited 15 Jan 2008]); available from <http://www.wcpfc.int>.

(ICCAT) which was established in 1966 through adoption of the International Convention for the Conservation of Atlantic Tuna in respect of tuna stocks in the Atlantic Ocean.¹³³ Third, the *Indian Ocean Tuna Commission* (IOTC) which was established in 1993 through adoption of the Agreement for the Establishment of the Indian Ocean Tuna Commission under the aegis of the FAO.¹³⁴ Fourth, the *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT) which was established in 1994 through adoption of the Convention for the Conservation of Southern Bluefin Tuna.¹³⁵ Fifth, the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western Central Pacific Ocean which was finalised and adopted in 2000, with the establishment of the *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western Central Pacific Ocean* (WCPFC) in December 2004.¹³⁶ While ICCAT, IATTC, IOTC and WCPFC have defined areas of jurisdiction and are mandated to conserve and manage tuna and tuna-like species within those areas, CCSBT was established for the conservation and management of a single tuna species, southern bluefin (*T. maccoyii*) throughout its global range. The membership of each RFMO varies considerably, and each includes a range of coastal States, developing and developed, as well as fishing States. The current membership of each tuna RFMO is listed in Table 1-6.

Despite there being global coverage by the five tuna RFMOs, as was discussed previously in *1.3 Impacts of fishing for tuna and billfish* the best available scientific

¹³³ International Convention for the Conservation of Atlantic Tuna of 14 May 1966, in force 21 March 1969, *UN/LEG/SER.B/16*, pp. 483-491. (ICCAT Convention,) The ICCAT Convention objective is “to cooperate in maintaining the populations of tuna and tuna-like fishes found in the Atlantic Ocean and at levels which will permit the maximum sustainable catch for food and other purposes.” (*About ICCAT*, [website] (ICCAT, 17 January 2007 [cited 15 January 2008]); available from <http://www.iccat.int/introduction.htm>.)

¹³⁴ Agreement for the Establishment of the Indian Ocean Tuna Commission of 25 November 1993, in force 27 March 1996, accessed from <http://www.iotc.org/about/> (IOTC Agreement,). The IOTC Agreement objective is “promote cooperation among its Members with a view to ensuring, through appropriate management, the conservation and optimum utilisation of stocks covered by this agreement and encouraging sustainable development of fisheries based on such stocks” (IOTC Agreement, Article V)

¹³⁵ Convention for the Conservation of Southern Bluefin Tuna of 10 May 1993, in force 20 May 1994, accessed from http://www.ccsbt.org/docs/pdf/about_the_commission/convention.pdf (CCSBT Convention,). The objective of CCSBT Agreement is to “To ensure through appropriate management, the conservation and optimum utilization of the global southern bluefin tuna fishery.” (CCSBT Convention, Article 3)

¹³⁶ Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean of 5 September 2000, in force 19 June 2004, [2000] *ATNIF No.11* (WCPFC Convention,) The objective of the WCPFC Convention is “To ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the western and central Pacific Ocean in accordance with the 1982 United Nations Convention on the Law of the Sea and the 1995 UN Fish Stocks Agreement.”

advice indicates that most tuna and billfish in the world are fully or over-exploited is cause for concern.¹³⁷ These concerns have been amongst the reasons that have led to recent efforts by the international community to strengthen and improve RFMOs.

Current directions to improve tuna RFMOs

In recent years, there has been an increasing recognition of the need for tuna RFMOs to improve their performance in accordance with the demands of strengthened international fishery instruments aimed at better conservation and management of fishery resources. The poor record of status of fish stocks globally has also been cause for concern. Over the last decade many studies have been undertaken to identify weaknesses in the current fisheries management arrangements in international waters, and to provide direction to strengthen fisheries management and reverse the trend in global fish stocks.¹³⁸

The general conclusion from these studies has been that given the nature of international fisheries, States cooperating through RFMOs remain the most realistic mechanism to facilitate international fisheries conservation and management of shared or high seas fish stocks, including tuna and billfish stocks.¹³⁹ Furthermore it is recommended that there is scope for current practices in tuna RFMOs, including in respect of fisheries data practices, to be strengthened in-line with international best practices. These were among the key outcomes from the *2006 Review Conference on the Agreement for the Implementation of Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and*

¹³⁷ "Report of the Joint Meeting of Tuna RFMOs", (paper presented at the Joint Meeting of Tuna RFMOs, January 22-26, Kobe, Japan, 2007), p1. The Joint Meeting of Tuna RFMOs report stated 'It was noted with concern that most commercially important tuna stocks in the world are fully or over-exploited.'

¹³⁸ M. W. Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007), G. L. Lugten, *A Review of Measures Taken By Regional Marine Fishery Bodies to Address Contemporary Fishery Issues*, *FAO Fisheries Circular 940* (Rome: FAO, 1999), J. Swan, *Regional fishery bodies and governance: issues, actions and future directions*, *FAO Fisheries Circular 959* (Rome: FAO, 2000), J. Swan, *Summary Information on the Role of International Fishery Organizations or Arrangements and Other Bodies Concerned with the Conservation and Management of Living Aquatic Resources*, *FAO Fisheries Circular 985* (Rome: FAO, 2003).

¹³⁹ *Concern over situation of high-seas fish species: Strengthening fisheries management in international waters "a major challenge" - FAO report*, [website] (FAO Newsroom, [cited April 18 2007]); available from <http://www.fao.org/newsroom/en/news/2007/1000505/index/html>, FAO Fisheries Department, *The State of World Fisheries and Aquaculture 2006* (Rome: The Food and Agriculture Organisation of the United Nations, 2006), M. W. Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007).

Management of Straddling Fish Stocks which in its outcome statement proposed a range of means to strengthen RFMOs.¹⁴⁰

The most recent FAO State of the World Fisheries Report, in considering the current poor record of fisheries management, also recommended strengthening and reform in RFMOs so that fish stocks throughout the world can be conserved and managed more effectively.¹⁴¹ The report *inter alia* states the following:

The perceived lack of action by RFMOs and their inability in some cases to stem stock declines should be viewed in the context of the obstacles faced by many RFMOs, not all of which are their own making. A lack of political commitment by the members of some RFMOs and unyielding positions that mitigate against sound regional fisheries management (e.g. the insistence on the use of consensus-based decision-making, even for RFMOs established in the post-1995 UN Fish Stocks Agreement era, and opt-out/objection provisions for management measures), has thwarted, if not stalled, efforts by some RFMOs to meet and address conservation and management challenges. Such positions hinder RFMO performance, while criticism is directed at the organizations rather than at their members.¹⁴²

This particular summation indicates that tuna fisheries conservation and management is a complex challenge for tuna RFMOs.

One particular recommended action towards strengthening RFMOs is a recent trend towards performance reviews of RFMOs.¹⁴³ At the Joint Tuna RFMO Meeting in

¹⁴⁰ "Report of the Review Conference on the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks - Prepared by the President of the Conference," (New York, 22-26 May: United Nations General Assembly A/Conf.210/2006/15, 2006). The Review Conference reported under four themes: conservation and management of stocks; mechanisms for international cooperation and non-members; monitoring, control and surveillance and compliance and enforcement; developing States and non-parties.

¹⁴¹ *Concern over situation of high-seas fish species: Strengthening fisheries management in international waters "a major challenge" - FAO report*, [website] (FAO Newsroom, [cited April 18 2007]); available from <http://www.fao.org/newsroom/en/news/2007/1000505/index/html>, FAO Fisheries Department, *The State of World Fisheries and Aquaculture 2006* (Rome: The Food and Agriculture Organisation of the United Nations, 2006), M. W. Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007).

¹⁴² FAO Fisheries Department, *The State of World Fisheries and Aquaculture 2006* (Rome: The Food and Agriculture Organisation of the United Nations, 2006), p56.

¹⁴³ M. W. Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007), pvi.: "Calls for better performance have come from, inter alia, the 2006 United Nations Fish Stocks Review Conference, the FAO Committee on Fisheries, the 2005 St John's Conference on the Governance of High Seas Fisheries and the High Seas Task Force. The most recent (December 2006) UN General Assembly resolution on sustainable fisheries urged RFMOs to strengthen their mandates and to modernize their measures for and approaches to fisheries management; it called upon States to make further efforts to strengthen and enhance cooperation among existing and developing RFMOs. The same resolution also called upon States to develop and apply best practice guidelines to

Kobe Japan, January 2007 “It was agreed that the five tuna RFMOs should have their performance reviewed in accordance with a common methodology, based on common criteria to the extent possible.”¹⁴⁴ The goal of such performance reviews was to assist the RFMOs, through these evaluations, in improving their effectiveness in fulfilling their mandates.¹⁴⁵ At the time of writing four of the five tuna RFMOs have agreed to the conduct of individual performance reviews and the results of each review will be reported to the annual session of the relevant RFMO in 2008.¹⁴⁶ Whist the newest of the tuna RFMOs, the WCPFC, has agreed to a performance review in 2008.¹⁴⁷

These performance reviews will among others evaluate the implementation by tuna RFMOs of the fisheries data-related practices. In particular the extent to which the RFMO (a) has agreed formats, specifications and timeframes for data submission consistent with UN Fish Stocks Agreement Annex I; (b) members and cooperating non-members individually or through the RFMO, collect and share complete and accurate fisheries data concerning target and non-target species and other relevant data in a timely manner; (c) gathers and shares fishing data and fishing vessel data among Members and other RFMOs; (d) has adopted and is implementing measures to address failure by members to collect and share data as required; (e) receives and/or produces the best scientific advice relevant to the fish stocks and other living marine resources under its purview, as well as to the effects of fishing on the marine environment.¹⁴⁸

RFMOs and to undertake performance reviews of them, based on transparent criteria.” The reference to the call in the UN Fish Stocks Review Conference is: “Report of the Review Conference on the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks - Prepared by the President of the Conference,” (New York, 22-26 May: United Nations General Assembly A/Conf.210/2006/15, 2006), Annex Outcome of the Review Conference, para 29.

¹⁴⁴ “Report of the Joint Meeting of Tuna RFMOs”, (paper presented at the Joint Meeting of Tuna RFMOs, January 22-26, Kobe, Japan, 2007), p2.

¹⁴⁵ Ibid., Appendix 14 Agreed Course of Actions for RFMOs - Annex I Attachment on RFMO Performance Review.

¹⁴⁶ CCSBT, *Report of the Fourteenth Annual Meeting of the Commission, 16-19 October 2007* (Canberra, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2007), p28 para 157, IOTC, *Report of the Ninth Annual Session of the Indian Ocean Tuna Commission, 13-18 May, IOTC-2007-S11-R/EJ* (Grand Baie, Mauritius: Indian Ocean Tuna Commission, 2007), p12, p56.

¹⁴⁷ WCPFC, *Summary Record of the Fourth Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 3-7 December 2007* (Tumon, Guam, USA: 2007).

¹⁴⁸ The Joint Tuna RFMO agreed that there was a need for development of draft criteria that were consistent across all tuna RFMOs to enable comparison. However, each tuna RFMO has the ability to be able to add additional criteria to those that were recommended by an informal group that met in the margins of the United Nations, *Sixth round of Informal Consultations of State Parties to the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly*

Accordingly, it is to be expected that in the future there might be improvement *inter alia* with respect to the arrangements in tuna RFMOs for data on fisheries for purposes of conservation and management of tuna and billfish fisheries.

Conclusion

This Chapter has reviewed the history of fishing for tuna and billfish and has examined the characteristics of tuna and billfish species. Currently available information, at the time of writing this thesis, suggests that most principal market tuna stocks, bluefin tuna stocks and billfish stocks are significantly impacted by fishing. Noting the ten-fold increase in catches of principal market tunas over the last five decades, it is also anticipated that fishing activities for tuna and billfish are having a substantial impact on marine ecosystems. However, there is high uncertainty associated with the scientific advice on impacts of tuna and billfish fishing, and there is scope to further improve the quality of this scientific advice through better fisheries data.

To effect tuna fisheries conservation and management, given the highly mobile nature of tuna and billfish, and the international character of tuna and billfish fishing activities, tuna RFMOs have been established. Tuna RFMOs facilitate the cooperation between all States involved in tuna and billfish fisheries, which is required to effectively conserve and manage these fisheries. In recent times it has been recommended that tuna RFMOs must improve their performance. Improving the quality of fisheries data to support scientific analyses of impacts of fishing, will be fundamental to tuna RFMOs meeting their objective to ensure the effective long-term conservation and sustainable use of tuna and billfish fisheries, and the integrity of marine ecosystems.

Chapter 2. International legal framework for data on tuna fisheries:

Part I. Fisheries data that tuna RFMOs are to collect

The previous Chapter established that tuna regional fisheries management organisations (RFMOs) must ensure the effective long-term conservation and sustainable use of tuna fisheries. Fisheries data support scientific analyses that are used by the relevant Scientific Committee, or scientific secretariat, as a basis for scientific advice to the Commission regarding the likely impact of tuna fisheries on the tuna stocks and the marine ecosystem, as well as predicting likely future trends. This Chapter will be the first of a two-part analysis of international legal requirements for data on tuna fisheries. The structure of the analyses of the international legal framework for data on tuna fisheries follows the analytical framework for this thesis which was outlined earlier in the Introduction to this thesis. This Chapter will focus on the types and format for fisheries data that tuna RFMOs are to collect to support scientific analyses of impacts of fishing.

This Chapter comprises four parts. First, as background to the international legal framework for data on tuna fisheries, the Chapter will briefly analyse the international legal instruments that stipulate requirements for data practices, as well as guidelines for the implementation of these international legal requirements. Second the international legal framework for data on tuna fisheries will be examined. As was discussed in the thesis Introduction, there are four types of data on tuna fisheries that tuna RFMOs require to support scientific analyses of impacts of tuna fishing: catch and effort data; biological data to support stock assessment; vessel and gear data; and data-related to impacts of fishing on non-target, associated and dependent species. Third, the international legal requirements for States to provide catch and effort data to tuna RFMOs will be analysed and the current practices in tuna RFMOs examined.¹ Fourth, the international legal requirements relating

¹ It should be noted that this Chapter will not analyse data practices in the *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPFC).

to the other three types of fisheries data (biological data to support stock assessment; vessel and gear data; and data-related to impacts of fishing on non-target, associated and dependent species) that tuna RFMOs require will be analysed and the current practices in tuna RFMOs examined.

2.1 Background and overview

This section will comprise four parts. First, the background to the development of international legal instruments and guidelines relevant to tuna fisheries conservation and management will be reviewed. Second, the relevant binding treaties that make up the international legal framework for fisheries data will be examined. Third, the two groups of non-binding instruments will be examined. Finally, the guidelines that have been developed to assist implementation of binding treaties and non-binding instruments will be examined. It should be noted that a chronological summary of key developments in tuna fisheries, international law and tuna fisheries conservation and management is provided in Appendix 3.

Background

Prior to the 20th Century the oceans were thought to be so vast that marine living resources were inexhaustible. The concept of fisheries management did not exist.² This perception arose in part because fishing vessels were sailing vessels with limited ranges, with limited operations, with manually operated gear and without refrigeration facilities, so most fishing would have occurred in coastal areas. The oceans were governed under the principle of freedom of the seas, first proclaimed by Hugo Grotius.³ Grotius sought to establish the

Instead, the data practices in the other four tuna RFMOs will be examined herein. The findings from the present Chapter will be subsequently referenced in later Chapters that analyse WCPFC data practices (Chapters 7 and 8).

² P. Birnie and A. Boyle, *International Law and the Environment*, 1 ed. (New York, United States: Oxford University Press, 1992), p422, D. H. Cushing, *The Provident Sea* (Cambridge: Cambridge University Press, 1988), W. Dubinsky, "Management of world fisheries: Implication of extended fisheries jurisdiction: edited by Edward Miles University of Washington Press, Seattle, WA, 1989," *Marine Policy* 15, no. 4 (1991): 297-300.

³ H. Grotius, *The Freedom of the Seas* (New York: Oxford University Press, 1916). Grotius wrote his doctrine in 1604-1605, but it was not widely published until 1868 as *Mare Liberum*, the 1916 publication cited here is the English translation of the Latin text. Grotius argued that the oceans were the common property of all, particularly in regard to freedom of navigation and trade. This argument refuted the sovereign

inclusive interest of the whole community in the oceans, in opposition to the claims of some States for exclusive rights to areas of the oceans. At that time fisheries and their management were not considered priorities; interest in the oceans was more for navigation and trade. Three nautical miles was widely accepted as the breadth of a States territorial sea.⁴

During the 20th Century the oceans and its resources gained increasing significance, particularly following the end of the Second World War. Fishing technology and techniques continued to improve and limits to the oceans fishery resources began to be realised.⁵ Coastal States began to claim extended jurisdiction or sovereignty over waters adjacent to their coasts, of up to 12 nautical miles, and the marine resources contained within.⁶ Often these claims were justified by States as being necessary to guarantee the availability of the resources contained therein for their nationals and to protect the livelihoods of those that depended on these resources.⁷ Nevertheless these claims were met

claims by Spain and Portugal over parts of the ocean (the Pacific Ocean and Gulf of Mexico were claimed by Spain and the Atlantic Ocean south of Morocco and the Indian Ocean were claimed by Portugal).

⁴ P. Birnie and A. Boyle, *International Law and the Environment*, 1 ed. (New York, United States: Oxford University Press, 1992), p494.

⁵ D. H. Cushing, *The Provident Sea* (Cambridge: Cambridge University Press, 1988), W. Dubinsky, "Management of world fisheries: Implication of extended fisheries jurisdiction: edited by Edward Miles University of Washington Press, Seattle, WA, 1989," *Marine Policy* 15, no. 4 (1991): 297-300. P. Birnie and A. Boyle, *International Law and the Environment*, 1 ed. (New York, United States: Oxford University Press, 1992), p490, 502. Concern about declines in certain fisheries existed from as early as the 1920s, where the International Council for the Exploration of the Seas (ICES) reported to the League of Nations that measures should be taken internationally for all fisheries including whales to ensure uniformity of national legislation.

⁶ One of the first prominent claims was the Truman Proclamation on Conservation that was made by the United States in 1945 (Truman Proclamation on Conservation, Presidential Proclamation No. 2668 28 September 1945 – Policy of the United States with Respect to Coastal Fisheries in Certain Areas of the High Seas). The Truman Proclamation recognized the inadequacies of the present arrangements for the protection and perpetuation of fishery resources within areas contiguous to the coast of the United States. Conservation zones were established “in those areas of the high seas contiguous to the coasts of the United States wherein fishing activities have been or in the future may be developed and maintained on a substantial scale.”

Following the Truman Declaration, Chile Ecuador and Peru made the Santiago Declaration on the Maritime Zone (Santiago Declaration on the Maritime Zone (and the 1955 Protocol of Accession to the Santiago Declaration on the Maritime Zone) Agreements between Chile, Ecuador and Peru of 18 August 1952). The Santiago Declaration claimed sovereignty within a 200 nautical mile maritime zone from each of their coasts. The justification for extended sovereignty claims were similar to the Truman Declaration in that they were to ensure the conservation and protection of the natural resources within the zone by preventing such resources “from being used outside the area of its jurisdiction so as to endanger their existence, integrity and conservation to the prejudice of peoples so situated geographically that their seas are irreplaceable sources of essential food and economic material.”

⁷ S. M. Kaye, *International Fisheries Management, International Environmental Law & Policy Series* (The Hague, The Netherlands: Kluwer Law International, 2001).

with protests because such exclusive claims were contrary to the freedom of the seas.⁸ In addition to individual State action, realisations that fishery resources had limits lead to collective action by States. During the period 1945 to 1970 States cooperated to establish international fishery commissions in respect of high seas marine fishery resources.⁹ These commissions *inter alia* provided mechanisms for collating fisheries data and for obtaining regular scientific advice. However, such arrangements were voluntary and subject to the freedom of fishing, so were not a satisfactory means of managing and regulating fisheries.¹⁰ Two of the tuna RFMOs, *Inter-American Tropical Tuna Commission* (IATTC) and *International Commission for Atlantic Tunas* (ICCAT), were established during this period so in recent years have had to face the challenge of adapting their constituting Conventions to the modern international legal framework for tuna fisheries conservation and management.¹¹ Unsatisfactory regional fisheries management actions and varying unilateral claims of extended jurisdiction, were reasons necessitating codification of the fisheries management aspects of the law of the sea.

Binding treaties

The most relevant binding international treaties pertaining to data on tuna fisheries are the *United Nations Convention on the Law of the Sea of 10 December 1982* (LOS Convention)¹² and the *Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the*

⁸ P. Birnie and A. Boyle, *International Law and the Environment*, 1 ed. (New York, United States: Oxford University Press, 1992), p494, E. Hey, *The Regime for the Exploitation of Transboundary Marine Fisheries Resources: The United Nations Law of the Sea Convention Cooperation between States* (Dordrecht, The Netherlands: Martinus Nijhoff Publishers, 1989).

⁹ Patricia Birnie and Alan Boyle, *International Law and the Environment*, 1 ed. (New York, United States: Oxford University Press, 1992), Ellen Hey, *The Regime for the Exploitation of Transboundary Marine Fisheries Resources: The United Nations Law of the Sea Convention Cooperation between States* (Dordrecht, The Netherlands: Martinus Nijhoff Publishers, 1989).

¹⁰ E. Hey, *The Regime for the Exploitation of Transboundary Marine Fisheries Resources: The United Nations Law of the Sea Convention Cooperation between States* (Dordrecht, The Netherlands: Martinus Nijhoff Publishers, 1989).

¹¹ The Inter-American Tropical Tuna Commission was established in 1949 through adoption of the Convention for the Establishment of an Inter-American Tropical Tuna Commission, of 31 May 1949, 80 *UNTS* 4. The International Commission for the Conservation of Atlantic Tuna was established in 1966 through adoption of the International Convention for the Conservation of Atlantic Tuna of 14 May 1966, *UN/LEG/SER.B/16*, pp. 483-491.

¹² United Nations Convention on the Law of the Sea of 10 December 1982, entered into force from 16 November 1994 (1982) 21 *ILM* 1261 (LOS Convention,)

Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, of 4 December 1995 (UN Fish Stocks Agreement).¹³ The LOS Convention sets down the legal order for the seas and oceans, including the rights and duties of States in areas beyond national jurisdiction.¹⁴ For many uses of the sea, and this is certainly the case with fisheries, the LOS Convention divides the oceans into three distinct jurisdictional zones, each with its own legal characteristics. The first jurisdictional zone is *zones under sovereignty*, which are comprised of internal waters, archipelagic waters and territorial seas. In areas under national sovereignty, the LOS Convention generally imposes very few limitations on coastal States with regard to the management and conservation of the fish stocks.¹⁵ The second jurisdictional zone is *zones under sovereign rights*, which are the exclusive economic zone (EEZ) and the continental shelf.¹⁶ In the EEZ, declared areas of up to 200 nautical miles from a coastal States baseline, coastal States have sovereign rights to exploit, conserve and manage the living marine resources found therein.¹⁷ It should be noted that the continental shelf regime is not relevant to data on tuna fisheries.¹⁸ The third jurisdictional zone are the *high seas*, which are areas outside the EEZ (for fishing purposes). In areas beyond national jurisdiction, fishing is subject to a qualified regime that places responsibility for the operation of fishing vessels on the respective flag State.¹⁹

¹³ Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, of 4 December 1995, entered into force from 11 December 2001 (1995) 34 *ILM* 1542 (UN Fish Stocks Agreement,)

¹⁴ The LOS Convention is an international instrument that “reflects a delicate balance between competing interests in the use of the ocean and its resources by taking a functional approach in establishing the various maritime zones and the rights and duties of States in those zones, including areas beyond national jurisdiction.” S. N. Nandan, “Chapter 1: An Introduction to the 1982 United Nations Convention on the Law of the Sea,” in *Order for the Oceans at the Turn of the Century*, ed. D. Vidas and W. Østreng (The Hague, The Netherlands: Kluwer Law International, 1999), p10.

¹⁵ LOS Convention, Part II and Part IV.

¹⁶ *Ibid.*, Part V and VI.

¹⁷ *Ibid.*, Part V; primarily Articles 61, 62, 64 and 73.

¹⁸ The living resources on the continental shelf are sedentary species (i.e. “organisms which, at the harvestable stage, either are immobile on or under the sea-bed or are unable to move except in constant physical contact with the sea-bed or the subsoil” (*Ibid.*, Article 77(4)). However, sedentary species do not fall within the scope of this thesis which is concerned with tuna and billfish species.

¹⁹ *Ibid.*, Article 116, grants all States a right to fish on the high seas. This right is subject to States’ treaty obligations, and provisions dealing with conservation of marine living resources in the EEZ, which require cooperation with coastal States with regard to straddling stocks. Specific conservation obligations that the LOS Convention imposes on States fishing on the high seas include: first, the duty to adopt, with respect to their nationals, measures for the conservation of living resources on the high seas (Article 117); second, cooperation in the conservation and management of living resources (Article 118); and third, conservation of living resources on the high seas through the implementation of a number of management measures such as

Tuna and billfish species by their nature are found both in areas under national jurisdiction as well as in high seas areas of the world's oceans.²⁰ Recognising this feature of tuna and billfish species, the LOS Convention obliges coastal States and flag States to cooperate to ensure the conservation and promote the optimum utilisation of such species both within and beyond the EEZ.²¹ In fulfilling this obligation States are encouraged to utilize RFMOs, or similar arrangements, to facilitate cooperation between them for the conservation of tuna and billfish fisheries.²² As was discussed in Chapter 1 (*1.4 Achieving long-term conservation and sustainable use of tuna fisheries through fisheries management*), there are now five tuna RFMOs that together cover the global range of the four principal market tunas: IATTC covering the eastern Pacific Ocean, ICCAT covering the Atlantic Ocean, *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT) covering the global range of southern bluefin tuna, *Indian Ocean Tuna Commission* (IOTC) covering the Indian Ocean and *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPFC) covering the western central Pacific Ocean.²³

In the early 1990s, ten years after the adoption of the LOS Convention, it was formally recognised that management of fisheries in many areas of high seas and in many areas under national jurisdiction was inadequate and some fishery resources were overfished.²⁴ Poor quality fisheries data, unreliable databases and ineffective sharing

the determination of the allowable catch, taking into account the need for associated species to be maintained at a level above that at which their reproduction may become seriously threatened and cooperation in the development of scientific information on fisheries stocks through international organisations (Article 119).

²⁰ See *Chapter 1, 1.1 Tuna and billfish species*.

²¹ LOS Convention, Article 64(1): "The coastal State and other States whose nationals fish in the region for the highly migratory species listed in Annex I shall cooperate directly or through appropriate international organizations with a view to ensuring conservation and promoting the objective of optimum utilization of such species throughout the region, both within and beyond the exclusive economic zone. In regions for which no appropriate international organization exists, the coastal State and other States whose nationals harvest these species in the region shall cooperate to establish such an organization and participate in its work." It should be noted that LOS Convention Annex I is reproduced herein as Appendix 1.

²² *Ibid.*,

²³ The chronological order for the establishment of tuna RFMOs are summarised and included with other key developments in tuna fisheries and international law in Appendix 3.

²⁴ Declaration of Cancún, adopted at the International Conference on Responsible Fishing, Cancún, Mexico, May 6-8 1992. Accessed from Ocean Law <<http://www.oceanlaw.net/texts/cancun.htm>> on 14 January 2004, Preamble. *Earth Summit: UN Conference on Environment and Development (1992)*, [Internet] (Department of Public Information, United Nations, 23 May 1997 1997 [cited 14 January 2004]); available from <http://www.un.org/geninfo/bp/enviro.html>. For further discussion of the issues see: E. Hey, *The Regime for the Exploitation of Transboundary Marine Fisheries Resources: The United Nations Law of the Sea*

arrangements of data among States were factors contributing to these failures.²⁵ Also it was recognised that there was a need to promote effective implementation of the LOS Convention for straddling fish stocks and highly migratory fish stocks, by improving cooperation among States concerned with the conservation and management of these stocks.²⁶ The response of the international community to these post-LOS Convention concerns was three pronged. First, through adoption of two binding treaties to specifically address gaps and deficiencies in the international legal framework for tuna conservation and management and further qualifies rights for high seas fisheries. Second, through elaboration of non-binding instruments establishing principles for responsible and sustainable fisheries and which reflect what is considered ideal by the international community. Third, through the elaboration of international guidelines that provides expert advice on recommended best-practices to implement binding treaties and non-binding instruments.

The first of the post-LOS Convention binding treaties is the *Agreement to Promote Compliance with International Conservation and Management Measures by Fishing*

Convention Cooperation between States (Dordrecht, The Netherlands: Martinus Nijhoff Publishers, 1989), E. Hey, "Chapter 1: Global Fisheries Instruments Adopted in the Post-UNCLOS III Period," in *Developments in International Fisheries Law*, ed. E. Hey (The Hague, Netherlands: Kluwer Law International, 1999), 4-6, E. Hey, "Chapter 2: The Fisheries Provisions of the LOS Convention," in *Developments in International Fisheries Law*, ed. E. Hey (The Hague, The Netherlands: Kluwer Law International, 1999), L. Juda, "Rio Plus Ten: The Evolution of International Marine Fisheries Governance," *Ocean Development and International Law* 33 (2002): 109-144, p115.

²⁵ Agenda 21, Chapter 17, para 17.45 & 17.71. "Coastal States, where necessary, should improve their capacity to collect, analyse, assess and use information for sustainable use of resources" (para 17.8 & 17.70). For high seas fisheries there was a need for "action by States whose nationals and vessels fish on the high seas, as well as cooperation at the bilateral, subregional, regional and global levels, is essential particularly for highly migratory species and straddling stocks. Such action and cooperation should address inadequacies in fishing practices, as well as in biological knowledge, fisheries statistics and improvement of systems for handling data." (para 17.45)

²⁶ United Nations, "Chapter 17: Protection of the Oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources," in *Report of the United Nations Conference on Environment and Development 3-14 June* (Rio de Janeiro: 1992), para 17.49 (e). "States should convene, as soon as possible, an intergovernmental conference under United Nations auspices, taking into account relevant activities at the subregional, regional and global levels, with a view to promoting effective implementation of the provisions of the United Nations Convention on the Law of the Sea on straddling fish stocks and highly migratory fish stocks. The conference, drawing *inter alia*, on scientific and technical studies by FAO, should identify and assess existing problems related to the conservation and management of such fish stocks, and consider means of improving cooperation on fisheries among States, and formulate appropriate recommendations. The work and the results of the conference should be fully consistent with the provisions of the United Nations Convention on the Law of the Sea, in particular the rights and obligations of coastal States and States fishing on the high seas."

Vessels on the High Seas (FAO Compliance Agreement) which prescribes certain obligations on flag States to ensure that flag States exercise effective flag State control over fishing vessels greater than 24m particularly on the high seas.²⁷ This treaty has limited contribution to the international legal framework for data on tuna fisheries, primarily for the establishment by States of a national record of fishing vessels entitled to fly its flag.²⁸

The second of the binding treaties, the UN Fish Stocks Agreement is the principal binding treaty that is of relevance to the international legal framework for data on tuna fisheries. The UN Fish Stocks Agreement complements the LOS Convention and provides an innovative and comprehensive framework for the conservation and management of straddling fish stocks and highly migratory fish stocks, which includes tunas and billfish species.²⁹ The objective of the UN Fish Stocks Agreement is “to ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks” through effective implementation of the relevant provisions of the LOS Convention.³⁰ The UN Fish Stocks Agreement is concerned not only with the conservation and management of target straddling fish stocks and highly migratory fish stocks, but also in achieving responsible fisheries for these stocks, which includes *inter alia* maintaining the integrity of marine ecosystems and taking into account social and economic considerations.³¹

²⁷ Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas of 24 November 1993, entered into force from 24 April 2003 (1994) 33 *ILM* 968 (FAO Compliance Agreement,).

²⁸ The FAO Compliance Agreement obliges flag States to ensure that their fishing vessels complete and submit logbook catch and effort data (Article III(7)); to collect information for completion of national vessel records (Article IV) and to exchange data with other States (Article VI).

²⁹ The provisions of the UN Fish Stocks Agreement are reviewed thoroughly elsewhere, see for example T. Aqorau and A. Bergin, "The UN Fish Stocks Agreement-A New Era for International Cooperation to Conserve Tuna in the Central and Western Pacific," *Ocean Development and International Law* 29, no. 1 (1998): 21-42, P. Birnie and A. Boyle, *International Law and the Environment*, 2 ed. (New York, United States: Oxford University Press, 2002), M. Hayashi, "The 1995 Agreement on the conservation and management of straddling and highly migratory fish stocks: significance for the Law of the Sea Convention," *Ocean and Coastal Management* 29, no. 1-3 (1995): 51-69, M. Hayashi, "Chapter 4: The Straddling and Highly Migratory Fish Stocks Agreement," in *Developments in International Fisheries Law*, ed. E. Hey (The Hague, The Netherlands: Kluwer Law International, 1999), M. Hayashi, "Chapter 3: The 1995 UN Fish Stocks Agreement and the Law of the Sea," in *Order for the Oceans at the Turn of the Century*, ed. D. Vidas and W. Østreng (The Hague, The Netherlands: Kluwer Law International, 1999), L. Juda, "The 1995 United Nations Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks: A Critique," *Ocean Development and International Law* 28, no. 2 (1997): 147-166.

³⁰ UN Fish Stocks Agreement, Article 2.

³¹ *Ibid.*, Preamble, Article 5 and various references throughout. The international legal framework for fisheries data includes provisions to address concerns for impacts of fishing on non-target, dependent and associated species. See this Chapter 2.4 *Other data and information that are to be collected by tuna RFMOs*.

Article 5 of the UN Fish Stocks Agreement sets out general principles for conservation and management of straddling fish stocks and highly migratory fish stocks. These principles include the application of the precautionary approach and obligations to collect and share complete and accurate data on fisheries to ensure that the best scientific evidence is available. Although the UN Fish Stocks Agreement applies “unless otherwise provided” to the conservation and management of straddling fish stocks and highly migratory fish stocks “beyond areas under national jurisdiction”, coastal State Parties are required to apply *mutatis mutandis* the general principles set out in Article 5 of the UN Fish Stocks Agreement in the exercise of their sovereign rights concerning straddling fish stocks and highly migratory fish stocks.³² Consequently, coastal State parties to the UN Fish Stocks Agreement are obliged to apply the provisions of the UN Fish Stocks Agreement as is appropriate to tuna fishing activities occurring in areas under their national jurisdiction.

To facilitate cooperation among States involved in tuna and billfish fisheries, the UN Fish Stocks Agreement contains detailed rules on the establishment and operation of RFMOs, which are to establish conservation and management measures on the high seas. Parties to the UN Fish Stocks Agreement, that are involved in tuna and billfish fisheries, are obliged to become members of the relevant tuna RFMO or agree to comply with the conservation and management measures created by the relevant tuna RFMO, otherwise they are not permitted to fish in the areas to which the conservation and management measures apply.³³

Non-binding instruments

There are two types of non-binding instruments that are relevant to the analysis of the international legal framework for tuna fisheries data. The first is the FAO Code of Conduct for Responsible Fisheries, which was adopted by the FAO Conference on 31 October 1995.³⁴ The Code of Conduct was drafted to be consistent with the LOS Convention and takes into account *inter alia* the Declaration of Cancún,³⁵ outcomes of 1992 United Nations

³² Ibid., Article 3(2).

³³ Ibid., Article 8(4).

³⁴ Code of Conduct, adopted by the FAO Conference on 31 October 1995, reprinted in (1995) International Organizations and the Law of the Sea Documentary Yearbook p700.

³⁵ Declaration of Cancún, adopted at the International Conference on Responsible Fishing, Cancún, Mexico, May 6-8 1992. Accessed from Ocean Law <<http://www.oceanlaw.net/texts/cancun.htm>> on 14 January 2004,

Conference on Environment and Development including Agenda 21, FAO Compliance Agreement and UN Fish Stocks Agreement. In fact, because the Code of Conduct was being negotiated at the same time as the UN Fish Stocks Agreement text, as a *modus operandi*, it was agreed that the final wording of the high seas fishing provisions of the Code should be left in abeyance pending the outcome of the negotiations of the UN Fish Stocks Agreement. Following the adoption of the UN Fish Stocks Agreement, the Code of Conduct text relating to high seas issues was adjusted to be consistent with the provisions of the UN Fish Stocks Agreement.³⁶ However despite drawing substantially from binding treaties, the Code was always intended to be non-binding, with its objective to serve as a series of principles which States can draw upon in the formulation of national legislation, as well as in the negotiation of binding international agreements and less formal arrangements.³⁷

The second type of non-binding instruments were elaborated within the framework of the Code of Conduct and adopted by the FAO Conference. These include the International Plan of Action for reducing incidental catch of seabirds in longline fisheries (IPOA-Seabirds) and International Plan of Action for the conservation and management of sharks (IPOA-Sharks), both adopted by the FAO Conference in 1999. The International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU) was adopted by the FAO Conference in 2001. Also the Strategy for Improving Information on Status and Trends of Capture Fisheries (FAO Strategy on Improving Information in Fisheries) was adopted by the FAO Conference in 2003. The Strategy is a voluntary instrument that was elaborated within the framework of the Code of Conduct that aims to provide a framework for the improvement of knowledge and understanding of fishery status and trends as a basis for fisheries policy making and management for the conservation and sustainable use of fishery resources within ecosystems.³⁸

³⁶ Code of Conduct for Responsible Fisheries, Annex 1, 35-39.

³⁷ Code of Conduct, Article 2.

³⁸ FAO Strategy on Improving Information in Fisheries, paras 6 and 12.

Guidelines

Guidelines are developed by a panel of experts in the particular field, often following an expert consultation, to provide expert advice on implementation of certain practices at a national and regional level. For instance, there are a number of issue-specific guidelines elaborated by FAO that set out expert advice and recommendations to assist States in implementing the Code of Conduct and International Plans of Action. There are at least six Guidelines that are relevant to the analysis of the international legal framework for tuna fisheries data. First, the *FAO Technical Guidelines on Fisheries Management* which was produced to support the implementation of Article 7 of the Code of Conduct, and *inter alia* provides some guidance on the data-related implementation requirements for fisheries management in general.³⁹ Second, the *FAO Technical Guidelines on the ecosystem approach to fisheries*, which is the second supplement the FAO Technical Guidelines on Fisheries Management. These guidelines provide expert advice on how to operationalise the ecosystem approach to fisheries.⁴⁰ Third, the *FAO Technical Guidelines for Implementation of the IPOA-IUU*, which review the measures to prevent, deter and eliminate IUU fishing that are contained in the IPOA-IUU and aim to provide advice to assist States and RFMOs in the implementation of the IPOA-IUU.⁴¹ Fourth, the *FAO Guidelines to reduce Sea Turtle Mortality in Fishing Operations* which were prepared by a Technical Consultation in 2004, and endorsed by the FAO Committee on Fisheries (COFI) for voluntary implementation by States and RFMOs.⁴² The intent of these sea turtle guidelines is to offer guidance to the preparation of national or multilateral fisheries management activities and other measures allowing for the conservation and management of sea turtles, which includes *inter alia* collection and sharing of data on sea turtle-fishery interactions. Fifth, the *Guidelines for Routine Collection of Capture Fishery Data*, which

³⁹ FAO Fishery Resources Division and Fishery Policy and Planning Division, *Fisheries Management*, vol. 4, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 1997).

⁴⁰ FAO Fisheries Department, *Fisheries Management: The ecosystem approach to fisheries*, vol. 4 Suppl. 2, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 2003).

⁴¹ FAO Fisheries Department, *Implementation of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing*, vol. 9, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 2002).

⁴² FAO, "Guidelines to reduce sea turtle mortality in fishing operations," in *Report of the Technical Consultation on Sea Turtles Conservation and Fisheries, Bangkok, Thailand 29 November - 2 December 2004* (Rome: FAO, 2005).

were prepared at an expert consultation in 1998, and published by FAO.⁴³ The intent of these guidelines is to assist national governments and fisheries management authorities to undertake routine data collection and processing necessary for effective monitoring and management of capture fisheries, and in particular, for implementing the relevant articles of UN Fish Stocks Agreement, Code of Conduct and FAO Compliance Agreement.⁴⁴ Sixth, the FAO Fisheries Circular publication titled *Research Implications of Adopting the precautionary approach to management of tuna fisheries*, which presents recent information on implementation to date and outstanding gaps and challenges for tuna RFMOs in implementing the precautionary approach to fisheries management.⁴⁵ This FAO Fisheries Circular was based on findings from an Expert Consultation on Implications of the Precautionary Approach for Tuna Biological and Technological Research held in Phuket, Thailand, from 7 to 15 March 2000. The expert consultation was organised in response to the adoption of the precautionary approach to fisheries management in: (a) the UN Fish Stocks Agreement and (b) the Code of Conduct for Responsible Fisheries.⁴⁶

2.2 Analysis of international legal framework for data on tuna fisheries

This section commences the analysis of the international legal framework for data on tuna fisheries, and will examine the overarching international legal requirements for fisheries data practices. There will be three parts to this section. First, the international legal requirement to base decisions on the best scientific evidence available will be examined. Second, the international legal basis for States to collect and share data through tuna RFMOs will be examined. Third, the international legal requirement for tuna RFMOs to adopt standards that stipulate the types and format for the provision of fisheries data to tuna RFMOs, will be examined.

⁴³ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999).

⁴⁴ Ibid., p1.

⁴⁵ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries, FAO Fisheries Circular 963* (Rome: FAO, 2001).

⁴⁶ Ibid.

International legal requirement to base fisheries management decisions on the best scientific evidence available

The LOS Convention did not elaborate a specific list of fisheries data and scientific information that coastal States are required to collect on fishing activities conducted within their EEZ or that flag States are required to collect on fishing activities by fishing vessels flying their flag. Instead the LOS Convention indicates, as a part of the fishery resource related obligations for the EEZ and high seas, two parts of a qualitative fisheries data standard for fisheries conservation that coastal States and flag States are obliged to meet. First, States are to take conservation and management measures for fishery resources that are designed on the “best scientific evidence available” to the States concerned.⁴⁷ Second, States are to contribute and exchange on a regular basis, “available data and information” that are relevant to the conservation of fish stocks.⁴⁸ Additionally, to facilitate the conservation and management of tuna stocks coastal States and flag States are instructed to cooperate.⁴⁹ It is the coastal State which is responsible for collecting data on tuna fishing activities in EEZ areas and exchanging data with other coastal States and flag States involved in tuna fisheries for the same stocks. But for tuna fishing activities conducted on the high seas, it is the flag State that is responsible for the operation of each fishing vessel flying its flag and for collecting data on tuna fishing activities by these vessels and exchanging such data with coastal States and other flag States.

The UN Fish Stocks Agreement expands on these general provisions of the LOS Convention. In Article 5(b), the UN Fish Stocks Agreement reaffirms that coastal States and flag States, in fulfilling their duty to cooperate to conserve and manage tuna stocks, are obliged to ensure that conservation and management measures they adopt for tuna stocks are based on the “best scientific evidence available”. The term “scientific evidence” implies information or data generated through some sort of scientific research or analysis. “The term ‘best’ explicitly suggests that there is no better scientific information available and implicitly suggests the use of the most relevant and contemporary data and methods.”⁵⁰

⁴⁷ LOS Convention, Article 61(2) and 119(1a).

⁴⁸ Ibid., Article 61(5) and 119(2).

⁴⁹ Ibid., Article 64.

⁵⁰ National Research Council, *Improving the Use of the "Best Scientific Information Available" Standard in Fisheries Management* (Washington, D.C.: National Academy Press, 2004), p42.

In practice, “best” is a relative term and the quality of the information that is the “best” will vary depending on the circumstances. For example, in new fisheries or in developing countries with limited scientific capacity, fisheries data and information could be expected to be of lesser quality than that for established and significant fisheries in a developed country. The term “available” implies that conservation and management measures can be adopted by a State without the State necessarily seeking to obtain new or better information.⁵¹ Thus the phrase best scientific evidence available “acknowledges the existence of scientific uncertainty, a feature of even the most robust biological population assessments, and dictates that prudent management be consistent with the scientific information that is available even though data gaps exist.”⁵²

Contemporary international fisheries law has embraced the principle to base conservation and management measures on the “best scientific evidence available”; however this has not always been the case. Prior to the LOS Convention, the 1958 High Seas Fishing and Conservation Convention required that States use fisheries data and scientific information to prove the necessity of conservation measures in high seas areas, before such measures could be considered applicable to other States.⁵³ Now, following the adoption of the LOS Convention and UN Fish Stocks Agreement, States are obliged to adopt conservation and management measures based on the “best available scientific evidence available” rather than only adopting measures when the data proves that measures are required.

The flexibility that is afforded in the standard of “best scientific evidence available” is an advantage because it acknowledges that inevitably there will be shortfalls in available information and information may not be of the utmost quality. In practice, this standard also takes some of the pressure and some of the burden off fisheries management agencies. Essentially fisheries management agencies are able to adopt conservation and management measures based on the best information that is available to them. Furthermore it is the need for measures, guided by principles of conservation and management and informed by available information, which determines conservation and management measures rather

⁵¹ Ibid.

⁵² Ibid.

⁵³ Convention on the Fishing and the Conservation of the Living Resources of the High Seas, done at Geneva on 29 April 1958, entered into force 20 March 1966, 559 *UNTS* 285.

than the lack of information relative to a standard that ties the agencies hands. Taking fisheries management action in spite of uncertainty is a fundamental principle of the precautionary approach to fisheries management: “States shall be more cautious when information is uncertain, unreliable or inadequate. The absence of scientific information shall not be used as a reason for postponing or failing to take conservation and management measures.”⁵⁴

International legal requirement for States to collect and share fisheries data, through tuna RFMOs

The LOS Convention obliges coastal States and flag States to contribute and exchange “available scientific information, catch and fishing effort statistics and other data relevant to the conservation of fish stocks”, on a regular basis through competent international organisations.⁵⁵ The UN Fish Stocks Agreement recognises that the collection and sharing of data on tuna fisheries, is part of the duty for coastal States and flag States to cooperate for the conservation and management of tuna stocks. To this end the UN Fish Stocks Agreement Article 5(j) sets down as a general principle for the conservation and management of tuna stocks the obligation for coastal States and flag States to “collect and share, in a timely manner, complete and accurate data concerning fishing activities on, inter alia, vessel position, catch of target and non-target species and fishing effort, as set out in Annex I, as well as information from national and international research programmes.” Additionally, Article 10(f) stipulates that one function of tuna RFMOs is to “compile and disseminate accurate and complete statistical data, as described in Annex I, to ensure that the best scientific evidence is available, while maintaining confidentiality where appropriate.”

UN Fish Stocks Agreement Annex I, which was referred to in the provisions of UN Fish Stocks Agreement Articles 5(j) and 10(f), is titled *Standard Requirements for the Collection and Sharing of Data*.⁵⁶ Annex I provides guidance on the minimum standards for fisheries data practices. Importantly for the present analysis, Annex I lists types of fisheries data that States are obliged to provide to a tuna RFMO as well as some descriptors

⁵⁴ UN Fish Stocks Agreement, Article 6(2), Code of Conduct, Article 7.5 Precautionary Approach.

⁵⁵ LOS Convention, Article 61(5) and Article 119(2).

⁵⁶ UN Fish Stocks Agreement Annex I is reproduced herein as Appendix 2.

relating to the minimum data-quality standards for these fisheries data. Also UN Fish Stocks Agreement Article 14 (1) places an additional obligation on flag States to, in accordance with Annex I: a) collect and exchange scientific, technical and statistical data with respect to fisheries for straddling fish stocks and highly migratory fish stocks; b) ensure that data are collected in sufficient detail to facilitate effective stock assessment and are provided in a timely manner to fulfil the requirements of subregional or regional fisheries management organizations and arrangements; and c) take appropriate measures to verify the accuracy of such data.⁵⁷

International legal requirements for tuna RFMOs to specify fisheries data standards

The task of sharing fisheries data is made easier and more effective if the relevant States, and where appropriate the RFMO, collect data according to common definitions, classifications and methodologies and in a pre-agreed, standardized format, so as to enable all data to be more easily combined and compared as required.⁵⁸ To this end, the UN Fish Stocks Agreement sets out some relevant obligations. First, States, in fulfilling their obligation to cooperate through tuna RFMOs are to “agree on standards for collection... of data on fisheries for the stocks.”⁵⁹ Second, UN Fish Stocks Agreement Annex I specifies that “States should compile fishery-related and other supporting scientific data and provide them in an agreed format and in a timely manner to the relevant subregional or regional fisheries management organization or arrangement where one exists.”⁶⁰ Third, flag States are also obliged to cooperate “to agree on the specification of data and the format in which they are to be provided to [tuna RFMOs] taking into account the nature of the stocks and the fisheries for those stocks.”⁶¹ These standards should as a minimum ensure that data are collected “in sufficient detail to facilitate effective stock assessment” and ensure that conservation and management measures are based on the best scientific evidence available.⁶²

⁵⁷ UN Fish Stocks Agreement, Article 14 (1a and b).

⁵⁸ FAO Fishery Resources Division and Fishery Policy and Planning Division, *Fisheries Management*, vol. 4, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 1997), 28-29.

⁵⁹ UN Fish Stocks Agreement, Article 10(e).

⁶⁰ *Ibid.*, Annex I Article 2(c).

⁶¹ *Ibid.*, Article 14(2a).

⁶² *Ibid.*, Article 14(1b) and Annex I Article 3(1).

The practice that most tuna RFMOs have used to implement these obligations has been through a formal decision that specifies the types of and format for States to submit data on tuna fisheries to the relevant tuna RFMO on an annual basis.⁶³ These decisions may be revised from time to time, and they may contain minimum statistical requirements as well as “where possible” or voluntary statistical requirements. Also it is common practice in tuna RFMOs for these decisions to be supplemented on an *ad hoc* basis through adoption of subsequent decisions that specify additional data that States are to provide to tuna RFMOs. The decisions might be binding or voluntary data submission requirements, and normally are for sourcing data that are required by the tuna RFMO to address specific fisheries management concerns.

The practice in the *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT) is an exception. Instead CCSBT specifies the fisheries data that States are to provide to CCSBT on an annual or biennial basis. The annual or biennial fisheries data requirements are determined by the CCSBT Data Exchange Working Group which produces a table of “agreed requirements for data exchange”.⁶⁴ These fisheries data requirements can apply to all contracting Parties, or they might be specific to a particular flag State or fleets.⁶⁵ One advantage of the CCSBT practice, over a single decision for data to be provided which is used in other tuna RFMOs, is that the regular detailed reviews of data requirements on an annual or biennial basis allow the requirements to be tailored to specific circumstances and specific scientific analytical needs. For example, the requirements can be tailored to individual States or fleets depending on either the availability of certain statistics or because more detailed data are required to address specific fisheries management issues. Such practice provides an opportunity for CCSBT to make steady and regular progress on the best scientific evidence available. The disadvantage is the additional complexity arising from multiple formats of data used to

⁶³ IATTC, *Resolution on Data Provision (Resolution C-03-05)*, ICCAT, *Recommendation by ICCAT on Compliance with Statistical Declaration Obligations (Recommendation 05-09)*, IOTC, *Resolution on Mandatory Statistical Requirements for IOTC Members (Resolution 01/05)*.

⁶⁴ At the time of writing the most recent agreed “Data Exchange Requirements” were for 2008 covering 2007 fishing activities for southern bluefin tuna and attached as Annex I to CCSBT, *Report of the Twelfth Meeting of the Scientific Committee, 10-14 September 2007* (Hobart, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2007), Attachment 11 - Report of the Data Exchange Working Group.

⁶⁵ *Ibid.*

submit to the Commission, and time used in reviewing and revising data requirements from year to year; but the CCSBT Secretariat seems to be able to effectively accommodate these.

It is likely that these sorts of detailed annual or biennial discussions are more easily facilitated in CCSBT because of the small-sized membership of CCSBT (six contracting parties and less than five other States as observers or cooperating non-contracting parties) as well as a single tuna species focus. Other tuna RFMOs, which have greater rosters of contracting Parties and with mandates for multiple tuna and billfish species, would probably find such regular negotiations logistically difficult and impractical. However, recently as part of efforts by the *International Commission on Conservation of Atlantic Tunas* (ICCAT) to improve the quality of data on tuna and billfish fisheries, ICCAT has tasked its Standing Committee on Research and Statistics to review gaps in data and provide a comprehensive report on an annual basis of the extent to which missing data have adversely affected the most recent assessment and the consequences of the data deficiencies with respect to formulation of management advice.⁶⁶ ICCAT now requires contracting parties to provide explanations on reporting deficiencies including the reasons underlying the identified gaps, capacity challenges and plans for corrective action.⁶⁷ So perhaps this type of regular accountability, although time-consuming, is the way of the future for tuna RFMOs to ensure that standards for States to provide fisheries data are being adequately met.

UN Fish Stocks Agreement Annex I lists four groups of fisheries data States are to provide to the relevant tuna RFMO.⁶⁸ These are catch and effort data; biological data; vessel and gear data; and data relating to non-target, dependent and associated species. The next section will commence the analysis of the first of four types of data to be submitted by States to tuna RFMOs: catch and effort fisheries data.

⁶⁶ ICCAT, *Recommendation by ICCAT on Compliance with Statistical Declaration Obligations* (Recommendation 05-09).

⁶⁷ Ibid.

⁶⁸ UN Fish Stocks Agreement, Annex I Articles 3 and 4.

2.3 Catch and effort data to be provided to tuna RFMOs

Catch and effort data are the baseline data to be collected for any fishery, including for tuna fisheries. Catch in numbers or weight represents the removal of biomass and individuals from the ecosystem, and is the fundamental impact that fishing has on fish populations.⁶⁹ Catch data are necessary for most stock assessment techniques. Effort in biological assessments is used to estimate fishing mortality. Fishing mortality is a fundamental variable in stock assessments and represents the rate of removal of the stock by fishing.⁷⁰ This section analyses international legal requirements for States to provide catch and effort data to tuna RFMOs. It will comprise two parts: first the international legal requirements for States to provide catch and effort data will be analysed, and second the practices in tuna RFMOs to collect catch and effort data will be examined.

International legal requirements for catch and effort data

The catch and effort data that all States are obliged to collect and make available to the relevant tuna RFMO are listed in the UN Fish Stocks Agreement Annex I Article 3(1). There are five catch and effort data statistics listed: “(a) time series of catch and effort statistics by fishery and fleet; (b) total catch in number, nominal weight,⁷¹ or both, by species (both target and non-target) as is appropriate to each fishery; (c) discard statistics, including estimates where necessary, reported as number or nominal weight by species, as is appropriate to each fishery; (d) effort statistics appropriate to each fishing method; and (e) fishing location, date and time fished and other statistics on fishing operations as appropriate.”⁷² The standard for the provision of these catch and effort statistics by States to the RFMOs is that the data should be “in sufficient detail to facilitate effective stock assessment in accordance with agreed procedures”.⁷³ This standard implies that fisheries data will be used by the tuna RFMO to support scientific analyses of impacts of tuna

⁶⁹ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), p16.

⁷⁰ Ibid., p18.

⁷¹ UN Fish Stocks Agreement, Annex I Article 3(1): “Nominal weight is defined by the Food and Agriculture Organization of the United Nations as the live-weight equivalent of the landings;”

⁷² Ibid., also the list is repeated in IPOA-IUU, para 47(2).

⁷³ UN Fish Stocks Agreement, Annex I Article 3(1): “States shall collect and make available to the relevant subregional or regional fisheries management organization or arrangement the [listed] types of data in sufficient detail to facilitate effective stock assessment in accordance with agreed procedures.”

fishing, including stock assessments. Thus, the choice of tuna stock assessment method, which will be determined by the tuna RFMO taking into account *inter alia* the characteristics of the fisheries and the fish stocks, is relevant to determining the specific fisheries data that are required to be collected from fishing vessels and collected through research programmes. The five types of catch and effort data that States are to provide to tuna RFMOs (listed in UN Fish Stocks Agreement Annex I Article 3(1)) will now be analysed in turn.

Time series of catch and effort statistics by fishery and fleet

Catch data and effort data can together be used to produce the Catch per Unit of Effort (CPUE), or catch rate, which is frequently the single most useful index for long-term monitoring of the fishery.⁷⁴ Examples of commonly expressed CPUE units for tuna fisheries include catch per number of hooks for longline vessels, or catch per set or catch per trip for purse seine vessels. Ideally the time series of catch and effort data will be as long as possible, and preferably from the outset of the fishery so that there is some measure of the impact of fishing on the previously unexploited biomass of a fish stock. CPUE is often used as an index of stock abundance, where some proportional relationship is assumed between the index and stock abundance.⁷⁵ For tuna and billfish fisheries, some caution is required in the use of CPUE, as was stated in the Guidelines for Routine Collection of Capture Fisheries Data: “It may be dangerous to rely on CPUE alone as a stock size index, particularly in pelagic fisheries. It is commonly assumed that the index is proportional to stock size and that the stock size changes according to a particular population model. Verification of these assumptions requires additional data.”⁷⁶ CPUE can be calculated directly from logbook data, when catch is recorded by unit of effort.

⁷⁴ FAO, *Guidelines for the routine collection of capture fishery data*. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382 (Rome: FAO, 1999), p19. CPUE can also be used as an indicator in monitoring economic efficiency. For instance if you have two similar fishing vessels with different crew, but which are fishing at the same time, fishing in the same area for the same target species, but they have different CPUEs. The vessel with the higher CPUE is assumed to be more economically efficient than the vessel with the lower CPUE. Additional data are needed on costs and earning to distinguish causal factors for these differences.

⁷⁵ Ibid.

⁷⁶ Ibid., 19-20. These include changes over time of fishing efficiencies or operational patterns, which will require that the index be adjusted. Routine surveys of gear, such as those obtained from frequent frame surveys, should help to cope with this problem.

However, catch and fishing effort data can sometimes be provided to tuna RFMOs separately and in these instances CPUE is estimated from the available data.⁷⁷

There is an inherent bias in catch and effort data derived from fishing operations, because it is collected non-randomly: data are collected only when fishing occurs. Bias in catch and effort data can also arise as a result of management actions, particularly where fishing practices are made illegal or restricted for example a particular ban on landing of a particular species or size of species may create incentives to misreport or not report catches of that species.⁷⁸ Another example is where catch records are used to determine the size of a fishery licence fee and in such instances there is a very real incentive to underreport catches to reduce the size of the fee paid. There may also be changes over time in fishing efficiencies or fishing operational patterns which will require the CPUE index to be adjusted.⁷⁹

Ideally some form of fishery-independent data, such as stock abundance indices from research vessel surveys, is used as an independent record of CPUE.⁸⁰ However, research vessel surveys for areas as large as the stock range for tuna and other pelagic species are costly and difficult.⁸¹ Tagging studies probably offer the best source of semi-independent fishery data: providing some independent assessment of movement, natural and fishing mortality, growth of the fish and stock structure.⁸² Tagging studies can be designed to address specific uncertainties in knowledge of tuna and tuna fishery interactions, but there will always be a degree of uncertainty that is inherent. So it may be necessary to consider whether the expected reduction in uncertainty from the tagging study will justify the costs associated with it.⁸³ In tuna fisheries, commercial fishery catch and effort data are the most widely available index of stock abundance and fishery-independent data are rarely used to verify the trends in stock abundance indicated by the commercial

⁷⁷ Ibid., p20.

⁷⁸ Ibid., 19-20.

⁷⁹ Ibid.

⁸⁰ Ibid., p73.

⁸¹ Ibid. “Although there are many reasons to prefer a fishery-independent measure of abundance, in practice, most current stock assessments of tunas depend on indices derived from catch and effort data. This is due, in part, to the prohibitively large cost of obtaining measures of abundance that sample adequately the population ranges of tunas and tuna-like fishes. Therefore, statistical methods for standardization have been developed to address such things as spatial structure to the extent that the data allow.”

⁸² FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p20.

⁸³ Ibid.

catch and effort data.⁸⁴ Consequently statistical methods for standardisation of catch and effort data have been developed to account for as much of these sorts of “bias” so that scientific analyses provide better estimates of impacts of fishing.

Total catch in number, nominal weight, or both, by species (both target and non-target) as is appropriate to each fishery

Ideally, catch data will be recorded in categories with as much detail as possible to widen the possible range of assessment methods that can use the catch data.⁸⁵ For example detailed catch data might be categorised by species as well as by size, maturity, location or date/time of the catch. Changes in total catches in a fishery may indicate change in stock status, but catch data on their own do not provide a sufficient indicator of sustainability and additional information on stock status, such as abundance or size composition of landings is required.⁸⁶ For any reliable indication of changes in status of stocks from catch statistics, a long time series of comparable catch data is required.⁸⁷ The primary source of catch data for total landings is logbooks. But sales slips or port sampling data also provide a useful alternative source of total landings. In tuna fisheries, discarding can occur, so catches will not be the same as the live-weight equivalent of the landings and some measure of discards, by record or by estimate will be required. Additionally, total catch includes a best guess of unreported and illegal fishing activities, that by their nature are not covered in either catch or landing reports. For non-target, dependent and associated species catches and interactions, these data can be sourced from logbooks, but these interactions tend to be more reliably accounted for through observer reports because of discards or misidentification.⁸⁸

⁸⁴ Ibid., 19-21. “Fishery-independent surveys, e.g. research-vessel and aerial surveys, do not often provide useful information, mainly because of the characteristics of tunas and tuna-like fishes. The extended range of these populations, even when they aggregate for spawning, means that the surveys can cover only a representative fraction of the total area of distribution. In some cases, they can provide only minimum estimates of abundance. Nevertheless, more recent model developments allow the use of measures of some portions of the stock, such as particular age groups or a specific area. Thus, partial surveys can still be useful.”

⁸⁵ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), p16.

⁸⁶ Ibid.

⁸⁷ Ibid.

⁸⁸ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics. La Jolla, California, USA, 13-16 December 1993, FAO Fisheries Report 500* (Rome: FAO, 1994), p8, T. Lawson, *Observer Coverage Rates and Reliability of CPUE Estimates for Offshore Longliners in Tropical Waters of the Western and Central Pacific Ocean* (Noumea, New Caledonia: Oceanic Fisheries 82

Discard statistics, including estimates where necessary, reported as number or nominal weight by species, as is appropriate to each fishery

Often the catches that are retained in fishing operations are less than the total landings caught, the difference occurs because of discards. Sources for discard estimates can sometimes be through interviews with fishers or by port-sampling. Discard estimates are generally best obtained from on-board observers during fishing trips. The use of on-board observers also has the advantage in that the data are recorded at an operational-level so will provide additional information on vessel operations.⁸⁹

Effort statistics appropriate to each fishing method

Changes in fishing effort may indicate changes in stock status or fishing profitability, but like catch data are difficult to interpret without additional biological, economic and socio-cultural indicators.⁹⁰ For data on fishing effort to be used as an indicator of stock status, data on fishing effort must be standardized to account for changes in the data arising from improvements in fishing efficiency, or from the use of new or altered fishing gear and fishing techniques.⁹¹ Effort data generally for stock assessment methods would require relating the fishing effort measures very closely to specific gear use. For example in longline fisheries the number of hooks set, date, times, position of start set, end set, hook size, bait used and number of hooks between floats. And in purse seine fisheries the date, times, positions of start of set, end set, type of FADs used if any.⁹² Commonly effort data is sourced directly from logbooks.

Programme, Secretariat of the Pacific Community, 2004), B. Molony, "Estimates of the mortality of non-target species with an initial focus on seabirds, turtles and sharks (WCPFC-SC1 Working Paper EB WP-1)," in *1st Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2005). The role of independent observers is discussed in more detail later in this Chapter, under the topic of "additional data for non-target, associated and dependent species" (see section 2.4 *Collection of other data and information*).

⁸⁹ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), p18.

⁹⁰ Ibid.

⁹¹ Sources of information to assist in standardizing fishing effort data are discussed in more detail later in this Chapter, under the topic of "vessel-related gear and information" (see section 2.4 *Collection of other data and information*).

⁹² FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), p19.

Fishing location, date and time fished and other statistics on fishing operations as appropriate

Data on fishing operations describe the composition of fishing fleets and fishing patterns. Fishing gear and techniques require careful monitoring because fishers will continuously improve their gear (fishers are economically motivated so aim to increase their catch rate or minimise their costs of operation, and hence decrease their costs of production).⁹³ The sources for data on fishing operations are wide-ranging and include: logsheets, observer reports, port inspections, and Vessel Monitoring Systems (VMS).

Practices in tuna RFMOs to collect catch and effort data

As was discussed in 2.2 *Analysis of international legal framework for fisheries data* of the present Chapter, most tuna RFMOs have adopted a formal decision that specifies the types of and format for States to submit data on tuna fisheries to the relevant tuna RFMO on an annual basis.⁹⁴ These decisions may be revised from time to time, and they may contain minimum statistical requirements as well as “where possible” or voluntary statistical requirements. In the *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT) the data requirements are agreed and specified, annually or biennially, by committee.⁹⁵

Through these decisions all four tuna RFMOs require States to provide annual catch estimates, which are generally raised or adjusted to account for catches that were unreported.⁹⁶ In terms of the time-series of catch and effort data, in general, tuna RFMOs require in these decisions that States provide aggregated catch and effort data. The exception is the *Inter-American Tropical Tuna Commission* (IATTC) for purse seine

⁹³ Ibid., p20.

⁹⁴ IATTC, *Resolution on Data Provision (Resolution C-03-05)*, IATTC, *Resolution on At-Sea Reporting (Resolution C-03-04)*, ICCAT, *Recommendation by ICCAT on Compliance with Statistical Declaration Obligations (Recommendation 05-09)*, IOTC, *Guide for the preparation of National Reports to IOTC Scientific Committee* [website] (IOTC, June 6, 2007 [cited 5 February 2008]); available from http://www.iotc.org/Common/Template_for_the_presentation_of_National_Reports.pdf, IOTC, *Resolution on Mandatory Statistical Requirements for IOTC Members (Resolution 01/05)*, IOTC, *Resolution on Mandatory Statistical Requirements for IOTC Members (Resolution 01/05)*.

⁹⁵ CCSBT, *Report of the Twelfth Meeting of the Scientific Committee, 10-14 September 2007* (Hobart, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2007), Attachment 11 - Report of the Data Exchange Working Group.

⁹⁶ CCSBT: Total catch (weight and number) by fleet, and total number of boats fishing by fleet and by gear (raised figures); IATTC: Total annual catches, without data on fishing effort. And *where practical* by vessel logbook and unloading records or aggregated data; ICCAT: Nominal Annual Catch by species, region, gear, flag and *where possible* separated between EEZ and high seas; and IOTC: Annual catch by species, for each gear type.

fisheries where data are obtained by the IATTC Secretariat direct from vessels and ports.⁹⁷ The standard for submission of aggregated catch and effort data generally are: (a) surface fisheries (purse seine and pole-and-line) catch and effort data are aggregated by 1-degree latitude by 1-degree longitude by month by the flag State; and (b) longline fisheries catch and effort data are aggregated by 1-degree latitude by 1-degree longitude by month by the flag State. However, the format for these aggregated catch and effort data vary slightly between the tuna RFMOs.⁹⁸

As was discussed previously, the standard for the provision of these catch and effort statistics by States to the RFMOs is that the data should be “in sufficient detail to facilitate effective stock assessment in accordance with agreed procedures”.⁹⁹ Aggregated data at these levels can be used and are used for stock assessments in tuna RFMOs, however “data at finer scales are required for some purposes, such as standardization of effort, studies of the effects of local environment on effort or expected species composition in sets, and analyses of catches and effort on FADs.”¹⁰⁰ This is probably the reason that most tuna RFMOs specify minimum levels of aggregation for catch and effort data, and also specify that catch and effort data in finer levels of aggregation may also be provided to tuna RFMOs.¹⁰¹ Some States will provide data to tuna RFMOs at finer scale than the minimum

⁹⁷ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p44 and p48, *IATTC Data*, [website] (IATTC, 05 September 2007 [cited 29 January 2008]); available from <http://www.iattc.org/DataENG.htm>.

⁹⁸ CCSBT: Catch (weight and number) and effort data is to be provided as either shot-by-shot or as aggregated data. The maximum level of aggregation is 5° x 5° (longline fishery) and 1° x 1° (surface fishery); IATTC: *Where practical* by vessel logbook and unloading records and otherwise 5° x 5°, by month, by species with information on gear configuration and target species Or whenever possible 1° x 1°, by month by species with information on gear configuration and target species Or whenever possible set-by-set, logbook data with information on gear configuration and target species: ICCAT: Catch and fishing effort for each species by 5° x 5° (longline fishery) and 1° x 1° (surface fishery), by gear, flag and month; IOTC: Catch weight and fishing days, 1° x 1°, by month, stratified by type of school (surface fishery) and Catch numbers and weight, 5° x 5°, by month, stratified by number of hooks.

⁹⁹ UN Fish Stocks Agreement, Annex I Article 3 (1): The preamble states that “States shall collect and make available to the relevant subregional or regional fisheries management organization or arrangement the [listed] types of data in sufficient detail to facilitate effective stock assessment in accordance with agreed procedures.”

¹⁰⁰ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p48.

¹⁰¹ For example: CCSBT: Catch (weight and number) and effort data is to be provided as either shot-by-shot or as aggregated data. The maximum level of aggregation is 5° x 5° (longline fishery) and 1° x 1° (surface fishery); IATTC: *Where practical* by vessel logbook and unloading records and otherwise 5° x 5°, by month, by species with information on gear configuration and target species Or whenever possible 1° x 1°, by month by species with information on gear configuration and target species Or whenever possible set-by-set, logbook

level of aggregation for stock assessments purposes.¹⁰² This is likely to be because it is recognised that lack of access to fine scale data “may significantly hamper the ability of the [tuna RFMOs] to reduce uncertainty in their findings.”¹⁰³

Requirements for timely submission of fisheries data

Tuna RFMOs need to specify, in decisions specifying the fisheries data that States are to provide, deadlines for the submission of that data, because effective fisheries management requires reliable and up-to-date data and information. Ideally, fisheries managers would want to have stock assessments conducted annually so that management options can be regularly and frequently reviewed.¹⁰⁴ The 1993 *Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics* stated that “The timely provision of data is necessary for assessing the status of fisheries resources and for determining the adoption of appropriate management measures.”¹⁰⁵ The Code of Conduct also supports the timely distribution of data as a necessary part of effective fisheries management: “States should ensure that timely, complete and reliable statistics on catch and fishing effort are collected and maintained in accordance with applicable international standards and practices and in sufficient detail to allow sound statistical analysis.”¹⁰⁶

The UN Fish Stocks Agreement obliges States to collect and share data on tuna fisheries “in a timely manner”.¹⁰⁷ This is a significant advance on the LOS Convention obligation to contribute and exchange data “on a regular basis”.¹⁰⁸ Further for flag States UN Fish Stocks Agreement Article 14 (1b) obliges flag States to ensure that data are “provided in a timely manner to fulfil the requirements of subregional or regional fisheries management organisations or arrangements”.¹⁰⁹ Similarly the UN Fish Stocks Agreement

data with information on gear configuration and target species; and ICCAT: Catch and fishing effort for each species by 5° x 5° (longline fishery) and 1° x 1° (surface fishery), by gear, flag and month.

¹⁰² FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p49.

¹⁰³ Ibid.

¹⁰⁴ FAO Fishery Resources Division and Fishery Policy and Planning Division, *Fisheries Management*, vol. 4, FAO Technical Guideline for Responsible Fisheries (Rome: FAO, 1997), p29 section 2.1.4

¹⁰⁵ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics. La Jolla, California, USA, 13-16 December 1993*, FAO Fisheries Report 500 (Rome: FAO, 1994), p11, para 42.

¹⁰⁶ Code of Conduct, Article 7.4.4.

¹⁰⁷ UN Fish Stocks Agreement, Article 5(j), Article 14(1b), Annex I Article 1(1), Annex I Article 2(c).

¹⁰⁸ LOS Convention, Article 61(5) and Article 119(2).

¹⁰⁹ UN Fish Stocks Agreement, Article 14(1b).

Annex I Article 5 obliges States to ensure that vessels flying their flag send logbooks to its national fisheries administration “at sufficiently frequent intervals to meet national requirements and regional and international obligations.”¹¹⁰ But just what length of time is considered “timely”? The US National Research Council determined that there were two aspects to timeliness: “First, timeliness refers to the acquisition of data in such a manner that sufficient time exists to analyze it adequately before it is used to make management decisions. Second, timeliness refers to whether the data are applicable to the current situation. Management decisions should give greatest weight to the most recent, reliable data available.”¹¹¹ So, *in a timely manner* means the data are collected from fishing vessels and then are shared with other States whilst allowing sufficient time for the data to be analysed and provided to fisheries managers while the information is still current and relevant. Tuna RFMO decisions requiring that States provide fisheries data should *inter alia* specify a deadline for submission.

All the tuna RFMOs have annual deadlines for the submission of their standard catch and effort and size composition data on tuna fisheries, with deadlines for the previous year’s data which range from the end of April to end of July.¹¹² The exception is in *Indian Ocean Tuna Commission (IOTC)*, which has a separate specific deadline for high seas longline vessels to submit provisional aggregated catch and effort figures by 30 June, and final figures by end of December.¹¹³ A possible reason for the different deadline is that the operational characteristics of longline fisheries. For example larger, high-seas longline vessels use freezer systems for catch preservation so are capable of staying at sea for long continuous periods. The delays in these vessels returning to port, may result in considerable delays in the submission of logbooks to national authorities. Consequently,

¹¹⁰ Ibid., Annex I Article 5.

¹¹¹ National Research Council, *Improving the Use of the "Best Scientific Information Available" Standard in Fisheries Management* (Washington, D.C.: National Academy Press, 2004), p55.

¹¹² Sources: CCSBT, *Report of the Twelfth Meeting of the Scientific Committee, 10-14 September 2007* (Hobart, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2007), Attachment 11. general deadline of 30 April, but alternative deadlines may be set for specific data sets, IATTC, *Resolution on Data Provision (Resolution C-03-05)*. deadline of 30 June, ICCAT, *Recommendation by ICCAT on Compliance with Statistical Declaration Obligations (Recommendation 05-09)*. deadline of 31 July, IOTC, *Resolution on Mandatory Statistical Requirements for IOTC Members (Resolution 01/05)*. deadline for fisheries data for surface fisheries is 30 June and high seas longline data is 30 June (provisional) and 30 December (Final)

¹¹³ IOTC, *Resolution on Mandatory Statistical Requirements for IOTC Members (Resolution 01/05)*.

there may be delays of up to two years in provision of aggregated data to the IOTC.¹¹⁴ However, this is not a valid excuse in contemporary times given that it is now technologically feasible to submit catch and effort data to national authorities electronically. For example, IATTC has in place submission of weekly catch reports by on-board observers for purse seine vessels to allow the IATTC Secretariat to closely monitor dolphin mortalities as well as catch of target tunas.¹¹⁵ Also more specifically, States are required to report monthly catches of longline-caught bigeye tuna to the IATTC Secretariat.¹¹⁶ Delays in submission of logbooks by vessels at sea for long periods, increases the reliance for verification of landings and transshipments.¹¹⁷

Collection of logbook data from fishing vessels

Logbooks are a key source for all five types of catch and effort data that are listed in UN Fish Stocks Agreement Annex I Article 3(1). Logbooks record catch and effort data on a per-trip or a per-set basis. Logbooks should compile information on the gear configuration on each set of the gear (for longlines) and for the trip (for purse seine and pole-and-line).¹¹⁸ Purse seine logbook data provides information on individual sets, including position, times of initiation and completion of the set, type of set (fish aggregating device (FAD) use, or unassociated), use of aircraft, estimated catch by species or size-based species aggregates, wells in which the fish were stored etc.¹¹⁹ Longline logbook data provide information by individual set, including positions at the start and end of the set, and retained catches by species, in weight and/or numbers of fish.¹²⁰ They may provide data on species that are discarded at sea. Some logbooks may also include data on gear configuration, construction

¹¹⁴ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p45.

¹¹⁵ IATTC, *Resolution on At-Sea Reporting (Resolution C-03-04)*.

¹¹⁶ IATTC, *Resolution for a program on the Conservation of Tuna in the Eastern Pacific Ocean for 2007 (Resolution C-06-02)*.

¹¹⁷ See Chapter 3 3.2 *Verifying data on tuna fisheries*.

¹¹⁸ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p54. "A non-exhaustive list of the kinds of data which should be obtained in association with nominal fishing effort data includes gear specifications, gear construction materials, other auxiliary equipment and gears used, school type, times and positions for starting and ending fishing operations, bait used, use of supply vessels, including transfer dates and amounts, use of oceanographic data obtained directly from satellite or from companies providing current oceanographic and/or weather data, use of aircraft, and use of FADs."

¹¹⁹ *Ibid.*, p44.

¹²⁰ *Ibid.*, p45.

materials, bait and the species at which the fishery was directed.¹²¹ Pole-and-line logbook data provide information such as locations, dates, catches by species, types of schools, nominal fishing effort, and bait.¹²²

Coastal States and flag States must have access to the data necessary for them to collect and share catch and effort data on tuna fisheries through the relevant RFMO. The furnishing of catch and effort logsheets to a national authority should be a standard condition placed on the issuance of an authorisation to fish, to a fishing vessel by a State.¹²³ Flag States are obliged to ensure that fishing vessels flying their flag provide logbooks in a timely manner, so that the flag State can meet its international and regional obligations, were discussed in the previous section.¹²⁴ The FAO Compliance Agreement and Code of Conduct contain similar provisions in support of this obligation.¹²⁵ Flag States are also encouraged to ensure that data on fishing activities by each vessel, such as would be collected on a logbook, is collected according to the operational characteristics of each fishing method and in sufficient detail to facilitate effective stock assessment.¹²⁶

Coastal States, in the exercise of their sovereign rights can require the furnishing of logbook catch and effort data by fishing vessels, including foreign fishing vessels, operating in the EEZ of that coastal State, as a term and condition of fishing access.¹²⁷ Of course illegal, unreported and unregulated fishing activities by their nature, particularly unreported fishing, do not tend to furnish catch and effort logsheets to either national or regional fisheries authorities.¹²⁸

¹²¹ Ibid.

¹²² Ibid., p46.

¹²³ IPOA-IUU, paras 47(5) and 51 (5).

¹²⁴ UN Fish Stocks Agreement, Article 14(1) and Annex I Article 5.

¹²⁵ Additionally FAO Compliance Agreement, Article III(7) “Each Party shall ensure that each fishing vessel entitled to fly its flag shall provide it with such information on its operations as may be necessary to enable to Party to fulfil its obligations under this Agreement, including in particular information pertaining to the area of its fishing operations and to its catches and landings.” Also Code of Conduct for Responsible Fisheries, Article 6.11 “States should also ensure that vessels flying their flag fulfil their obligations concerning the collection and provision of data relating to their fishing activities.”

¹²⁶ UN Fish Stocks Agreement, Annex I Article 2(a).

¹²⁷ LOS Convention, Article 62(4 (a, c and e)) enables a coastal State to adopt terms and conditions on fishing in the EEZ applicable to nationals of other States fishing in the EEZ of that coastal State. These include inter alia “licensing of fishermen, fishing vessels and equipment, including payment of fees and other forms of remuneration...”, ‘regulating seasons and areas of fishing, the types, sizes and amount of gear, and the types, sizes and number of fishing vessels that may be used’ and ‘specifying information required of fishing vessels including catch and effort statistics and vessel position reports.’

¹²⁸ IPOA-IUU, paras 47(5) and 51(5).

Some other supporting sources, in addition to catch and effort logbooks, for the five types of catch and effort data listed in UN Fish Stocks Agreement Annex I Article 3(1) include: independent observer data, landing, sales slips and port sampling data, tagging data, and VMS data. These sources for catch and effort data are also used to support scientific analyses of impacts of fishing.

2.4 Collection of other data and information by tuna RFMOs

This section analyses the international legal requirements for the other types of data and information that tuna RFMOs require to support scientific analyses of impacts of fishing. It will comprise three parts: first, biological data and research information to support stock assessment; second, vessel-related data and information; and third, data for analyses of impacts of fishing on non-target, dependent and associated species.

International legal requirements for biological data and research information to be provided to tuna RFMOs to support stock assessment

As was discussed in Chapter 1 (*1.1 Tuna and billfish species*), the species of principal market tunas, bluefins and billfishes have different growth rates, depth and temperature distribution in the water column, longevity and maturity characteristics. Information on the basic biology and life history specific to individual species or stocks are essential for stock assessment; they help to make the stock assessment models behave in a more realistic way. A non-exhaustive list of these information include: length and weight relationships, including natural mortality by size; size composition of catch and discards, to improve understanding of the selectivity of fishing gear; any differences in age and growth between the sexes; age and maturity composition, which provide an indication on growth of the species; other biological parameters and research (tagging experiments, surveys of abundance, biomass surveys, ecological data, hydro-acoustic surveys, research on environmental factors affecting stock abundance, oceanographic data); and stock structure and movement.¹²⁹ The relationship between the environment and the abundance of recruits

¹²⁹ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics*. La Jolla, California, USA, 13-16 December 1993, FAO Fisheries Report 500 (Rome: FAO, 1994), p8

and fish behaviour may also be useful. And as was discussed previously (2.3 *Catch and effort data to be provided to tuna RFMOs*) tagging studies can assist greatly in understanding fish movements and newer satellite and acoustic tags provide promise for better understanding fish behaviour, growth and movements.

It should be noted that UN Fish Stocks Agreement Article 5(j) and Article 14(1a) oblige coastal States and flag States, in fulfilling their duty to cooperate for conservation and management of tuna stocks, to collect and share data on tuna fisheries as set out in Annex I. Article 3(2) of Annex I recommends a list of three types of biological data and research information that should be collected by coastal States and flag States “where appropriate”, and provided to the relevant tuna RFMO to support stock assessment.¹³⁰ These are: (a) composition of the catch according to length, weight and sex; (b) other biological information supporting stock assessments, such as information on age, growth, recruitment, distribution and stock identity; and (c) other relevant research, including surveys of abundance, biomass surveys, hydro-acoustic surveys, research on environmental factors affecting stock abundance, and oceanographic and ecological studies.¹³¹ The phrase “where appropriate” in Annex I Article 3(2) implies that States are obliged to collect and contribute this information to the relevant tuna RFMO if it is relevant to support stock assessment. This international legal requirement is not specific about target or non-target species, therefore the assumption is that it refers to both.¹³² The possible sources for each of these biological data and other research information, listed in UN Fish Stocks Agreement Annex I Article 3(2) will now be analysed in turn.

Composition of the catch according to length, weight and sex

Data on composition of the catch (by weight, length and sex) provides information on the nature of the impact on target and non-target stocks of different fleets, methods and operations within a fishery. This can be used to infer changes in the stock structure over time, and whether it is likely that current levels of catch will lead to recruitment failure in the later years. For example if too many larger older fish are being caught, or if too many

¹³⁰ UN Fish Stocks Agreement, Annex I Article 3(2).

¹³¹ Ibid.,

¹³² There are substantive obligations with respect to data collection programmes for non-target species, and will be discussed later in the present section.

fish are caught before maturity there may not be enough spawners to sustain the population into future years.

Availability of catch composition data for use in scientific analyses could enable more complex analytical models to be used in stock assessment analyses. In the stock assessment process there are two main categories of models that are used. First, holistic or production models are simpler and consider that a fish stock is a homogeneous biomass, and thus use fewer population parameters than the analytic models.¹³³ In particular, production models use only two trains of annual information; fishing effort and total yield, generalizations are made as to the overall behaviour of the population, and generally the biological processes going on within it are unknown.¹³⁴ “Production models have a long history of application in tuna fisheries, primarily because they typically require only catch and effort data and because of the easy translation of its parameters into quantities relevant to management. Some of the first tuna stock assessments were done using these models.”¹³⁵ Second, are analytical models. Analytical models are used where processes of growth, reproduction and death, subscripted by age, are assumed to be understood and the relevant rates at which they occur are known.¹³⁶ The types of data required for analytical models, in addition to information on the catches of the different fisheries involved, include data on the size composition of the catch, a conversion factor for the size data to age data, and one or more indices of abundance (such as catch per unit of effort or CPUE).¹³⁷

¹³³ One of the simplest stock assessment models is the Surplus Production Model or a Biomass Dynamic Model. Such models use catch per unit effort (eg catch per number of hooks used) as the primary input and assumes catch per unit effort to be proportional to biomass of the stock in the sea. For more information on surplus production models see R. Hilborn and C. J. Walters, *Quantitative Fisheries Stock Assessment: Choice, Dynamics and Uncertainty* (New York: Chapman and Hall, 1992), 297-329, P. Sparre and S. C. Venema, *Introduction to tropical fish stock assessment. Part 1. Manual, FAO Fisheries Technical Paper 306.1 Rev 2* (Rome: FAO, 1998), 279-297.

¹³⁴ J. F. Caddy and R. Mahon, *Reference Points for Fisheries Management, FAO Fisheries Technical Paper 347* (Rome: FAO, 1995), Annex 1 p76.

¹³⁵ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries, FAO Fisheries Circular 963* (Rome: FAO, 2001), p18.

¹³⁶ J. F. Caddy and R. Mahon, *Reference Points for Fisheries Management, FAO Fisheries Technical Paper 347* (Rome: FAO, 1995), Annex 1 p76. The types of analytical models generally are the many variants of yield per recruit analyses, yield per spawning stock size and virtual population analysis models (VPA). For more detail on the range and details of analytical methods see R. Hilborn and C. J. Walters, *Quantitative Fisheries Stock Assessment: Choice, Dynamics and Uncertainty* (New York: Chapman and Hall, 1992), P. Sparre and S. C. Venema, *Introduction to tropical fish stock assessment. Part 1. Manual, FAO Fisheries Technical Paper 306.1 Rev 2* (Rome: FAO, 1998).

¹³⁷ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries, FAO Fisheries Circular 963* (Rome: FAO, 2001), p19.

Analytical models are based on more detailed description of the stock, particularly the age and size composition of the stock, and they are more demanding in terms of quality and quantity of the input data. In general, more detailed analyses are possible with analytical models, consequently where possible more sophisticated analytical models are preferred because they are believed to generally give more reliable predictions relative to production models.¹³⁸

Catch composition data can be sourced, for some fisheries such as longline fisheries, from many of the same sources used to collect catch and effort data including logsheets, observer programmes, port sampling programmes and possibly landing slips.¹³⁹ However, for larger high-seas longline fisheries, port-sampling programs are of limited value because the vessels make trips of long duration, and frequently the nature of the operations involves transshipment of catches at sea, which adds further uncertainty to identification of the area-time strata for catches.¹⁴⁰ Often longline catches are dressed at sea, which for tuna usually involves removal of the gills, internal organs and some fins, while for smaller billfishes will be removal of the head, and larger billfish will be filleted at sea.¹⁴¹ For sharks, in many cases only the fins are retained.¹⁴² Therefore conversion factors must be estimated and provided to convert landed weights with undressed weights, so that total catch can be estimated.¹⁴³

For fisheries such as purse seine with large quantities of fish taken in one haul, measuring each single fish in the catch would be very time consuming and in such circumstances specialist sampling programmes either by observers or port samplers are required to estimate these parameters.¹⁴⁴ In meeting this obligation, States would need to consider that undertaking regular catch composition programmes can be laborious and

¹³⁸ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries, FAO Fisheries Circular 963* (Rome: FAO, 2001), p19. Predictions from analytical models are presumed to be more reliable in part because the simplicity of the production models comes at the price of more restrictive structural assumptions in the model.

¹³⁹ UN Fish Stocks Agreement, Annex I Article 3(2a).

¹⁴⁰ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries, FAO Fisheries Circular 963* (Rome: FAO, 2001), p46.

¹⁴¹ Ibid.

¹⁴² Ibid.

¹⁴³ Ibid.

¹⁴⁴ Ibid., p44.

create extra costs. The catch composition of landings in purse seine fisheries are estimated by port sampling, although some limited data on size are collected by observers.¹⁴⁵ As was discussed previously, observers are often the only source for data on discards of tuna at sea using purse seine gear.¹⁴⁶ For pole and line fisheries, catches are often categorised in logbooks by size rather than by species, however and in such cases, port sampling must be conducted to establish species and size compositions.¹⁴⁷

All tuna RFMOs require States to provide some catch composition data.¹⁴⁸ Most of the requirements are voluntary requirements that are to be provided “where possible”.¹⁴⁹ The practices in tuna RFMOs meet the international legal requirements of UN Fish Stocks Agreement Annex I Article 3(2). The remaining two types of biological data that are listed in UN Fish Stocks Agreement Annex I Article 3(2) will now be analysed.

Biological information to support stock assessment and other relevant research

Basic biological information on the characteristics of tuna and billfish species is also essential for stock assessment, and must be sourced from specific research programs. The age, growth and maturity relationship is the basic information, from which catch composition data analyses discussed above draw on. Age, growth and maturity studies commonly use otolith rings or scale rings, although tagging studies and length frequency analyses can also be used.¹⁵⁰ Recruitment information is important for providing an indication of the likely quantity of young fish entering into the fishery. Recruitment

¹⁴⁵ Ibid.

¹⁴⁶ Ibid., p45.

¹⁴⁷ Ibid., p46.

¹⁴⁸ CCSBT, *Report of the Twelfth Meeting of the Scientific Committee, 10-14 September 2007* (Hobart, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2007), Attachment 11 - Report of the Data Exchange Working Group, IATTC, *Resolution on Data Provision (Resolution C-03-05)*, ICCAT, *Recommendation by ICCAT on Compliance with Statistical Declaration Obligations (Recommendation 05-09)*, IOTC, *Resolution on Mandatory Statistical Requirements for IOTC Members (Resolution 01/05)*.

¹⁴⁹ CCSBT: Raised size composition data should be provided at an aggregation of year, month, fleet, gear and 50 x 50 to where possible to the finest size class; IATTC: *Whenever possible* length or weight of individual fish by grid position, best possible spatial-temporal resolution of area of capture. Also set position, start or end of set; ICCAT: Task II: Size frequencies for each species by 5° x 5° (longline fishery) and 1° x 1° (surface fishery), by gear, flag and month. Also catch at size data for bluefin, albacore, yellowfin, bigeye and skipjack and swordfish; IOTC: Length data by 5° x 5°, by month, stratified by gear and fishing mode (for purse seine and type of school). Also total number of fish measured. For all species covered by IOTC.

¹⁵⁰ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), p25, M. G. King, *Fisheries Biology, Assessment and Management*, 2nd ed. (Oxford, United Kingdom: Blackwell Publishing, 2007), 189-211.

information can be collected from direct spawning surveys or inferred from environmental variables.¹⁵¹

Information on the distribution and stock identity is important because a *stock* refers to a “sub-set of one species having the same growth and mortality parameters, and inhabiting a particular geographic area.”¹⁵² Generally it is preferable that fish stock assessments are conducted over the entire distribution of the stock, and therefore where possible data should be collected over this range. There is a body of literature discussing varying points of view of the most reliable way to test a stock’s identity, but some commonly used methods include genetic studies and sometimes through morphometric variables.¹⁵³

Ecological studies are important to understand the impact of fishing on the broader ecosystem.¹⁵⁴ The undertaking of such studies is the backbone for the application of an ecosystem approach to fisheries management. The principles of the ecosystem approach to fisheries management are widely recognized as fundamental principles in the Code of Conduct for Responsible Fisheries and all other key international instruments adopted over the last two decades.¹⁵⁵ Ecological studies are commonly undertaken based on trophic studies (stomach content analyses) as well as through analysis of observer data.¹⁵⁶ Oceanographic studies are important to understand the impact that the environment has or could potentially have in the future on recruitment and fish behaviour and distribution. Often these sorts of studies and research on biology of tuna and billfish and the surrounding environment and ecology, are undertaken on an *ad hoc* basis by scientific agencies or

¹⁵¹ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), p25, M. G. King, *Fisheries Biology, Assessment and Management*, 2nd ed. (Oxford, United Kingdom: Blackwell Publishing, 2007), 219-222.

¹⁵² P. Sparre and S. C. Venema, *Introduction to tropical fish stock assessment. Part 1. Manual, FAO Fisheries Technical Paper 306.1 Rev 2* (Rome: FAO, 1998), p2.

¹⁵³ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), p25.

¹⁵⁴ The international legal requirements for data on non-target, associated and dependent species will be discussed later in this section of the present Chapter.

¹⁵⁵ FAO Fisheries Department, *Fisheries Management: The ecosystem approach to fisheries*, vol. 4 Suppl. 2, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 2003).

¹⁵⁶ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), 26-27.

universities as a contribution to improve and expand scientific knowledge.¹⁵⁷ The quality of the data from biological and scientific research studies has been described in general as acceptable: “In general, the objectives of these experiments have been well considered, the experimental designs have been good, and data obtained have been of good quality. These studies have included research on morphology, physiology, behaviour, feeding, reproduction, age and growth mortality, movements, and stock structure.”¹⁵⁸ However information on rates of natural mortality is still poorly estimated and this information remains a significant uncertainty in stock assessment analyses for tunas and billfishes.¹⁵⁹ Also the findings of studies on tuna and billfish from one part of the world can with some caution be applied to other regions. It should be noted that research studies like these may take many years. However it is important that should an important gap in knowledge arises that is pertinent to improving certainty in scientific advice for tuna conservation and management, that consistent with the precautionary approach, States either individually or collaboratively, would be obliged to make efforts for appropriate scientific research to be undertaken. This is emphasised in the language of UN Fish Stocks Agreement Annex I Article 3(2b and c) “shall also collect where appropriate and provide to the relevant [tuna RFMO] to support stock assessment.”

Specifically in regard to tagging studies, fairly extensive conventional tagging programs have been conducted for the principal market tunas in the Atlantic and Pacific Oceans.¹⁶⁰ However it was not until recently that a large-scale regional tagging study had been undertaken for the Indian Ocean by IOTC. This commenced in 2005 with a focus on the western Indian Ocean. Field work was anticipated to conclude in August 2007.¹⁶¹ The quality of the data from tagging studies has been described as acceptable: “The release data for conventional tagging studies are generally considered very good, but some of the recapture data maybe considered unreliable. Fortunately, however it usually fairly easy to

¹⁵⁷ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p47.

¹⁵⁸ Ibid.

¹⁵⁹ A. Lewis, Fisheries Consultant, Personal Communication by Email, Sat, 16 Feb 2008.

¹⁶⁰ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p47.

¹⁶¹ *Regional Tuna Tagging Project - Indian Ocean*, [website] (IOTC, [cited 3 February 2008]); available from <http://www.rtp.io.org/en/>, "Report of the Joint Meeting of Tuna RFMOs", (paper presented at the Joint Meeting of Tuna RFMOs, January 22-26, Kobe, Japan, 2007), Appendix 11.

tell which data are reliable and which are not, and the unreliable data (or outliers) often are excluded in the process of analysing the data.¹⁶²

International legal requirements for vessel-related data and information

Of relevance to scientific analyses of impacts of fishing, is the fact that the fishing industry continually seeks increased efficiency, incorporating developments in materials, technology, vessel and equipment design, fishing and fish handling techniques, and fish transport.¹⁶³ Vessel-related data can be used to monitor these changes in effort, and therefore to standardize the effort used in effort time series for stock assessments. One source for relevant vessel and gear data is from national records of fishing vessels. A *record of fishing vessels* is defined in the FAO Compliance Agreement as “a record of fishing vessels in which are recorded pertinent details of the fishing vessel. It may constitute a separate record for fishing vessels or form part of a general record of vessels.”¹⁶⁴

Flag States are obliged under UN Fish Stocks Agreement to maintain a national record of fishing vessels that are authorised to fish on the high seas and to share that information as appropriate.¹⁶⁵ But, as referenced in the IPOA-IUU, the detail of what data would comprise such a national record of fishing vessels can be found in the FAO Compliance Agreement.¹⁶⁶ The FAO Compliance Agreement further describes in Article VI the minimum information that should be included in a “national record of fishing

¹⁶² FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p47.

¹⁶³ Ibid., p48.

¹⁶⁴ FAO Compliance Agreement, Article I(d).

¹⁶⁵ UN Fish Stocks Agreement, Article 18(3c). Measures to be taken by a flag State in respect of vessels flying its flag shall include: “establishment of a national record of fishing vessel authorised to fish on the high seas and provision of access to the information contained in that record on request by directly interested States, taking into account any national laws of the flag State regarding the release of such information.” A similar obligation regarding the establishment of a national record of fishing vessels by flag States can be found in the FAO Compliance Agreement, Article IV: “Each Party shall, for the purposes of this Agreement, maintain a record of fishing vessels entitled to fly its flag and authorized to be used for fishing on the high seas, and shall take such measures as may be necessary to ensure that all such fishing vessels are entered in that record” Also see Code of Conduct for Responsible Fisheries, Article 8.1.2 (all States) and Article 8.21 (flag States), IPOA-IUU, para 24(2).

¹⁶⁶ IPOA-IUU, para 43. The IPOA-IUU calls on each flag State to maintain a record of fishing vessels entitled to fly its flag. For vessels authorised to fish on the high seas the record should include all the information in Article VI of the FAO Compliance Agreement and some additional information including *inter alia* details of the persons responsible for the fishing vessels beneficial ownership and ownership history of the fishing vessel.

vessels authorised to fish on the high seas” and made available to FAO by flag State Parties to the FAO Compliance Agreement.¹⁶⁷ The data that must be made available to FAO are: “Name of fishing vessel, registration number, previous names (if known), and port of registry; Previous flag (if any); International Radio Call Sign (if any); Name and address of owner or owners; Where and when built; Type of vessel; Length.”¹⁶⁸ The following types of data should be made available to FAO to the extent practicable: “Name and address of operator (manager) or operators (managers) (if any); type of fishing method or methods; moulded depth; beam; gross registered tonnage; power of main engine or engines.”¹⁶⁹

The UN Fish Stocks Agreement Annex I Article 4 lists vessel-related data and information that States should provide to tuna RFMOs to support analyses of impacts of fishing.¹⁷⁰ The types of vessel data and information listed in UN Fish Stocks Agreement Annex I Article 4 could be sourced by States from national vessel registers established pursuant to Article VI of the FAO Compliance Agreement. Alternatively they might also be sourced from the more general list required to be maintained by the LOS Convention.¹⁷¹

All tuna RFMOs have decisions that specify the data that States are to provide from

¹⁶⁷ FAO Compliance Agreement, Article VI. The IPOA-IUU, para 28(1) says that States should exchange such data with other States subject to any confidentiality requirements.

¹⁶⁸ FAO Compliance Agreement, Article VI(1).

¹⁶⁹ Ibid., Article VI(2).

¹⁷⁰ UN Fish Stocks Agreement, Annex I Article 4 “1. States should collect the following types of vessel-related data for standardizing fleet composition and vessel fishing power and for converting between different measures of effort in the analysis of catch and effort data: (a) vessel identification, flag and port of registry; (b) vessel type; (c) vessel specifications (e.g., material of construction, date built, registered length, gross registered tonnage, power of main engines, hold capacity and catch storage methods); and (d) fishing gear description (e.g., types, gear specifications and quantity).

2. The flag State will collect the following information: (a) navigation and position fixing aids; (b) communication equipment and international radio call sign; and (c) crew size.”

A similar list of data was recommended by the FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics. La Jolla, California, USA, 13-16 December 1993, FAO Fisheries Report 500* (Rome: FAO, 1994), p8, for purposes of fisheries management and verification of catch and effort data on the high seas. This list was: “(a) essential items for all vessels fishing on the high seas regardless of size: Name of fishing vessel, registration number, previous names (if known) and port of registry; previous flag (if any); International Radio Call Sign (if any); name and address of owner or owners; where and when built; type of vessel; length; and (b) to the extent practicable: name and address of operator/s (manager/s) (if any); type of fishing method or methods; moulded depth; beam; gross registered tonnage; power of main engine/s; fish preservation method; hold capacity; rated speed; vessel marking.”

¹⁷¹ LOS Convention, Article 94(2a) requires flag States to “maintain a register of ships containing the names and particular of ships flying its flag, except those which are excluded from generally accepted international regulations on account of their small size.”

Code of Conduct, Articles 8.1(2 and 3): Duties of all States: “States should maintain a record, updated at regular intervals, on all authorizations to fish issued by them. States should maintain, in accordance with recognized international standards and practices, statistical data, updated at regular intervals, on all fishing operations allowed by them.”

their national record of fishing vessels.¹⁷² Tuna RFMOs compile these data and information in tuna RFMO specific list of vessels authorised to fish, so called positive lists. The coverage of fishing vessels by each tuna RFMOs record of vessels authorised to fish varies from all sized fishing vessels that fish beyond the flag States area of national jurisdiction, to fishing vessels greater than 24 m length.¹⁷³ There are large similarities in the information to be provided to each tuna RFMO, and putting aside the fact that some tuna RFMO lists have partial coverage of the fleets, the tuna RFMO practices meet the requirements of UN Fish Stocks Agreement Annex I Article 4(1) and FAO Compliance Agreement Article VI.¹⁷⁴ However, tuna RFMO vessel record practices do not meet all of the data requirements of UN Fish Stocks Agreement Annex I Article 4(2) nor the additional information to that listed in FAO Compliance Agreement Article VI which the IPOA-IUU recommends also be collected.¹⁷⁵ Additionally the gathering of these information by tuna

¹⁷² CCSBT, *Resolution on amendment of the Resolution on “Illegal, Unregulated and Unreported (IUU) and Establishment of a CCSBT Record of Fishing Vessels over 24 meters Authorised to Fish for Southern Bluefin Tuna” adopted at the CCSBT11 19-22 October 2004*, IATTC, *Resolution on a Regional Vessel Register (Resolution C-00-06)*, ICCAT, *Recommendation by ICCAT concerning the establishment of an ICCAT record of vessels over 24 meters authorised to operate in the Convention Area (Recommendation 02-22)*, IOTC, *Resolution Concerning the Establishment of an IOTC Record of Vessels Authorised to Operated in the IOTC Area (Resolution 07/02)*.

¹⁷³ CCSBT: All vessels that fish for southern bluefin tuna (original resolution was greater than 24 m, but amended in 2003 to also cover vessels less than 24 m); IATTC: All vessels authorised to fish in the IATTC Convention Area for species under the purview of IATTC. IATTC also has specific positive lists for active purse seine vessels authorised to fish and authorised longline vessels greater than 24 m length (IATTC, *Resolution on the Capacity of the Tuna Fleet Operating in the Eastern Pacific Ocean (Revised) (Resolution C-02-03)*, IATTC, *Resolution on the Establishment of a List of Longline Fishing Vessels over 24 Meters (LSTLFVs) Authorised to Operate in the Eastern Pacific Ocean (Resolution C-03-07)*.); ICCAT: Limited to vessels larger than 24 m; IOTC: Vessels larger than 24 m length overall, or in case of those less than 24m, operating in waters outside the EEZ of the flag State.

¹⁷⁴ All tuna RFMOs require that States provide the following information on fishing vessels: Name of vessel(s), register number(s); Previous name(s) (if any); Previous flag(s) (if any); Name and address of owner(s) and operator(s); International call sign(s) (if any); and Gross registered tonnage (GRT).

There are requirements that are unique to one or more tuna RFMOs:

CCSBT: Previous details of deletion from other registries (if any); Type of vessel(s), and length, Gear(s) used, and Time period authorised for fishing and/or transshipping;

IATTC: Port of registry; A photograph of the vessel showing its registration number; When and where built; Length, beam and moulded depth; Fish hold capacity in cubic meters, and carrying capacity in metric tonnes; Name and address of operator (manager) or operators (if any); Type of fishing method or methods; Power of main engine or engines.

ICCAT: Previous details of deletion from other registries (if any); Type of vessel(s), and length; Gear(s) used; Time period authorised for fishing and/or transshipping.

IOTC: IMO number if available; Operating port; Previous details of deletion from other registries (if any); Type of vessel(s), and length; Gear(s) used; Time period authorised for fishing and/or transshipping.

¹⁷⁵ IPOA-IUU, para 43. The IPOA-IUU calls on each flag State to maintain a record of fishing vessels entitled to fly its flag. For vessels authorised to fish on the high seas the record should include all the information in Article VI of the FAO Compliance Agreement and some additional information including *inter alia* details of

RFMOs is more for fisheries compliance purposes, that is to specify which vessels are “authorised” and those that are not (by virtue of inclusion or non-inclusion on the positive list respectively). Information contained on national vessel registers can enable operational-level data to be linked to individual vessels specific characteristics through use of call sign or licence number. However, there can be problems with coverage of these registers and whether the information is current, so some degree of cross-checking and data gap-filling is often required before it can be used effectively for the purpose of effort standardization, as is required pursuant to UN Fish Stocks Agreement Annex I Article 4.¹⁷⁶ It should also be noted that in response to the outcomes of the 2007 Joint Tuna RFMO Meeting in Kobe, Japan, there is now a combined global list of authorized vessels that is maintained on the “Tuna-org” website (www.tuna-org.org), as well as links to the most current individual tuna RFMO lists of authorized vessels.¹⁷⁷

International legal requirements for collection of fisheries data for non-target, dependent and associated species

Ensuring the conservation of species that are impacted by the fishery but not targeted, or that are dependent or associated with target fish stocks has become an objective of responsible fisheries conservation and management.¹⁷⁸ The Code of Conduct for

the persons responsible for the fishing vessels beneficial ownership and ownership history of the fishing vessel.

¹⁷⁶ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), p20.

¹⁷⁷ *Report of the Joint Meeting of Tuna RFMOs, January 22-26, (Kobe, Japan: 2007)*, Appendix 14 Course of Actions for RFMOs from the Kobe Meeting of Joint Tuna RFMOs. It was agreed that one of the immediate tasks was “Creation of a harmonized list of tuna fishing vessels that is as comprehensive as possible (positive list) including use of a permanent unique identifier for each vessel such as an IMO number. The positive list should include support vessels.”

¹⁷⁸ United Nations, “Chapter 17: Protection of the Oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources,” in *Report of the United Nations Conference on Environment and Development 3-14 June (Rio de Janeiro: 1992)*, paras 45 & 70. “Emphasis should also be on multi-species management and other approaches that take into account the relationships among species.” Code of Conduct for Responsible Fisheries, Article 7.2.3 “States should assess the impacts of environmental factors on target stocks and species belonging to the same ecosystem or associated with or dependent upon the target stocks, and assess the relationship among the populations within the ecosystem.” Article 12.5 “States should be able to monitor and assess the state of the stocks under their jurisdiction, including the impacts of ecosystem changes resulting from fishing pressure, pollution or habitat alteration. They should also establish the research capacity necessary to assess the effects of climate or environmental change on fish stocks and aquatic ecosystems.”

Responsible Fisheries states that fisheries management objectives must not be limited to ensuring the sustainability of target stocks. Fisheries management objectives should also seek to minimise the impacts of fishing on the structure and functioning of the ecosystem as well.¹⁷⁹ As was discussed in Chapter 1 (*1.3 Impacts of fishing for tuna and billfish*), there are significant gaps in empirical data on pelagic food-webs and catch data in tuna and billfish fisheries for non-target species.¹⁸⁰ In response to these gaps, the need for fisheries data on non-target, dependent and associated species was recognised at the recent Joint Tuna RFMO meeting. Accordingly the Agreed Course of Actions from that meeting identified as a key area or challenge to be urgently addressed in tuna RFMOs was: “Implementation of the precautionary approach and an ecosystem-based approach to fisheries management including improved data collection on incidental by-catch and non-target and establishment of measures to minimize the adverse impacts of fishing for highly migratory fish species on ecologically related species, particularly sea turtles, seabirds and sharks, taking into account the characteristics of the ecosystem and technologies used to minimize adverse effect.”¹⁸¹ This finding is consistent with those of a previous study commissioned by FAO, which was based on questionnaire responses; the study was titled ‘Regional fishery bodies and governance: Issues, Actions and Future Directions.’¹⁸² The finding is also consistent with a report on recommended international best practice for RFMOs, that recommends current best practice is for RFMOs to identify limits of acceptable impact on key non-target species (both fish and non-fish species), including associated and dependent species and collection of data on non-target species in accordance with UN Fish Stocks Agreement Annex I.¹⁸³

The 2002 Plan of Implementation of the World Summit on Sustainable Development had called for, amongst other things, the application by 2010 of the ecosystem approach to fisheries management (FAO Fisheries Department, *Fisheries Management: The ecosystem approach to fisheries*, vol. 4 Suppl. 2, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 2003).)

¹⁷⁹ Code of Conduct, Article 7.2.3.

¹⁸⁰ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, *FAO Fisheries Circular 963* (Rome: FAO, 2001), 39-41.

¹⁸¹ *Report of the Joint Meeting of Tuna RFMOs, January 22-26*, (Kobe, Japan: 2007), Appendix 14, Course of Actions for RFMOs from the Kobe meeting of Joint Tuna RFMOs, I. para10.

¹⁸² J. Swan, *Regional fishery bodies and governance: issues, actions and future directions*. *FAO Fisheries Circular 959* (Rome: FAO, 2000), p17.

¹⁸³ M. W. Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007), 19-31.

The UN Fish Stocks Agreement obliges States to “assess the impacts of fishing, other human activities and environmental factors on target stocks and species belonging to the same ecosystem or associated with or dependent upon the target stocks” and to “adopt, where necessary, conservation and management measures” for such species “with a view to maintaining or restoring populations of such species above levels at which their reproduction may become seriously threatened.”¹⁸⁴ These UN Fish Stocks Agreement provisions expand the more general LOS Convention Article 61(4) and Article 119(1b) obligations to consider impacts of fishing when adopting conservation and management measures for fisheries. In particular, when adopting conservation and management measures coastal States and States fishing on the high seas, shall “take into consideration the effects on species associated with or dependent upon harvested species with a view to maintaining or restoring populations of such associated or dependent species above levels at which their reproduction may become seriously threatened.”¹⁸⁵

For flag States specifically, the UN Fish Stocks Agreement Article 18(3i) obliges flag States to take measures to regulate fishing activities of vessels flying their flag. Flag States must take measures to ensure compliance of its vessels with subregional, regional or global measures including those that are aimed at minimising catches of non-target species. Other relevant obligations under the UN Fish Stocks Agreement, Article 5 (f and g) are that States shall: “minimize pollution, waste, discards, catch by lost or abandoned gear, catch of non-target species, both fish and non-fish species, (hereinafter referred to as non-target species) and impacts on associated or dependent species, in particular the endangered species, through measures including, to the extent practicable, the development and use of selective, environmentally safe and cost-effective fishing gear and techniques; and protect biodiversity in the marine environment.”

The international legal requirements for fisheries data to fulfil these obligations for non-target, dependent and associated species come in three forms. First, States are obliged to *collect fisheries data, not just covering target tuna and billfish stocks* but also, covering non-target and associated or dependent species in order to obtain information on

¹⁸⁴ UN Fish Stocks Agreement, Article 5(d and e).

¹⁸⁵ LOS Convention, Article 61(4) and Article 119(1b).

interactions including catches of such species in fisheries.¹⁸⁶ Specifically this would include the catch and effort data and biological data including basic information on these species biology and characteristics, as listed in UN Fish Stocks Agreement Annex I Article 3, and discussed previously in this Chapter. Of course, coastal States are to collect and share data on non-target and associated or dependent species for fishing activities in EEZs and flag States in respect of high seas fishing activities. The possible sources for such data include those considered previously as sources for catch and effort data and for biological data for target tuna and billfish stocks, such as logsheets, landings and observer programmes.

Second, States are to establish and implement specific *data collection and research programmes for non-target and associated or dependent species*. Article 6 of the UN Fish Stocks Agreement, obliges States to take action to “develop data collection and research programmes to assess the impact of fishing on non-target and associated or dependent species and their environment, and adopt plans which are necessary to ensure the conservation of such species and to protect habitats of special concern.”¹⁸⁷ This obligation to develop data collection and research programmes applies to areas under national jurisdiction and to high seas.¹⁸⁸ These data collection and research programmes could

¹⁸⁶ UN Fish Stocks Agreement, Annex I Article 1(1) “Data collected should also include information on non-target and associated or dependent species.” and UN Fish Stocks Agreement, Annex I Article 3(1b) States shall collect and make available to the relevant subregional or regional fisheries management organization or arrangement the following types of data in sufficient detail to facilitate effective stock assessment in accordance with agreed procedures: “(b) total catch in number, nominal weight or both by species (both target and non-target) as is appropriate to each fishery.” IPOA-Sharks, para 21 says that the “consistent collection of data including inter alia catch and data leading to improved species identification and, ultimately, the establishment of abundance indices.” IPOA-Seabirds, 4-5 requires collection of data on interactions of seabirds with fisheries for assessment purposes.

¹⁸⁷ UN Fish Stocks Agreement, Article 6(3d), Code of Conduct for Responsible Fisheries, Articles 7.2.3, 8.4.7, 8.4.8, 12.5 and in respect of fishing gear selectivity Articles 8.5.1 and 12.10.

¹⁸⁸ UN Fish Stocks Agreement, Article 3(1). “Unless otherwise provided, this Agreement applies to the conservation and management of straddling fish stocks and highly migratory fish stocks beyond areas under national jurisdiction, except that articles 6 and 7 apply also to the conservation and management of such stocks within areas under national jurisdiction, subject to the different legal regimes that apply within areas under national jurisdiction and in areas beyond national jurisdiction as provided for in the Convention.” The legal regimes relevant to conducting research programmes would include the regime for marine scientific research, of the LOS Convention, that encourages States to cooperate to “actively promote the flow of scientific data and information and the transfer of knowledge resulting from marine scientific research.” (LOS Convention, Article 244 (1)). Coastal States have the exclusive right to regulate, authorize and conduct marine scientific research in their territorial sea and the right to regulate, authorize and conduct marine scientific research in their exclusive economic zone (LOS Convention Article 245 and Article 246 (1)). Whereas on the high seas, all States, irrespective of their geographical location, and competent international

include specific observer programmes, already outlined previously, to address particular fishery impact concerns related to non-target and associated or dependent species. For example the IPOA-Seabirds and IPOA-Sharks include specific data collection programmes as a part of the assessment process and implementation process for national plans of action to *inter alia* minimise impacts of fishing on these species.¹⁸⁹

Independent on-board observers are useful for estimating interactions, including catches, of non-target, associated and dependent species with fisheries. Especially those species which are difficult for fishers to identify to species level or which are of little commercial value and that tend not to be accurately reported by fishers on logsheets, for example, shark species.¹⁹⁰ Often specific observer programmes are required for estimates of fishery interactions including captures and discards of non-target and associated or dependent species, particularly where interactions of such species are rare occurrences and are of significant concern to fishery managers.¹⁹¹

organizations have the right, to conduct marine scientific research in the water column beyond the limits of the exclusive economic zone (LOS Convention, Article 257).

¹⁸⁹ IPOA-Seabirds, p6: "Data collection programmes should collect reliable data to determine the incidental catch of seabirds in longline fisheries and the effectiveness of mitigation measures. Such programmes may make use of onboard observers." IPOA-Sharks, p11, 13-14 "The current state of knowledge of sharks and the practices employed in shark fisheries cause problems in the conservation and management of sharks due to lack of available catch, effort, landings and trade data, as well as limited information on the biological parameters of many species and their identification. In order to improve knowledge on the state of shark stocks and facilitate the collection of the necessary information, adequate funds are required for research and management." Also "The assessment would necessitate consistent collection of data, including *inter alia* commercial data and data leading to improved species identification and, ultimately, the establishment of abundance indices. Data collected by States should, where appropriate, be made available to, and discussed within the framework of, relevant subregional and regional fisheries organizations and FAO. International collaboration on data collection and data sharing systems for stock assessments is particularly important in relation to transboundary, straddling, highly migratory and high seas shark stocks."

¹⁹⁰ B. Molony, "Estimates of the mortality of non-target species with an initial focus on seabirds, turtles and sharks (WCPFC-SC1 Working Paper EB WP-1)," in *1st Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2005).

¹⁹¹ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics. La Jolla, California, USA, 13-16 December 1993*, FAO Fisheries Report 500 (Rome: FAO, 1994), p8, T. Lawson, *Observer Coverage Rates and Reliability of CPUE Estimates for Offshore Longliners in Tropical Waters of the Western and Central Pacific Ocean* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2004), B. Molony, "Estimates of the mortality of non-target species with an initial focus on seabirds, turtles and sharks (WCPFC-SC1 Working Paper EB WP-1)," in *1st Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2005).

Table 2-1. Summary of data required by tuna RFMOs, other than WCPFC, to be submitted by contracting Parties that relate to non-target, dependent or associated species and implementation of the precautionary approach.

	CCSBT	IATTC	ICCAT	IOTC
Sharks: In response to IPOA-Sharks		<i>Where possible</i> report as for target tuna and billfish. Resolution C-05-03	Shall report as for target tuna and billfish, including discards Recommendation 2004-10	Report as for target tuna and billfish Resolution 05/05
Sea Turtles: In response to FAO Guidelines Sea Turtles		<i>Encouraged</i> to collect and provide to IATTC all available information on fishery interactions with sea-turtles Resolution C-04-07	<i>Encourages</i> the collection and reporting of all available information on interactions including incidental catch with sea turtles Resolution 2003-11	<i>Where possible</i> data on sea turtle fishery interactions Recommendation 05/08
Seabirds: In response to IPOA-Seabirds		Collect and <i>voluntarily provide</i> all available information on seabirds including incidental catches in all fisheries Resolution C-05-01	<i>Encourages</i> the collection and reporting of all available information on interactions including incidental catch with seabirds Resolution 2001-14	<i>Where possible</i> data on seabird fishery interactions Recommendation 05/09
Near-real time monitoring: In response to application of the Precautionary Approach	In addition, to annual data exchange monthly reports are to be made by Members to CCSBT. ¹⁹²	Weekly report by observer on purse seine vessels on estimated catch of tuna by species and set-type, and mortalities of dolphins by stock. Resolution A-03-02 Resolution C-03-04 Monthly catch reports for longline caught bigeye for those States that caught more than 500Mt annually Resolution C-06-02	Considering development of near-real time monitoring of catch limits, including through electronic documentation systems ¹⁹³	

¹⁹² CCSBT, "CCSBT Report on Intersessional Developments in Fisheries Statistics since CWP21 (March 2005) (CWP-22/CCSBT)," in *Coordinating Working Party on Fishery Statistics 22nd Session (26 February - 2 March)* (Rome, Italy: 2007), "Report of the Joint Meeting of Tuna RFMOs", (paper presented at the Joint Meeting of Tuna RFMOs, January 22-26, Kobe, Japan, 2007), Appendix 13 - Paper by CCSBT. The monthly reporting requirement was implemented from 1 January 2006.

¹⁹³ "Report of the Joint Meeting of Tuna RFMOs", (paper presented at the Joint Meeting of Tuna RFMOs, January 22-26, Kobe, Japan, 2007), Appendix 10 - Paper by ICCAT.

The current implementation by tuna RFMOs of data requirements for non-target, dependent and associated species generally focuses on sharks, seabirds and sea turtles. This is likely to be in response to the adoption of the IPOA-Seabirds, IPOA-Sharks and FAO Guidelines for Sea Turtles, and probably cover the major species of concern with respect to tuna fisheries. But if concerns for other species arise, the tuna RFMOs should probably initiate intensive monitoring through specialist observer program and other data types of dedicated data collection programs. In general the data submission requirements involve voluntary reporting of catches and interactions with sharks, seabirds and sea-turtles. IOTC and ICCAT have mandatory reporting of sharks, similar to that for principal market tuna, bluefin tuna and billfish species. CCBST does not appear to have adopted formal arrangements for submission of data on species other than southern bluefin tuna. However, in accordance with the IPOA-Seabirds CCSBT does have mandatory requirements for use of seabird mitigation measures.¹⁹⁴ Table 2-1 summarises the implementation to date in tuna RFMOs of requirements for States to provide data on non-target species.

Third, for species which are *heavily impacted by fishing*, *States are to subject these species and the relevant fisheries to enhanced monitoring*. This international legal requirement comes from the application of the precautionary approach, particularly UN Fish Stocks Agreement Article 6(5). This provision provides that “Where the status of target stocks or non-target or associated or dependent species is of concern, States shall subject such stocks and species to enhanced monitoring in order to review their status and efficacy of conservation and management measures.”¹⁹⁵

To this end, some tuna RFMOs have taken actions that in some ways implement this obligation. These are summarized in Table 2-1. For example, *Inter American Tropical Tuna Commission* (IATTC) requires that vessels make weekly reports to IATTC by observers on purse seine vessels of estimated catch of tuna by species and set-type, and mortalities of dolphins by stock. This enables near-real time monitoring of the catches of target species with sustainability concerns such as yellowfin and bigeye, whilst also monitoring the impact of fishing on dolphins which that are specifically subject to annual

¹⁹⁴ Ibid., Appendix 13 - CCSBT Report.

¹⁹⁵ UN Fish Stocks Agreement, Article 6(5).

mortality limit.¹⁹⁶ IATTC also requires that Contracting Parties and cooperating non-Contracting Parties report to IATTC Secretariat their monthly catches in longline fisheries of bigeye tuna by their national fleets that catch more than 500 Mt.¹⁹⁷ For transparency in the implementation of this Resolution the reported catches by national fleet are made publicly available on the IATTC website. This is significant because, as was discussed previously, longline catch data is reported in aggregated format to IATTC Secretariat and scientific advice is that the eastern Pacific bigeye stock likely to be overfished and overfishing is occurring (see Chapter 1 *1.3 Impacts of fishing for tuna and billfish*). Also recently in *Commission for Conservation of Southern Bluefin Tuna* (CCSBT), following concerns about underreporting through the CCSBT Statistical Documentation Scheme, monthly catch monitoring has been implemented to closely monitor the southern bluefin tuna stock which has sustainability concerns (see Chapter 1 *1.3 Impacts of fishing for tuna and billfish*).¹⁹⁸ *International Commission for the Conservation of Atlantic Tunas* (ICCAT) has also indicated that is considering some form of near-real time monitoring of compliance with catch limits applicable to species with sustainability concerns.¹⁹⁹

Conclusion

This Chapter has analysed the international legal requirements for fisheries data that tuna RFMOs require to support scientific analyses of the impacts of fishing. These international legal requirements specify certain types of fisheries data that States are to provide to tuna RFMOs. Four groups of data are required by tuna RFMOs to support scientific analyses of impacts of fishing: catch and effort data, biological data and other research information on

¹⁹⁶ *IATTC-Home*, [website] (IATTC, 26 December 2007 [cited 15 Jan 2008]); available from <http://www.iattc.org/HomeENG.htm>.

¹⁹⁷ *IATTC-Monthly longline catches of bigeye tuna*, [website] (IATTC, [cited 23 February 2008]); available from <http://www.iattc.org/IATTCLonglineCatches2007ENG.htm>, IATTC, *Resolution for a program on the Conservation of Tuna in the Eastern Pacific Ocean for 2007 (Resolution C-06-02)*. The reported longline catches of bigeye for 2007 by relevant IATTC Parties and cooperating non-contracting Parties are included in the public access section on the IATTC website.

¹⁹⁸ CCSBT, "CCSBT Report on Intersessional Developments in Fisheries Statistics since CWP21 (March 2005) (CWP-22/CCSBT)," in *Coordinating Working Party on Fishery Statistics 22nd Session (26 February - 2 March)* (Rome, Italy: 2007), "Report of the Joint Meeting of Tuna RFMOs", (paper presented at the Joint Meeting of Tuna RFMOs, January 22-26, Kobe, Japan, 2007), Appendix 13 - CCSBT Report.

¹⁹⁹ "Report of the Joint Meeting of Tuna RFMOs", (paper presented at the Joint Meeting of Tuna RFMOs, January 22-26, Kobe, Japan, 2007), Appendix 10 - Paper by ICCAT.

the tuna species and the surrounding ecosystem, vessel-related information and data on non-target species. Commonly, tuna RFMOs have taken decisions that require States to provide certain types of fisheries data to the tuna RFMO. These tuna RFMO decisions fulfil two substantive international legal obligations applicable to States: first, the duty to cooperate to conserve and management tuna and billfish stocks; and second to ensure the conservation and management measures adopted by tuna RFMOs are informed by the best scientific evidence available. Tuna RFMOs also collect fisheries data that are necessary to support scientific analyses of fishing through data collection and research programmes, that include tagging programmes, observer programmes, VMS and port sampling programmes.

The obligations on coastal States and flag States with respect to these four types of data on tuna fisheries that States are required to provide to tuna RFMOs are now clear. The current data practices in tuna RFMOs, in the form of requirements for submission of these types of data have also been clearly stated. The findings of the present Chapter can comfortably be used as a basis in later Chapters (6, 7 and 8) for analyses of fisheries data practices for western and central Pacific Ocean tuna fisheries.

Chapter 3. International legal framework for data on tuna fisheries:

Part II. Arrangements required in tuna RFMOs for fisheries data

Effective arrangements within a tuna RFMO (regional fisheries management organisation) are required to ensure that fisheries data is the best scientific evidence available to effectively underpin decisions for conservation and management measures to achieve long-term conservation and sustainable use of tuna fisheries. Accordingly, Article 10 of the *Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks* (UN Fish Stocks Agreement) obliges States, through tuna RFMOs, to: “agree on standards” for verification and exchange of fisheries data;¹ and to “compile and disseminate accurate and complete statistical data, as described in Annex I, to ensure that the best scientific evidence is available, while maintaining confidentiality where appropriate;”² This Chapter is the second of a two-part analysis of international legal requirements for data on tuna fisheries. The structure of the analyses of the international legal framework for data on tuna fisheries follows the analytical framework for this thesis which was outlined earlier in the Introduction to this thesis. Chapter 2 examined types and format for fisheries data that tuna RFMOs are to collect to support scientific analyses of impacts of fishing. The present Chapter will analyse international legal requirements and the data practices of tuna RFMOs that occur following the receipt fisheries data by the tuna RFMO.

¹ Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, of 4 December 1995, entered into force from 11 December 2001 (1995) 34 *ILM* 1542 UN Fish Stocks Agreement, Article 10(e).

² *Ibid.*, Article 10(f).

This Chapter will comprise five parts, and in each part the international legal requirements will be analysed and data practices in tuna RFMOs will be examined.³ First, data practices for compilation of fisheries data will be analysed. Second, practices for data verification, to ensure completeness and accuracy of data, will be analysed. Third, data practices to maintain confidentiality of data by the tuna RFMO will be analysed. Fourth the institutional arrangements for fisheries data at the global level will be overviewed, and finally, the consideration of the special requirements for developing States in tuna RFMO data practices will be examined.

3.1 Compiling data on tuna fisheries

Compilation refers to processes of storing and arranging data from multiple sources into one place. The data on tuna fisheries contributed by States to a tuna RFMO must be stored securely, but made easily available for analysis and where appropriate, for dissemination to other States and other Parties.⁴

The UN Fish Stocks Agreement Article 10(f) obliges States in fulfilling their obligation to cooperate through tuna RFMOs to compile accurate and complete data on tuna fisheries, as described in Annex I, to ensure that the best scientific evidence is available, while maintaining confidentiality where appropriate.⁵ For reference Annex I is reproduced herein as Appendix 2. To implement this obligation, UN Fish Stocks Agreement Annex I, requires as a general principle that tuna RFMOs “compile data and make them available in a timely manner and in an agreed format to all interested States under the terms and conditions established by” that RFMO.⁶ Such arrangements for compilation of data on tuna fisheries in RFMOs should include, to the extent feasible,

³ It should be noted that this Chapter will not analyse data practices in the *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPFC). Instead, the data practices in the other four tuna RFMOs will be examined herein. The findings from the present Chapter will be subsequently referenced in later Chapters that analyse WCPFC data practices (Chapters 7 and 8).

⁴ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), p63.

⁵ UN Fish Stocks Agreement, Article 10(f).

⁶ Ibid., Annex I Article 2(e) and Article 7(1).

development of database systems which provide efficient access to data.⁷ Pursuant to the general obligations for coastal States and flag States to share data on tuna fisheries, the database management system should also include an ability to facilitate the exchange of data amongst States subject to agreed formats and specifications.⁸ Also data should be “compiled in such a way as to enable statistically meaningful analysis for the purposes of fishery resource conservation and management”⁹

In terms of what these obligations mean in practice, the arrangements with respect to securing data and maintaining confidentiality will be covered elsewhere in 3.3 *Maintaining confidentiality of data on tuna fisheries and sharing data*. But in respect of database arrangements to ensure the effective use of data, the Guidelines for Routine Collection of Capture Fisheries Data recommends that the database ensure (a) data conform to standard classifications; (b) the validity of the data; (c) data integrity and internal consistency; (d) primary data is maintained and secure; (e) easy access to primary data; (f) data are processed as efficiently as required; and (g) different data sets can be integrated, thereby increasing their overall utility.¹⁰

Tuna RFMOs compile data for the purpose of undertaking scientific analyses of impacts of fishing, such as stock assessment, which underpin scientific advice to Commissions.¹¹ For those tuna RFMOs that compile data on behalf of their members, in practice the database system used by each tuna RFMO differ depending on the agreed format and specifications for the provision of data on tuna fisheries within the respective RFMO and the institutional arrangements for undertaking of stock assessment. For example, in *International Commission for the Conservation of Atlantic Tuna* (ICCAT) its members submit to ICCAT Secretariat data on fisheries in an agreed specific format for use

⁷ Ibid., Annex I Article 7(1).

⁸ FAO, *Guidelines for the routine collection of capture fishery data*. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382 (Rome: FAO, 1999), p67.

⁹ UN Fish Stocks Agreement, Annex I Article 1.

¹⁰ FAO, *Guidelines for the routine collection of capture fishery data*. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382 (Rome: FAO, 1999), p63.

¹¹ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics*. La Jolla, California, USA, 13-16 December 1993, FAO Fisheries Report 500 (Rome: FAO, 1994), 125-126.

in stock assessments.¹² ICCAT assessments are conducted using a multinational approach to science that involves regular meetings of national scientists that provide advice on several multispecies tuna fisheries in the Atlantic Ocean.¹³ Based on the format in which the data is provided, the ICCAT database contains total catches by fish size, and effort by flag, gear type, month and five-degree-square for longline, month and one-degree-square for other gear types, for each stock in the Atlantic and adjacent seas.¹⁴ Similar data provision and scientific structure arrangements to those of ICCAT are in place in the *Indian Ocean Tuna Commission* (IOTC), except the database is maintained with the assistance of *Food and Agriculture Organisation of the United Nations* (FAO).¹⁵

In *Inter-American Tropical Tuna Commission* (IATTC), the majority of data for the purse seine fishery are collected by the IATTC Secretariat directly from logbooks directly provided to IATTC Secretariat, through the IATTC observer programme and from unloading data directly provided by the canneries.¹⁶ This fine-scale data is available directly for use in stock assessment analyses by the IATTC Secretariat scientists who provide the Commission with annual assessments of stock status and scientific advice.¹⁷ Aggregated catch and effort data that does not identify the activities of an individual vessel are available in publications and from the website.¹⁸ However detailed records for the longline fishery are not maintained by IATTC, and instead the IATTC Secretariat compiles

¹² ICCAT, *Recommendation by ICCAT on Compliance with Statistical Declaration Obligations* (Rec. 05-09).

¹³ P. Ward, N. Tsirbas, and R. Kearney, *Getting Science into Regional Fisheries Management - A Global View* (Canberra, Australia: Bureau of Research Sciences, 1998), p52.

¹⁴ ICCAT - *Assessments - Access to ICCAT Statistical databases*, [website] (ICCAT, [cited 29 January 2008]); available from <http://www.iccat.int/accessingdb.htm>, P. Ward, N. Tsirbas, and R. Kearney, *Getting Science into Regional Fisheries Management - A Global View* (Canberra, Australia: Bureau of Research Sciences, 1998), p54.

¹⁵ IOTC, *Resolution on Mandatory Statistical Requirements for IOTC Members* (Resolution 01/05), *IOTC>about IOTC>structure of the commission*, [website] (IOTC, July 23 2003 [cited 29 Jan 2008]); available from <http://www.iotc.org/English/info/comstruct.php>, *IOTC>meetings>working parties*, [website] (IOTC, June 21 2007 [cited 29Jan 2008]); available from <http://www.iotc.org/English/meetings/wp/allwp.php>.

¹⁶ *IATTC_Data*, [website] (IATTC, 05 September 2007 [cited 29 January 2008]); available from <http://www.iatcc.org/DataENG.htm>.

¹⁷ P. Ward, N. Tsirbas, and R. Kearney, *Getting Science into Regional Fisheries Management - A Global View* (Canberra, Australia: Bureau of Research Sciences, 1998), 29-31.

¹⁸ *IATTC_Data*, [website] (IATTC, 05 September 2007 [cited 29 January 2008]); available from <http://www.iatcc.org/DataENG.htm>.

aggregated catch and effort data provided by the relevant flag State (generally five-degree-square by flag, by month for each tuna species).¹⁹

Initially the *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT) Secretariat did not hold data on tuna fisheries – instead the individual CCSBT members held the data and had formal arrangements for sharing of data between themselves.²⁰ In 2001, CCSBT agreed to establish a central database within the Secretariat as part of a scientific research program.²¹ Since 2005, a Data Exchange Working Group has been established and meets annually or biennially to specify the data exchange requirements for the following year/s. The Data Exchange Working Group makes detailed recommendations to the Scientific Committee that includes detailed tables specifying the data that contracting Parties and cooperating non-Parties are to submit, such as catch and effort data, catch composition data, import statistics and other data necessary for scientific analyses.²² These data are then available to share between CCSBT members through the secure data exchange facility on the CCSBT website.²³

The database arrangements established in tuna RFMOs are suited to their individual circumstances and requirements for access to that data. Now that the arrangements for compilation of data in tuna RFMOs have been outlined, the next section will detail how tuna RFMOs ensure that the data contained in their databases are the best scientific information available.

¹⁹ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics*. La Jolla, California, USA, 13-16 December 1993, *FAO Fisheries Report 500* (Rome: FAO, 1994), 43-46, *IATTC_Data*, [website] (IATTC, 05 September 2007 [cited 29 January 2008]); available from <http://www.iatcc.org/DataENG.htm>, P. Ward, N. Tsirbas, and R. Kearney, *Getting Science into Regional Fisheries Management - A Global View* (Canberra, Australia: Bureau of Research Sciences, 1998), 29-31.

²⁰ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, *FAO Fisheries Circular 963* (Rome: FAO, 2001), p44.

²¹ *Research: CCSBT Commission for the Conservation of Southern Bluefin Tuna*, [website] (CCSBT, [cited 2 February 2008]); available from <http://www.ccsbt.org/docs/research.html>.

²² CCSBT, *Report of the Twelfth Meeting of the Scientific Committee, 10-14 September 2007* (Hobart, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2007), Attachment 11 - Report of the Data Exchange Working Group.

²³ *Research: CCSBT Commission for the Conservation of Southern Bluefin Tuna*, [website] (CCSBT, [cited 2 February 2008]); available from <http://www.ccsbt.org/docs/research.html>.

3.2 Verifying data on tuna fisheries

Verification of data is essential to ensure the highest quality data on tuna fisheries are obtained, that is data are accurate, complete and give a true indication of the state or value of the factors under question.²⁴ High priority should be attached to the verification of data on catch, effort and bycatch, given that misreporting of commercial data is recognised as a factor leading to errors in scientific assessments.²⁵ Verification of data involves crosschecking multiple sources of data to fill in gaps in time series of data, to identify errors and anomalies, and to detect and adjust for sources of bias in data.

The UN Fish Stocks Agreement obliges coastal States and flag States, in giving effect to their duty to cooperate through RFMOs, to collect, share, compile and disseminate “complete” and “accurate” data concerning fishing activities as set out in Annex I.²⁶ The references to “complete” data implies that data on tuna fisheries should be without gaps or omissions and the references to “accurate” implies that data on tuna fisheries should be without errors. Together these references to “complete and accurate” imply that States should adopt some validation or verifications processes to identify and highlight gaps and errors in fisheries data.

Additionally States are obliged, in fulfilling their obligation to cooperate through RFMOs, to agree on standards for, *inter alia*, verification of data on tuna fisheries.²⁷ Flag States are further obliged to take appropriate measures to verify the accuracy of data on tuna fisheries in accordance with UN Fish Stocks Agreement Annex I.²⁸ Also the UN Fish Stocks Agreement Article 18(3f) specifically obliges flag States to take the following minimum actions with respect to verification of data on tuna fisheries: “Measures to be taken by a State in respect of vessels flying its flag shall include requirements for verifying the catch target and non-target species through such means as observer programmes,

²⁴ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), p73.

²⁵ FAO, *Report of the Technical Consultation on High Seas Fishing. Rome, 7-15 September 1992, FAO Fisheries Report 484* (Rome: FAO, 1992), p4 (para 28).

²⁶ UN Fish Stocks Agreement, Article 5(j) and Article 10(f).

²⁷ *Ibid.*, Article 10(e).

²⁸ *Ibid.*, Article 14(1c).

inspection schemes, unloading reports, supervision of transshipment and monitoring of landed catches and market statistics.”²⁹

Some general guidance on implementing of these obligations is provided in UN Fish Stocks Agreement Annex I.³⁰ In general for tuna fisheries conservation and management “all data should be verified to ensure accuracy” and “States should ensure that fishery data are verified through an appropriate system.”³¹ To this end, UN Fish Stocks Agreement Annex I Article 6 recommends the following with respect to implementing measures for verifying data on tuna fisheries: “States or, as appropriate, subregional or regional fisheries management organisations and arrangements should establish mechanisms for verifying fishery data, such as: (a) position verification through vessel monitoring systems; (b) scientific observer programmes to monitor catch, effort, catch composition (target and non-target) and other details of fishing operations; (c) vessel trip, landing and transshipment reports; and (d) port sampling.”³² These four possible mechanisms that States or as appropriate tuna RFMOs might use to verify data on tuna fisheries closely match the minimum actions that flag States are obliged undertake pursuant to UN Fish Stocks Agreement Article 18(3f).³³

In terms of international best practice standards for verification of data on tuna fisheries, the FAO Technical Guidelines on Fisheries Management proposes some examples of methods that States, either individually or within tuna RFMOs could use to validate data. This list included the four possible mechanisms set out in Article 6 of UN Fish Stocks Agreement Annex I, and also five additional possible methods. These additional recommended practices are: comparing landing statistics with certificates of origin, trade and commodity; production statistics (eg processed fish) and similar sources of information; inspecting data collection methods by statistical staff; interviews with fishers; reporting from sea on retained catch on entering and leaving the fishing zones; instituting

²⁹ Ibid., Article 18(3f).

³⁰ UN Fish Stocks Agreement Annex I is included in Appendix 2.

³¹ UN Fish Stocks Agreement, Annex I Article 1(1) and 2(b).

³² Ibid., Annex I Article 6.

³³ Except the UN Fish Stocks Agreement Article 18(3) provision does not specify use of VMS. However within the same Article but under a different subparagraph (Article 18(3g) iii)) flag States are obliged to develop and implement VMS as part of a monitoring, control and surveillance system.

airborne and shipboard surveillance, associated with the boarding of vessels.³⁴ Similarly the 1993 FAO Ad Hoc Consultation on the Role of Regional Fishery Agencies in relation to High Seas Fishery Statistics had previously recommended that verification procedures were essential at national and regional levels, and it recommended that standard procedures for data verification should be developed and employed at national and regional levels.³⁵

Recent experience in *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT), where it has been estimated that over a one-third to one-half of catch were being underreported over a fifteen year period under the CCSBT trade information scheme, has drawn public attention of the need to make improvements to verification systems in tuna RFMOs.³⁶ These findings arose following reviews in 2006 of southern bluefin tuna farming data and market data for southern bluefin tuna.³⁷ The underreporting in CCSBT has been attributed to large gaps related to members catching and consuming product domestically, and non-members catch and not trading with member States. These gaps are a particular design flaw in statistical documentation schemes and trade information schemes because only subsets of the catch and of the supply chain are monitored.³⁸ Consequently, concerns have followed regarding the overall reliability and accuracy of stock assessments based on inaccurate catch and effort data time series.³⁹

³⁴ FAO Fishery Resources Division and Fishery Policy and Planning Division, *Fisheries Management*, vol. 4, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 1997), p28, section 2.1.2 (iii).

³⁵ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics. La Jolla, California, USA, 13-16 December 1993, FAO Fisheries Report 500* (Rome: FAO, 1994), p11. A similar list of possible means with which fisheries data might be verified was proposed, however the Consultation considered that there was little practical value in recommending any particular verification procedure owing to the large differences between fisheries and in the magnitude and distribution of catch and effort, and in the specific application.

³⁶ CCSBT, *Report of the Thirteenth Annual Meeting of the Commission, 10-13 October 2006* (Miyazaki, Japan: Commission for the Conservation of Southern Bluefin Tuna, 2006), CCSBT, *Report of the Fourteenth Annual Meeting of the Commission, 16-19 October 2007* (Canberra, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2007), Andrew Darby, "Japan Tuna Scandal Starts to Bite," *Melbourne Age*, 24 October 2007, Justin McCurry, "Japan agrees to cut bluefin tuna catch after admitting overfishing," *The Guardian*, October 17 2006, Michael Riepen, Email, February 2007.

³⁷ CCSBT, "CCSBT Report on Intersessional Developments in Fisheries Statistics since CWP21 (March 2005) (CWP-22/CCSBT)," in *Coordinating Working Party on Fishery Statistics 22nd Session (26 February - 2 March)* (Rome, Italy: 2007).

³⁸ *Report of the Joint Tuna RFMO Working Group on Trade and Catch Documentation Schemes, 22-23 July 2007*, (Rahleigh, North Carolina, USA: 2007), p1, M. Riepen, Consultant, FFA, Personal Communication by Email, February 2007.

³⁹ CCSBT, *Report of the Thirteenth Annual Meeting of the Commission, 10-13 October 2006* (Miyazaki, Japan: Commission for the Conservation of Southern Bluefin Tuna, 2006). See for example Australia Statement (Attachment 4-1), CCSBT, "CCSBT Report on Intersessional Developments in Fisheries Statistics since CWP21 (March 2005) (CWP-22/CCSBT)," in *Coordinating Working Party on Fishery Statistics 22nd*

International Commission for Atlantic Tuna (ICCAT) has recently launched a review of the three statistical documentation programmes under its purview (covering exports or re-exports of bluefin tuna or bluefin tuna products; swordfish or swordfish products; and all frozen bigeye and bigeye products (except bigeye tuna caught by purse seine and pole-and-line vessels destined for canneries in the ICCAT area)).⁴⁰ In late 2007, ICCAT adopted a recommendation to implement a Catch Documentation Scheme for bluefin tuna, for the purpose of identifying the origin of any bluefin tuna in order to support the implementation of conservation and management measures.⁴¹ The Joint Tuna RFMO Working Group on Trade and Catch Documentation Schemes made note of a number of concerns with respect to the tuna RFMO statistical documentation schemes currently used in tuna RFMOs. These concerns included that it was difficult to identify the actual level of catches and the respective catch areas and to have real-time data exchange between parties regarding the verification of certain shipments.⁴² Furthermore “Parties expressed general agreement that the [Statistical Documentation Programs] had major shortcomings and that movement to catch documentation schemes that covered product from catch to market was needed.”⁴³

More recent reports on recommended best practices for RFMOs have specified the need for integrated monitoring, control and surveillance (MCS) systems in RFMOs.⁴⁴ An

Session (26 February - 2 March) (Rome, Italy: 2007), CCSBT, Report of the Fourteenth Annual Meeting of the Commission, 16-19 October 2007 (Canberra, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2007). See for example Australia and New Zealand Statement (Attachment 4-1 & 4-5)

⁴⁰ ICCAT, "ICCAT Report on Agency Programmes in Fisheries Statistics (CWP-22/ICCAT)," in *Coordinating Working Party on Fishery Statistics 22nd Session (26 February - 2 March) (Rome, Italy: 2007), "Report of the Joint Meeting of Tuna RFMOs", (paper presented at the Joint Meeting of Tuna RFMOs, January 22-26, Kobe, Japan, 2007), Appendix 10 - ICCAT Report, Report of the Joint Tuna RFMO Working Group on Trade and Catch Documentation Schemes, 22-23 July 2007, (Rahleigh, North Carolina, USA: 2007).*

⁴¹ ICCAT, *Recommendation by ICCAT on an ICCAT Bluefin Tuna Catch Documentation Program (Recommendation 07-10).*

⁴² *Report of the Joint Tuna RFMO Working Group on Trade and Catch Documentation Schemes, 22-23 July 2007, (Rahleigh, North Carolina, USA: 2007), p1.*

⁴³ *Ibid.*, p2.

⁴⁴ *Report of the Joint Meeting of Tuna RFMOs, January 22-26, (Kobe, Japan: 2007).* The measures could include VMS, observers, boarding and inspection schemes, port state controls, market state measures, stronger controls on transshipment, and monitoring of bluefin tuna farming, and the harmonisation of those measures across the five tuna RFMOs where appropriate to avoid duplication and increase cost efficiency. Also see High Seas Task Force, *Closing the net: Stopping illegal fishing on the high seas* (France: Governments of Australia, Canada, Chile, Namibia, New Zealand and the United Kingdom, WWF, IUCN and the Earth Institute at Columbia University, 2006), M. W. Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for*

integrated MCS system within a tuna RFMO, would among others include a comprehensive documentation scheme. A comprehensive documentation scheme would provide for verification of the species caught, the weight of the catch, when the catch was taken and the area in which the catch was taken. Together the elements of an integrated MCS system should improve the quality of data on tuna fisheries in tuna RFMOs. A properly designed integrated MCS system should enable landing and/or catch of Commission members within the Convention Area to be verified and they also should enable IUU-caught product to be detected.⁴⁵ The key elements of such an integrated MCS system within a tuna RFMO should include four elements. First, data verification for the location of fishing effort through vessel monitoring systems (VMS), preferably with the central operation of the VMS through the RFMO or simultaneous transmission to both the RFMO and flag State.⁴⁶ Second, at-sea scientific observer programmes and port sampling as a means of collecting and verifying catches of target and non-target species and for estimating discards.⁴⁷ Third, documentation schemes covering all components of the catch of tunas, rather than just that portion of fishery products entering international trade are required, so that catch and landing statistics can be compared with certificates of origin, trade and commodity.⁴⁸

improved governance by Regional Fisheries Management Organizations (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007).

⁴⁵ M. Lack, *Catching On? Trade-related Measures as a Fisheries Management Tool* (Sydney: TRAFFIC International, 2007), *Report of the Joint Tuna RFMO Working Group on Trade and Catch Documentation Schemes, 22-23 July 2007*, (Rahleigh, North Carolina, USA: 2007).

⁴⁶ Mary Lack, *Catching On? Trade-related Measures as a Fisheries Management Tool* (Sydney: TRAFFIC International, 2007), p20, Mary Lack, *With an eye to the future: addressing failures in the global management of bigeye tuna* (Sydney, Australia: Traffic International and WWF Australia, 2007), p55, Michael W Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007), p31.

⁴⁷ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, *FAO Fisheries Circular 963* (Rome: FAO, 2001), p57, M. Lack, *With an eye to the future: addressing failures in the global management of bigeye tuna* (Sydney, Australia: Traffic International and WWF Australia, 2007), p55, M. W. Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007), p31.

⁴⁸ FAO Fisheries Department, *Implementation of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing*, vol. 9, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 2002). Catch certification and catch documentation schemes provide market and trade incentives to improve real time monitoring of the fishery and act as a deterrent to IUU fishing, such schemes have the added advantage of providing a real time verification of the data, particularly catch data. Constraints include the need for regional and international coordination, compatibility of multiple schemes,

Fourth, prohibition of transshipment at sea or closer monitoring through a comprehensive compliance observer programme to supervise all transshipment operations at sea and to verify the amount and composition transhipped.⁴⁹

At the time of writing this thesis most tuna RFMOs had not yet fully implemented the four elements that are recommended as international best practice for an integrated system of MCS. For vessel monitoring systems (VMS), CCSBT was the only tuna RFMO that had not formally implemented a VMS system, but had made an in-principle decision to implement a VMS system in the future.⁵⁰ The other tuna RFMOs have implemented VMS, but these are implemented by flag States and the requirements are limited to larger-sized fishing vessels: in *Inter-American Tropical Tuna Commission* (IATTC) and ICCAT the requirement for VMS applies to fishing vessels greater than 24 m length; and in *Indian Ocean Tuna Commission* (IOTC) the requirement for VMS applies to fishing vessels greater than 15 m length.⁵¹ ICCAT is the only tuna RFMO to have established a requirement for the flag State to transmit VMS reports to the Commission Secretariat, and this requirement will be implemented in 2008 initially to fishing vessels larger than 24 length.⁵² Also, ICCAT by 2010 will expand the coverage of VMS to bluefin tuna fishing vessels larger than 15 m length.⁵³

Observer programmes in tuna RFMOs vary in the levels of coverage and how they are administered. For instance, CCSBT and IOTC have implemented flag State

requirement to have market states cooperation, skipper cooperation and a reliable third party to verify the catch source. Whether or not such schemes can be justified for lower value species or species caught in bulk is questionable, although for high value species under exploitation threats such as bluefin tuna and bigeye tuna there should be easy justification.

⁴⁹ M. Lack, *Catching On? Trade-related Measures as a Fisheries Management Tool* (Sydney: TRAFFIC International, 2007), M. Lack, *With an eye to the future: addressing failures in the global management of bigeye tuna* (Sydney, Australia: Traffic International and WWF Australia, 2007), M. W. Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007).

⁵⁰ CCSBT, *Report of the Thirteenth Annual Meeting of the Commission, 10-13 October 2006* (Miyazaki, Japan: Commission for the Conservation of Southern Bluefin Tuna, 2006).

⁵¹ IATTC, *Resolution on the Establishment of a Vessel Monitoring System (VMS) (Resolution C-04-06)*, ICCAT, *Recommendation by ICCAT concerning minimum standards for the establishment of a vessel monitoring system in the ICCAT Convention Area (Recommendation 03-14)* (June 19 2004), IOTC, *Resolution on establishing a vessel monitoring system programme (Resolution 06/03)*.

⁵² ICCAT, *Recommendation by ICCAT concerning data exchange format and protocol in relation to the vessel monitoring system (VMS) for the bluefin tuna fishery in the ICCAT Convention Area (Recommendation 07-08)*.

⁵³ ICCAT, *Recommendation by ICCAT to establish a multi-annual recovery plan for bluefin tuna in the eastern Atlantic and Mediterranean (Recommendation 06-05)* (June 13 2007).

administered national observer programmes.⁵⁴ Similarly, ICCAT has flag State administered observer programmes with minimum coverage level of 20% for fishing vessels catching bluefin tuna and 5% for longline fishing vessels catching bigeye tuna.⁵⁵ Whereas, IATTC has a dedicated observer program administered by the IATTC Secretariat for purse seine vessels with 100% observer coverage.⁵⁶

All tuna RFMOs have implemented trade or statistical documentation programmes. But there is a trend to move from trade or statistical documentation programmes to catch documentation programmes.⁵⁷ For instance, CCSBT has an in principle agreement to move to catch documentation.⁵⁸ In late 2007, ICCAT adopted a recommendation to implement a Catch Documentation Scheme for bluefin tuna, for the purpose of identifying the origin of any bluefin tuna in order to support the implementation of conservation and management measures.⁵⁹

For monitoring and verifying transshipment activities, from 2008, IOTC, ICCAT and IATTC will have implemented full observer coverage for transshipment activities from all large-scale longline fishing vessels.⁶⁰ These forms of observer programmes for

⁵⁴ CCSBT, *Report of the Seventh Annual Meeting of the Commission, 18-21 April 2001* (Sydney, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2001), IOTC, *Recommendation concerning the National Observer Programmes for Tuna Fishing in the Indian Ocean (Recommendation 01/01)*.

⁵⁵ ICCAT, *Recommendation by ICCAT on a Multi-year Conservation and Management Program for Bigeye tuna (Recommendation 04-01)* (June 13 2005), ICCAT, *Recommendation by ICCAT to establish a multi-annual recovery plan for bluefin tuna in the eastern Atlantic and Mediterranean (Recommendation 06-05)* (June 13 2007).

⁵⁶ IATTC, *Resolution on At-Sea Reporting (Resolution C-03-04)*, IATTC, *Resolution on Establishing a Program for Transshipments by Large-Scale Fishing Vessels (Resolution C-06-04)*, ICCAT, *Recommendation by ICCAT establishing a programme for Transshipment (Recommendation 06-11)* (June 13 2007), IOTC, *Resolution on establishing a programme for transshipment by large-scale fishing vessels (Resolution 06/02)*.

⁵⁷ IATTC has since 2003 had a Statistical Documentation Program for frozen bigeye tuna by longline (IATTC, *Resolution on IATTC Bigeye Tuna Statistical Document Program (Resolution C-03-01)*). ICCAT has since 1992 – 2001 implemented Statistical Documentation Program for bluefin, swordfish and bigeye tuna products (ICCAT, *Recommendation by ICCAT for bigeye tuna trade restrictive measures on Georgia (Recommendation 03-18)* (June 19 2004)). IOTC has since 2002 had a Statistical Documentation Program for frozen bigeye tuna (IOTC, *Resolution concerning the IOTC bigeye statistical document programme (Resolution 01/06)*, IOTC, *Resolution concerning the amendment of the forms of the IOTC Statistical Documents (Resolution 03/03)*).

⁵⁸ CCSBT, *Report of the Thirteenth Annual Meeting of the Commission, 10-13 October 2006* (Miyazaki, Japan: Commission for the Conservation of Southern Bluefin Tuna, 2006).

⁵⁹ ICCAT, *Recommendation by ICCAT on an ICCAT Bluefin Tuna Catch Documentation Program (Recommendation 07-10)*.

⁶⁰ IATTC, *Resolution on Establishing a Program for Transshipments by Large-Scale Fishing Vessels (Resolution C-06-04)*, ICCAT, *Recommendation by ICCAT establishing a programme for Transshipment (Recommendation 06-11)* (June 13 2007), IOTC, *Resolution on establishing a programme for transshipment by large-scale fishing vessels (Resolution 06/02)*.

transshipment vessels are designed to verify the amount and composition of transshipments from a subset of the fishing fleet, and do not provide comprehensive verification of catches of all species in longline fisheries. IATTC also has a prohibition on transshipment by purse seine vessels, as well as full coverage by observers.⁶¹ CCSBT has an in-principle decision to implement a transshipment scheme.⁶²

Tuna RFMOs are making progress towards meeting recommended standards for best practice for verification of fisheries data. Also further progress can be anticipated noting that two of the recommended criteria for RFMO performance reviews that are to be undertaken individually by these tuna RFMOs during 2008 are the extent to which RFMO has adopted integrated MCS measures (eg. required use of VMS, observers, catch documentation and trade tracking schemes, restrictions on transshipment, boarding and inspection schemes) and the extent to which RFMO members implement such measures effectively.⁶³ The next section will analyse the tuna RFMO practices to disseminate fisheries data as well as the international legal requirements for the confidentiality of fisheries data to be maintained.

3.3 Maintaining confidentiality of data on tuna fisheries and sharing data

Individual fishers or the fishing industry are usually concerned that the information that they supply to fisheries management authorities are kept confidential, in particular those information or data that could be used by their competitors to gain an advantage.⁶⁴ Information, which competitors could use to their advantage, include data relating to individual vessels or companies specific catch rates, fishing localities and fishing strategies. Information obtained from participants in the fisheries is intellectual capital, and, as with

⁶¹ IATTC, *Resolution on Fish Aggregating Devices (Resolution C-99-07)*.

⁶² CCSBT, *Report of the Thirteenth Annual Meeting of the Commission, 10-13 October 2006* (Miyazaki, Japan: Commission for the Conservation of Southern Bluefin Tuna, 2006).

⁶³ United Nations, *Sixth round of Informal Consultations of State Parties to the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (New York, 23 - 24 April 2007)*, ICSP6/UNFSA/REP/INF.1 (New York: United Nations, 2007), Annex II Recommended Minimum Criteria for Reviewing the Performance of Regional Fisheries Management Organisations (RFMOs).

⁶⁴ FAO Fishery Resources Division and Fishery Policy and Planning Division, *Fisheries Management*, vol. 4, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 1997), section 2.1.5(i) p29.

property of any individual, when in the hands of others appropriate steps must be taken to guard against loss or devaluation resulting from the manner in which it is handled.⁶⁵ The confidentiality of catch and fisheries-related data should be maintained to maintain the full cooperation of industry and national statistical reporting offices in the provision of timely data, and to ensure the reliability of data.⁶⁶ Any perceived or alleged breaches of data confidentiality are likely to lead to difficulties in obtaining future data on tuna fisheries or to falsified or incomplete data.⁶⁷

Coastal States and flag States are obliged in fulfilling their duty to cooperate through tuna RFMOs to collect and “share” data as set out in UN Fish Stocks Agreement Annex I, and to compile and “disseminate” that data, while maintaining confidentiality where appropriate.⁶⁸ States also have a general responsibility to make objective, reliable and credible information available to the international community relating to trends in the fisheries as well as on impacts of the fisheries on the stocks and ecosystem.⁶⁹ Therefore States have to find a balance between two competing obligations. First, the obligation to share and exchange fisheries data with other States for the purposes of ensuring the best scientific evidence is available to be considered in tuna conservation and management. And second, with the responsibility to maintain the confidentiality of data on tuna fisheries. UN Fish Stocks Agreement Annex I Article 7(1) reaffirms this balance between these two obligations and recommends the use of tuna RFMOs as the mechanism for facilitating the exchange of data between States whilst also ensuring the confidentiality of data, particularly non-aggregated data is maintained.⁷⁰

⁶⁵ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), 43-44.

⁶⁶ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics*. La Jolla, California, USA, 13-16 December 1993, FAO Fisheries Report 500 (Rome: FAO, 1994), p10, para 36.

⁶⁷ FAO Fishery Resources Division and Fishery Policy and Planning Division, *Fisheries Management*, vol. 4, FAO Technical Guideline for Responsible Fisheries (Rome: FAO, 1997), section 2.1.5, 29-30.

⁶⁸ UN Fish Stocks Agreement, Article 5(j), Article 10(f) and Article 14(1a).

⁶⁹ FAO Strategy on Improving Information in Fisheries, adopted by the FAO Conference in 2003.

⁷⁰ UN Fish Stocks Agreement, Annex I Article 7(1): “Data collected by flag States must be shared with other flag States and relevant coastal States through appropriate [tuna RFMOs]. Such [tuna RFMOs] shall compile data and make them available in a timely manner and in an agreed format to all interested States under the terms and conditions established by the [tuna RFMO], while maintaining confidentiality of non-aggregated data, and should to the extent feasible, develop database systems which provide efficient access to data.” UN Fish Stocks Agreement, Annex I Article 1(1) also states that “Confidentiality of non-aggregated data shall be maintained.” The Code of Conduct also requires both States and subregional or regional fisheries

The types of data on tuna fisheries that are commercially sensitive are generally not aggregated catch and effort data. However, “data relating to the fishing activity of individual vessels or company specific catch rates, fishing localities and fishing strategies are frequently seen as being of potential interest to competitors and therefore need to be kept confidential.”⁷¹ For example, reflecting the serious nature of this issue, the United States of America has enacted domestic legislation to protect the confidentiality of fisheries data and which also has the effect of constraining the terms under which the United States can share data with other States. Data on tuna fisheries may be shared by the United States National Marine Fishery Service with other actors if data on fisheries cannot be “identifiable with any individual, corporation or other entity. In other words, if the identity of the fisherman or processor can be determined from the data, the data are confidential and cannot be shared without permission from the fisherman or processor. If the identity of the fisherman or processor can be obscured by aggregation into strata by time or space or both, the data are not confidential and cannot be shared. There is no sunset clause on data confidentiality; data are confidential in perpetuity.”⁷²

Practically, States will need to consider priorities relating to the potential uses of non-aggregated fisheries data, particularly within tuna RFMOs. Generally for scientific purposes, including *inter alia* stock assessments, operational-level catch and effort data is preferred because such fine-resolution data on fisheries provides more detailed information on trends and variability in the fisheries.⁷³ There is also the matter of the need for transparency in the compilation and sharing of data in tuna RFMOs. Transparency leads to mutual trust by the concerned parties that all relevant information are valid and adequate to meet the objectives and mandates of the tuna RFMOs, particularly when that data is being relied on for conservation and management purposes.⁷⁴ However the challenge arises in

management organisations and arrangements to maintain confidentiality of fisheries data (Article 7.4.4 in respect of States, and Article 7.4.7 in respect of subregional or regional fisheries management organisations or arrangements).

⁷¹ FAO Fishery Resources Division and Fishery Policy and Planning Division, *Fisheries Management*, vol. 4, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 1997), section 2.1.5(i) 29-30.

⁷² National Research Council, *Improving the Collection, Management, and Use of Marine Fisheries Data* (Washington, D.C.: National Academy Press, 2000), p112. (NOAA Administrative Order 216-100, dated July 16 1994.

⁷³ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, *FAO Fisheries Circular 963* (Rome: FAO, 2001), 17-19.

⁷⁴ *Ibid.*, 43-44.

that operational-level data is the same data is that which is commonly deemed by fishers to be commercially sensitive.

One way that States can meet the obligation to maintain confidentiality of data on tuna fisheries is through establishment of clear policies and standards within tuna RFMOs. Such policies and standards should be designed to maintain confidentiality of catch and fisheries-related data that are identified as having confidential sensitivities, including through minimum security arrangements. These policies and standards should also include terms and conditions for dissemination of commercially sensitive data by the respective State, RFMO or other organisation holding that data. The policies and standards should be developed in consultation with the fishing industry to establish what data should be kept confidential including what level of aggregation would be an acceptable form for data dissemination.⁷⁵ Scientists should also be consulted to ensure that data on fisheries that they have access to is of adequate quality for the stock assessment and other analyses that fisheries managers require.

Another way that States, and where appropriate tuna RFMOs, can balance scientific needs with commercial confidentiality concerns is by ensuring “that the data collection tasks and structures of a management authority are kept totally separate from the enforcement tasks and structures.”⁷⁶ For example keeping scientific and statistical databases maintained separate from enforcement division databases. Although the drawback from not permitting operational-level catch and effort data to be used for enforcement purposes within a tuna RFMO is that illegal and unreported fishing activities may be more difficult to detect.

In practice, tuna RFMOs have developed formats so that data can be disseminated publicly through their websites, used in presentations to meetings and published in reports. This aggregated format for dissemination of catch and effort data is fairly standardised across the tuna RFMOs (a) for surface fisheries such as purse seine: total catches by fish size, and effort by flag, gear type, month and one-degree-square, for each stock; and (b) for

⁷⁵ FAO Fishery Resources Division and Fishery Policy and Planning Division, *Fisheries Management*, vol. 4, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 1997), section 2.1.5(ii) p30.

⁷⁶ *Ibid.*, section 2.1.5(iii) p30. “Failure to do this will generate a fear amongst fishers that the data they supply to the management authority to facilitate monitoring and assessment of the stocks and fishery will be used against them by the enforcement arm. Again, this could lead to difficulties obtaining data or to falsified or incomplete data.”

longline fisheries: total catches by fish size, and effort by flag, gear type, month and five-degree-square for longline for each stock.⁷⁷ Also it is common practice for the tuna RFMO, or where appropriate the State, to adjust the fisheries data so that the fishing activities of individual vessels or operators cannot be identified. As was discussed previously, *International Commission on Conservation of Atlantic Tunas* (ICCAT) and *Indian Ocean Tuna Commission* (IOTC) receive catch and effort data reports from their membership in the same format that can be disseminated, so in these instances it is the State which is responsible for ensuring that the data it submits to ICCAT or IOTC does not compromise confidentiality of that data. Whereas for *Inter-American Tropical Tuna Commission* (IATTC) that collects its own purse seine catch and effort data, it is the IATTC Secretariat that is responsible for maintaining the confidentiality of the data that it releases publicly. In instances where non-public domain data or commercially sensitive data are being held by a tuna RFMO, appropriate security arrangements are necessary to restrict access to that data.⁷⁸ IATTC has a proven successful record of being able to guarantee confidentiality in these regards.

Tuna RFMOs, such as IATTC and *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT), which hold non-public domain data in a central database, have established request mechanisms for to enable release of non-public domain data. These mechanisms allow scientists conducting research to request access to confidential data or to data other than that which is available on websites. The requests must state the nature of information sought and the purpose for which the information will be used and this may be facilitated through a standardised request form.⁷⁹ Access to such data can be granted once

⁷⁷ CCSBT, *Report of the Tenth Annual Meeting of the Commission, 7-10 October 2003* (Christchurch, New Zealand: Commission for the Conservation of Southern Bluefin Tuna, 2006), Attachment 13-Revised Confidentiality Policy of the CCSBT Central Database and the CCSBT Statistical Document Program, *ICCAT - Assessments - Access to ICCAT Statistical databases*, [website] (ICCAT, [cited 29 January 2008]); available from <http://www.iccat.int/accessingdb.htm>, P. Ward, N. Tsirbas, and R. Kearney, *Getting Science into Regional Fisheries Management - A Global View* (Canberra, Australia: Bureau of Research Sciences, 1998), p54.

⁷⁸ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, *FAO Fisheries Circular 963* (Rome: FAO, 2001), p44.

⁷⁹ CCSBT, *Report of the Tenth Annual Meeting of the Commission, 7-10 October 2003* (Christchurch, New Zealand: Commission for the Conservation of Southern Bluefin Tuna, 2006), Attachment 13-Revised Confidentiality Policy of the CCSBT Central Database and the CCSBT Statistical Document Program, FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, *FAO Fisheries Circular 963* (Rome: FAO, 2001), p44.

permission from the source of that data has been received. Often such access will be for certain specific fisheries data, and access to that data will be conditional and includes restrictions against subsequent release to others. Such conditions ensure that the confidentiality of that data is maintained. There may also be a requirement that an account of the results obtained from the use of the data be presented for approval of the relevant tuna RFMO Secretariat or appropriate States, prior to publication or release of the results.⁸⁰

This section completes the analysis of arrangements required in tuna RFMOs for data on tuna fisheries. The next section moves on from arrangements at the level of tuna RFMO to the global level.

3.4 Arrangements required at the global level for data on tuna fisheries

As was previously discussed, coastal States and flag States are obliged to contribute and exchange scientific information and data, relevant to the conservation of fish stocks, on a regular basis and as is appropriate through “competent” international organisations and with relevant States.⁸¹ Specifically, States are obliged to exchange with other States “available scientific information, catch and fishing effort and other data relevant to the conservation of fish stocks.” The term “available” implies that for a State to meet this obligation, it is not contingent on the State having any or all of the types of data and information described, nor is it contingent on the State obtaining any additional data or information. So in meeting the standard of this obligation, States need only share with other States, directly or through competent international organisations, the fisheries data and scientific information that the State has access to and which may be relevant to the conservation of fish stocks.

⁸⁰ CCSBT, *Report of the Tenth Annual Meeting of the Commission, 7-10 October 2003* (Christchurch, New Zealand: Commission for the Conservation of Southern Bluefin Tuna, 2006), Attachment 13-Revised Confidentiality Policy of the CCSBT Central Database and the CCSBT Statistical Document Program, FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p44.

⁸¹ LOS Convention, Article 61(5) and Article 119(2): Available scientific information, catch and fishing effort statistics, and other data relevant to the conservation of fish stocks shall be contributed and exchanged on a regular basis through competent international organizations, whether subregional, regional or global, where appropriate and with participation by all States concerned. Also UN Fish Stocks Agreement, Article 5(j).

In terms of determining the international organisation that is “competent” to facilitate the exchange of fisheries data, note should be taken of the differences in the uses of fisheries data at subregional and regional levels with the uses of fisheries data collated at global levels. This distinction was highlighted in the report of the 1993 Ad Hoc Consultation on the Role of Regional Fishery Agencies in Relation to High Seas Fishery Statistics.⁸² At the subregional and regional levels, fisheries data, often at a finer scale of resolution, are contributed and exchanged for stock assessment and management related purposes. In contrast, data on tuna fisheries at the global level are more likely to be used in an aggregated form and compiled to inform the international community of status and trends in tuna fisheries.⁸³ Improving the quality and availability of fisheries data at a global level is the intent behind the Strategy for Improving Information on Status and Trends of Capture Fisheries.⁸⁴ The role of tuna RFMOs is conceptualised in UN Fish Stocks Agreement Article 7(1).⁸⁵

At the global level, the *Food and Agriculture Organisation of the United Nations* (FAO) collates and disseminates global fisheries data. Post-adoption of the LOS Convention and in the lead-up to the adoption of the UN Fish Stocks Agreement, this role of FAO was recognized by two international consultations that considered issues associated with high seas fishing and high seas fishery statistics.⁸⁶ The role of FAO in fisheries data is

⁸² FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics. La Jolla, California, USA, 13-16 December 1993*, FAO Fisheries Report 500 (Rome: FAO, 1994).

⁸³ FAO, *Report of the Ad-Hoc Consultation on Global Tuna Statistics. Colombo, Sri Lanka, 6-7 December 1985*, FAO Fisheries Report 365 (Rome: FAO, 1985), p7 para 34, FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics. La Jolla, California, USA, 13-16 December 1993*, FAO Fisheries Report 500 (Rome: FAO, 1994), 1-2 para 6. “the task of the Consultation [Ad Hoc on Role of Fishery Agencies] would be essentially to consider two levels of statistical information (i) data of a fine resolution that regional fishery agencies would require for stock assessment, management and related purposes, and (ii) aggregated data relating to high seas catches, species composition, effort, etc., that could be compiled by FAO to be made available to the international community. In this respect aggregated data held by FAO would generally not be used for stock assessment purposes.”

⁸⁴ FAO Strategy on Improving Information in Fisheries,

⁸⁵ UN Fish Stocks Agreement, Annex I, Article 7 (1) “Data collected by flag States must be shared with other flag States and relevant coastal States through appropriate subregional or regional fisheries management organizations or arrangements. Such organizations or arrangements shall compile data and make them available in a timely manner and in an agreed format to all interested States under the terms and conditions established by the organization or arrangement, while maintaining confidentiality of non-aggregated data, and should, to the extent feasible, develop database systems which provide efficient access to data.”

⁸⁶ FAO, *Papers presented at the Technical Consultation on High Seas Fishing. Rome, 7-15 September 1992*, FAO Fisheries Report 484, Suppl. (Rome: FAO, 1992), p2 para 16, FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics. La Jolla, California, USA, 13-16 December 1993*, FAO Fisheries Report 500 (Rome: FAO, 1994).

conceptualised in UN Fish Stocks Agreement Article 7(2), and will be examined in Chapter 4 of the present thesis.⁸⁷

3.5 Special requirements of developing States

There are a further set of obligations and duties arising from the UN Fish Stocks Agreement that relate to data practices in tuna RFMOs, and which are particularly relevant to Chapters 5, 6, 7 and 8 of the present thesis. Developing States are recognised by international law as having special requirements. Agenda 21 highlighted that developing States needed specific assistance in regard to fisheries data and fisheries science to improve the capacity of such States to participate effectively in fisheries conservation and management both in areas under national jurisdiction and high seas.⁸⁸ Further Agenda 21 proposed the establishment or strengthening of subregional or regional “Centres for the development and diffusion of scientific information and advice” to assist small island developing States with marine resources management.⁸⁹ “Special support, including cooperation among States, will be needed to enhance the capacities of developing countries in the areas of data and information, scientific and technological means, and human resource development in order to participate effectively in the conservation and sustainable utilization/use of high seas marine living resources/marine living resources under national jurisdiction.”⁹⁰

The relevant provisions for the special requirements of developing States are set out in Part VII of the UN Fish Stocks Agreement. Developing States are to receive assistance in relation to the conservation and management of tuna and billfish stocks and the development of fisheries for such stocks, because they have special requirements that should be recognised by other States. These special requirements recognise that developing States are vulnerable and depend on marine living resources for nutrition; that often subsistence, small-scale and artisanal fishers are significant components of developing

⁸⁷ UN Fish Stocks Agreement, Annex I, Article 7 (2) “At the global level, collection and dissemination of data should be effected through the Food and Agriculture Organization of the United Nations. Where a subregional or regional fisheries management organization or arrangement does not exist, that Organization may also do the same at the subregional or regional level by arrangement with the States concerned.”

⁸⁸ Agenda 21, Chapter 17, paras 17.6, 17.68 and 17.95.

⁸⁹ Ibid., para 17.133.

⁹⁰ Ibid., paras 17.68 and 17.95.

State fisheries, particularly small-island developing State fisheries; and that consequently developing States should not have to bear a disproportionate share of the burden of conservation action.⁹¹ Accordingly, States are obliged to cooperate, either directly or through relevant organisations including tuna RFMOs, to enhance the ability of developing States to conserve and manage stocks and to develop their own fisheries for such stocks.⁹² Such efforts should also enable developing States to participate in high seas fisheries for such stocks; and to facilitate the participation of developing States in subregional or regional fisheries management organisations or arrangements.⁹³

The UN Fish Stocks Agreement Article 25 specifies areas where assistance in tuna conservation and management should be directed to, for the benefit of developing States. The areas where assistance should be directed to include but are not limited to “improved conservation and management of straddling fish stocks and highly migratory fish stocks through collection, reporting, verification, exchange and analysis of fisheries data and related information; stock assessment and scientific research; and monitoring, control, surveillance, compliance and enforcement, including training and capacity-building at the local level, development and funding of national and regional observer programmes and access to technology and equipment.”⁹⁴ Additionally with respect to arrangements for data on tuna fisheries UN Fish Stocks Agreement Annex I Article 1(2) provides some guidance on how these obligations should be implemented:

Assistance, including training as well as financial and technical assistance, shall be provided to developing States in order to build capacity in the field of conservation and management of living marine resources. Assistance should focus on enhancing capacity to implement data collection and verification, observer programmes, data analysis and research projects supporting stock assessments. The fullest possible involvement of developing State scientists and managers in conservation and management of straddling fish stocks and highly migratory fish stocks should be promoted.⁹⁵

These areas for assistance to developing States are an essential part of the international legal framework for tuna fisheries data that has been discussed throughout the previous and present Chapter.

⁹¹ UN Fish Stocks Agreement, Article 24(2a - c).

⁹² Ibid., Article 25(1).

⁹³ Ibid.,

⁹⁴ Ibid., Article 25(3).

⁹⁵ Ibid., Annex I, Article 1(2), Code of Conduct for Responsible Fisheries, Article 12.18.

Tuna RFMOs have implemented the elements of UN Fish Stocks Agreement Part VII in different ways. First, *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT) provides financial assistance to cover the costs of certain developing States to observe its meetings. Also financial assistance has been given to Indonesia for participation in CCSBT activities and assistance provided to build fisheries administration in relation to southern bluefin tuna.⁹⁶ Second, in *International Commission for the Conservation of Atlantic Tunas* (ICCAT), the adoption of the Madrid Protocol has significantly reduced the financial costs to some developing States of membership of the Commission. The Commission also manages special research programmes that may be used to provide assistance in data collection and submission.⁹⁷ Third, in *Inter-American Tropical Tuna Commission* (IATTC), Article XXXIII of the Antigua Convention (not yet in force) provides for measures on technical assistance, technology transfer and other forms of cooperation with the purpose of assisting developing States that are members of IATTC to fulfil their obligations under the Convention.⁹⁸ Additionally some RFMOs have also developed their own capacity-building funds that are not related to UN Fish Stocks Agreement Part VII special requirements fund. For example, several ICCAT contracting Parties have made available substantial funds to finance improved data collection and reporting activities in ICCAT.⁹⁹

Recently the Joint Tuna RFMO meeting in Kobe, Japan in January 2007 identified as a key area and challenge to be urgently addressed by tuna RFMOs. The meeting noted that the “provision of adequate capacity building assistance, including human resource development, for developing coastal states, particularly small island developing states and territories, towards responsible fishery development, including participation in RFMO and scientific meetings, fisheries data collection and stock assessment and implementation of

⁹⁶ United Nations, *Report of the Secretary General prepared for the Conference to Review the provisions of the 1995 Agreement for the Implementation of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*, UN Doc. A/CONF.210/2006/1 (2006), para 292-307.

⁹⁷ M. W. Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007), p99.

⁹⁸ Ibid.

⁹⁹ ICCAT, *Resolution by ICCAT on Improvements in Data Collection and Quality Assurance (Resolution 03-21)*.

MCS measures.”¹⁰⁰ Also noting the decisions of most tuna RFMOs to undertake a performance review in 2008, the performance of each tuna RFMO will be assessed against the two criteria related to the “Special requirements of developing States”.¹⁰¹ These two criteria are first, the “extent to which the RFMO recognizes special needs of developing States” and second, the “extent to which RFMO members, individually or through RFMO, provide relevant assistance to developing States.”¹⁰²

Conclusion

This Chapter has completed the two-part analysis of the international legal framework for data on tuna fisheries. The international legal requirements, recommended best practice standards and data practices which are required in tuna RFMOs for the handling and treatment of data on tuna fisheries as they relate to compilation, verification and exchange of data on tuna fisheries are now clear. Also, the requirements in tuna RFMOs with respect to provision of assistance to developing States are clear. The findings of the present Chapter can comfortably be used as a basis in later Chapters to complete analyses of the data practices for western and central Pacific Ocean tuna fisheries. In particular, data practices for compilation, verification, dissemination and to maintain confidentiality of fisheries data. Additionally the obligations and duties with respect to the special requirements of developing States are particularly relevant because many State participants in these fisheries are small-island developing States. Hence, for the *Commission for the Conservation and Management of Highly Migratory Fish Stocks* (WCPFC), the special requirements of developing States should be an important consideration in the establishment of data practices for tuna fisheries in the western and central Pacific Ocean.

¹⁰⁰ *Report of the Joint Meeting of Tuna RFMOs, January 22-26, (Kobe, Japan: 2007), Appendix 14: Course of Actions for RFMOs from Kobe Meeting of Joint Tuna RFMOs, January 26 2007.*

¹⁰¹ See Chapter 1.4 *Achieving long-term conservation and sustainable use of tuna fisheries through fisheries management.*

¹⁰² United Nations, *Sixth round of Informal Consultations of State Parties to the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (New York, 23 - 24 April 2007), ICSP6/UNFSA/REP/INF.1* (New York: United Nations, 2007), Annex II Recommended Minimum Criteria for Reviewing the Performance of Regional Fisheries Management Organizations (RFMOs)

The present Chapter also established the FAO is the centre for the compilation of fisheries data at the global level. The next Chapter will analyse the implementation of the global framework for fisheries data.

Chapter 4. Global Institutional Framework for data on tuna fisheries: the role of the Food and Agriculture Organisation of the United Nations

The collation and dissemination of fisheries data at a global level is important for providing a global scale view of fisheries trends.¹ Such a global view is consistent with an ecosystem approach to fisheries management, which recognises that marine fish stocks exist within ecosystems that are contained within inter-connected bodies of water.² Information devised with such a global view, provides insight into commonalities and differences within and among fisheries in different regional areas. Insights can be gained into fisheries management problems, and lessons or solutions can be learnt, devised and shared.³ The collation of information at the global level is a coarse, broad-brushed approach to viewing international issues. In comparison at the regional or subregional level, information can be applied more directly to address specific problems within those regions. Nevertheless a global perspective allows the international community to be informed of constructive and effective means to achieve responsible fisheries, globally “FAO is the only source of comprehensive global fishery statistics and most reviews of the state of the world fisheries, past trends and future prospects rely on FAO statistics.”⁴

¹ FAO, *Report of the Ad-Hoc Consultation on Global Tuna Statistics. Colombo, Sri Lanka, 6-7 December 1985.*, FAO Fisheries Report 365 (Rome: FAO, 1985), p7 para 34. Three main purposes for which data were required were identified as follows: 1) to provide a global overview of world tuna production by species and by countries; 2) to provide detailed information for stock assessment purposes; 3) to provide countries with information on fishing activities in their EEZs. The consultation agreed that 2) and 3) were the tasks of regional fishery agencies, but 1) was a task for FAO.

² Code of Conduct, Articles 6 and 7, FAO Fisheries Department, *Fisheries Management: The ecosystem approach to fisheries*, vol. 4 Suppl. 2, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 2003), p14..”an ecosystem approach to fisheries (EAF) strives to balance diverse societal objectives, by taking account of the knowledge and uncertainties of biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries.

³ FAO, *Report of the Technical Consultation on High Seas Fishing. Rome, 7-15 September 1992*, FAO Fisheries Report 484 (Rome: FAO, 1992), p1 para 8. “The Consultation agreed on the need for accurate and complete statistical reporting on fisheries in all waters particularly on the high seas fisheries, both for monitoring and evaluating high seas catches and as an essential instrument for research and fisheries management.”

⁴ FAO Fisheries Department - Information, Data and Statistics Unit, [website] (FAO Fishery Department, [cited April 10 2002]); available from <http://www.fao.org/fi/struct/fidi.asp#FDESC>.

This Chapter examines the role of the *Food and Agriculture Organisation of the United Nations* (FAO) in data on tuna fisheries at the global level. The Chapter will comprise five parts. First, the role of FAO in global fisheries data will be reviewed. The second section will examine fisheries data compilation practices in FAO. The third section will examine practices to verify fisheries data held by FAO. Fourth, the practices for dissemination of global fisheries data and information will be examined. The fifth section will examine the quality of global fisheries data, and the implications of the findings to the quality of fisheries data held by FAO. Recent developments to improve the quality of fisheries data and information at the global level will also be reviewed.

4.1 Overview

The collation and sharing of data at the global level is desirable for deriving a world-scale view of fisheries globally. The international legal basis for the role of FAO in the collation and sharing of fisheries data at the global level stems from two sources: international fisheries legal instruments and the constituting treaties for FAO.⁵ Members of FAO are obliged under Article XI of the FAO Constitution to communicate various information to FAO including statistical, technical and other information published or issued by the government, and other information requested by FAO-related bodies.⁶

⁵ The basis in international fisheries law was previously discussed in Chapter 3 *3.4 Arrangements required at the global level for data on tuna fisheries*. The relevant international legal provisions include UN Fish Stocks Agreement, Annex I Article 7(2), LOS Convention, Article 61(5) and Article 119(2).

⁶ FAO, *Basic Texts of the Food and Agriculture Organization of the United Nations (Volumes I and II - 2000 edition)* (Rome: FAO, 2001), FAO Constitution, Article XI: Reports by Member Nations and Associate Members “1. All Member Nations and Associate Members shall communicate regularly to the Director-General, on publication, the texts of laws and regulations pertaining to matters within the competence of the Organization which the Director-General considers useful for the purposes of the Organization. 2. With respect to the same matters, all Member Nations and Associate Members shall also communicate regularly to the Director-General statistical, technical and other information published or otherwise issued by, or readily available to, the government. The Director-General shall indicate from time to time the nature of the information which would be most useful to the Organization and the form in which this information might be supplied. 3. Member Nations and Associate Members may be requested to furnish, at such times and in such form as the Conference, the Council or the Director-General may indicate, other information, reports or documentation pertaining to matters within the competence of the Organization, including reports on the action taken on the basis of resolutions or recommendations of the Conference.”

The FAO was established in 1945 as a specialized agency of the United Nations.⁷ FAO describes itself as an organisation that “that leads international efforts to defeat hunger. Serving both developed and developing countries, FAO acts as a neutral forum where all nations meet as equals to negotiate agreements and debate policy. FAO is also a source of knowledge and information. We help developing countries and countries in transition modernize and improve agriculture, forestry and fisheries practices and ensure good nutrition for all.”⁸ FAO was created to *inter alia* improve the efficiency of food and agriculture production, which is broadly interpreted to include *inter alia* fisheries.⁹ The compilation, analysis and dissemination of data and information are an important part of FAO’s mandate “The Organization shall collect, analyse, interpret and disseminate information relating to nutrition, food and agriculture.”¹⁰

The organisational structure of FAO is comprised of three major elements: (1) the Conference, in which all member States are represented; (2) the Council, which is composed of forty nine States elected by the conference;¹¹ and (3) the Staff, which are divided between eight departments and headed by a Director-General.¹² In fisheries matters, it is the Conference and a subsidiary body of the Council the Committee on Fisheries (COFI), which are FAO’s decision-making bodies and that determine the role of FAO in the area of marine fisheries.¹³ The COFI has been described by FAO as “The Committee presently constitutes the only global inter-governmental forum where major international fisheries and aquaculture problems and issues are examined and recommendations addressed to governments, regional fishery bodies, NGOs,

⁷ Ibid., FAO Constitution. The FAO Constitution was adopted in 1945, but amendments have been made over the years. The most recently amended version to date is the 2000 edition.

⁸ ‘FAO at Work: About Us’ http://www.fao.org/unfao/about/index_en.html accessed: 26 September 2005 2:00 PM.

⁹ FAO, *Basic Texts of the Food and Agriculture Organization of the United Nations (Volumes I and II - 2000 edition)* (Rome: FAO, 2001), FAO Constitution, Article I(1).

¹⁰ Ibid., FAO Constitution, Article I(1)

¹¹ FAO, *FAO Governing Bodies: FAO Council* [Website] (2008 2008 [cited 29 February 2008]); available from http://www.fao.org/unfao/govbodies/CouncilFinal_en.htm. Of the 49 seats on the Council 1 seat is allocated for the 16 member nations of the South-west Pacific (fourteen Pacific Island States, Australia and New Zealand). The FAO Council seat will be held by Australia until 31 December 2008.

¹² The eight departments of FAO are: Administration and Finance, Agriculture, Economic and Social, Fisheries, Forestry, General Affairs and Information, Sustainable Development and Technical Cooperation.

¹³ *FAO Fisheries Department - Mission Statement for the Fisheries Department of FAO*, [website] (FAO Fishery Department, [cited June 4 2002]); available from <http://www.fao.org/fi/struct/mission/english.asp>. COFI was established by the FAO Conference at its Thirteenth Session in 1965. Being a subsidiary body of FAO, membership and participation is open to all members of FAO, but membership each biennium requires formal application.

fishworkers, FAO and international community, periodically on a worldwide basis. COFI has also been used as a forum in which global instruments and non-binding instruments were negotiated.”¹⁴

The mission of the FAO Fisheries Department is to “facilitate and secure the long-term sustainable development and utilization of the world’s fisheries and aquaculture.”¹⁵ In its international advisory capacity, FAO compiles reports on fisheries problems and on national fisheries legislation, and provides fisheries technical assistance and advice, including legal advice, directly and collectively to members, including developing countries.¹⁶ More recently the FAO Fisheries Department has been fully involved in the implementation of the Code of Conduct for Responsible Fisheries, including the production of FAO Technical Guidelines and implementation of the four international plans of action.¹⁷

The Fisheries Information, Data and Statistics Unit (FIDI) is the focal point for the fisheries data functions of FAO; it fulfils the fisheries part of FAO’s overarching information function: “to collect, analyse, interpret and disseminate information relating to nutrition, food and agriculture.”¹⁸ In 2000, the FAO Fisheries Department adopted the ‘Information Strategy: Supporting Informed Decisions and Actions’.¹⁹ It is designed to achieve the Fisheries Departments goal of “developing a reliable, comprehensive, integrated information base on fisheries and aquaculture, and facilitating international collaboration and promoting further the role of FAO as an

¹⁴ Ibid, J. Swan and B. P. Satia, *Contribution of the Committee on Fisheries to Global Fisheries Governance 1977-1997*, 938 (Rome: FAO, 1999). Examples of instruments that have been negotiated in COFI include the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas of 24 November 1993, entered into force from 24 April 2003 (1994) 33 *ILM* 968 and Code of Conduct, adopted by FAO Conference on 31 October 1995, reprinted in (1995) *International Organizations and the Law of the Sea Documentary Yearbook* p.700. COFI had a supportive role in the negotiation of the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, of 4 December 1995, entered into force from 11 December 2001 (1995) 34 *ILM* 1542 (UN Fish Stocks Agreement). See Chapter 2 2.1 *Background and overview*.

¹⁵ FAO Fisheries Department - *Mission Statement for the Fisheries Department of FAO*, [website] (FAO Fishery Department, [cited June 4 2002]); available from <http://www.fao.org/fi/struct/mission/english.asp>.

¹⁶ P. Birnie and A. Boyle, *International Law and the Environment*, 2 ed. (New York, United States: Oxford University Press, 2002), 655.

¹⁷ FAO Fisheries Department, *FAO Fisheries Department Information Strategy: Supporting Informed Decisions and Actions* (Rome: FAO, 2000). See Chapter 2 2.1 *Background and overview*

¹⁸ FAO, *Basic Texts of the Food and Agriculture Organization of the United Nations (Volumes I and II - 2000 edition)* (Rome: FAO, 2001), Articles I(1).

¹⁹ FAO Fisheries Department, *FAO Fisheries Department Information Strategy: Supporting Informed Decisions and Actions* (Rome: FAO, 2000).

international forum.”²⁰ The Fisheries Information Strategy is intended to be dynamic and to be needs driven so it can be tailored to meeting the changing needs of the Fisheries Departments primary targets: the member governments of FAO and relevant international organizations and regional fishery bodies.

The global fisheries data framework

FAO has 188 members, which includes fourteen Pacific Island States²¹ that participate to varying degrees in the fisheries-related work of FAO.²² Members of FAO are required to provide fisheries data and information to FAO.²³ These fisheries data reports from FAO members are among the sources for data held by FAO in the global fisheries databases. National reports are the main but not the only source of data used by FAO.²⁴ Data is also obtained from publications, projects and surveys and is provided by regional fishery bodies.²⁵ All data collected by FAO is public domain data often in aggregated by time and area strata by flag; therefore there are no issues of

²⁰ Ibid.

²¹ All fourteen of the Pacific Island States (Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu) that are of interest to the present thesis are also members of FAO, and they became members at different times over the period 1971 – 2003.

²² FAO, *FAO Governing Bodies: FAO Members* [Website] (2008 2008 [cited 29 February 2008]); available from http://www.fao.org/unfao/govbodies/memberships_reg_en.htm. Australia and New Zealand are among the founding members of FAO (member since 16 October 1945).

²³ FAO, *Basic Texts of the Food and Agriculture Organization of the United Nations (Volumes I and II - 2000 edition)* (Rome: FAO, 2001)., Article XI: Reports by Member Nations and Associate Members.

“1. All Member Nations and Associate Members shall communicate regularly to the Director-General, on publication, the texts of laws and regulations pertaining to matters within the competence of the Organization which the Director-General considers useful for the purposes of the Organization.

2. With respect to the same matters, all Member Nations and Associate Members shall also communicate regularly to the Director-General statistical, technical and other information published or otherwise issued by, or readily available to, the government. The Director-General shall indicate from time to time the nature of the information which would be most useful to the Organization and the form in which this information might be supplied.

3. Member Nations and Associate Members may be requested to furnish, at such times and in such form as the Conference, the Council or the Director-General may indicate, other information, reports or documentation pertaining to matters within the competence of the Organization, including reports on the action taken on the basis of resolutions or recommendations of the Conference.”

²⁴ FAO Fisheries Department, *Fishery Statistics: Reliability and Policy Implications* [website] (FAO Fisheries Department, 2002 [cited May 26 2003]); available from http://www.fao.org/fi/statist/nature_china/30jan02.asp accessed 26 May 2003.

²⁵ FAO, *Report of the twentieth session of the Coordinating Working Party on Fishery Statistics. Victoria, Seychelles, 21–24 January 2003, FAO Fisheries Report 709* (Rome: FAO, 2003), paper presented at CWP20 'Report by FAO: Paper CWP-20/FAO'.

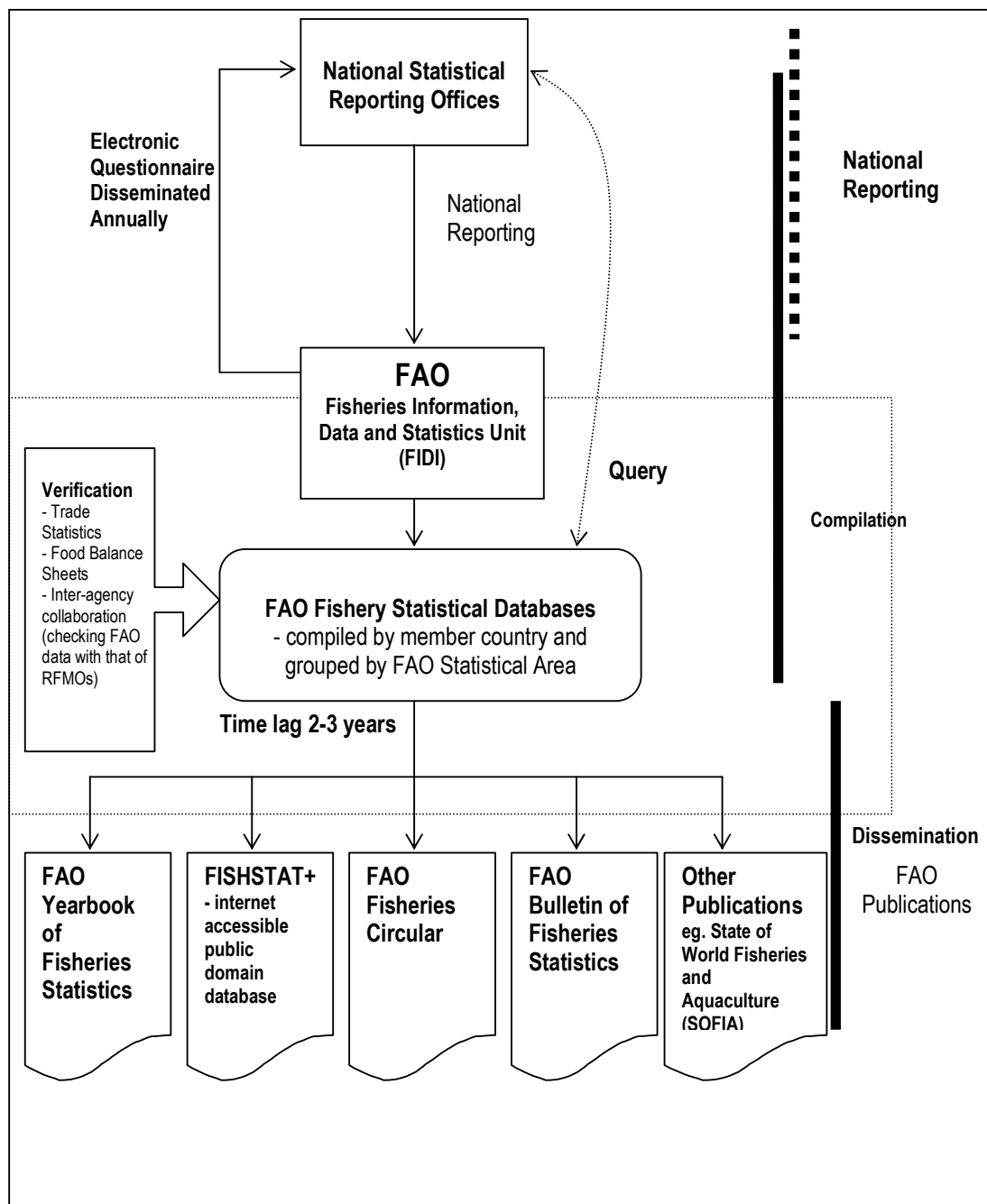


Figure 4-1. A schematic illustration of practices for global fisheries data effected through the FAO. Each of the processes of compilation, verification and dissemination of global fisheries data will be further examined by the present Chapter.

confidentiality relating to FAOs global fisheries database.²⁶ Fisheries data held by FAO are maintained in databases and disseminated through publications and electronic media. For example, aggregated data also is available through the FAO website and can be accessed using the downloadable FISHSTAT+ software.²⁷ The processes of compilation and dissemination of global fisheries data are illustrated in Figure 4-1. Each of the processes illustrated in Figure 4-1 will be examined in detail in the sections of the present Chapter that follow.

4.2 Compiling global fisheries data

The process of compiling global fisheries data begins with national reports from FAO members and is completed once a final version of the relevant FAO Fishery Statistical databases for a given year are published (see Figure 4-1). This section will consider the process of compiling global fisheries data in two parts: first the process that FAO collects national reports from FAO members will be analysed; and second the statistical areas used by FAO for compiling data will be analysed.

National reporting

The primary means through which FAO obtains global fisheries data is through statistical questionnaires that are issued to national reporting offices. The most widely used questionnaire is the FISHSTAT questionnaires that can collate information for either an individual countries fishing activity or for a particular region.²⁸ FISHSTAT questionnaires are used by FAO to collate global statistics on annual catch and

²⁶ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics*. La Jolla, California, USA, 13-16 December 1993, *FAO Fisheries Report 500* (Rome: FAO, 1994), p10 para 37. "...the primary responsibility for ensuring confidentiality of data provided to FAO should remain with the national authorities and regional fishery agencies. Consequently, such data provided to FAO would need to be in aggregated format. This would be necessary because FAO generally disseminates data to the international community without restriction."

²⁷ FAO Fisheries Statistics website: <<http://www.fao.org/fi/statist/statist.asp>>

²⁸ FAO, *The Coordinating Working Party on Fishery Statistics; Its Origin, Role and Structure*, 903 (Rome: FAO, 1995), para 25. The two forms that are most relevant to this thesis are the FISHSTAT NS 1 and FISHSTAT FF statistical questionnaire forms. FISHSTAT NS 1 is the form for reporting statistics on nominal catches of fish, crustaceans, molluscs by species items and major fishing areas. Fishing effort is recorded on the FISHSTAT FF form; FF1 records the total number of national fishing vessels with decks and FF2 records those fishing vessels without decks.

Additionally, there is a specialised type of questionnaire that is used by FAO to collect catch and effort data named the STATLANT questionnaires. STATLANT are issued by FAO to national authorities, on behalf of the relevant regional fisheries body to collect fisheries statistics for use by FAO and the relevant regional organisations. STATLANT are currently only used in the Atlantic, Southern Ocean and the Mediterranean Sea.

production from over 220 countries and for over 1000 species of aquatic organisms of significant commercial importance in inland and marine areas.²⁹ It should be noted that the FISHSTAT questionnaire record landings, and the FAO fishing areas in which the fish was caught.³⁰ The FISHSTAT questionnaires do not record discards, the type of fishing gear used, or whether the catches occurred in EEZ areas or high seas areas. Moreover it is at the discretion of the individual country to determine how they report fisheries landings data. For example, fisheries data may be provided to species level or genus level or even higher levels of aggregation eg Elasmobranchii (sharks, rays skates etc), Osteichthyes (marine bony fishes).³¹

Originally FISHSTAT questionnaires were issued in hard-copy form, now they are electronically circulated to national and regional reporting offices via the FAO website and electronic submissions are encouraged. Since 2001, all FAO summary statistical questionnaires have been available in electronic format on the FAO website.³² Increasingly national correspondents are returning questionnaires via email, although some correspondents still return their electronically-accessed questionnaires via fax or mail to FAO.³³ National agencies may report their fisheries statistics in the exact format of the FAO questionnaire or they may report to FAO in a form tailored by the individual country or following some other international standard, such as a regional standard.³⁴

FAO Major Fishing Areas for Statistical Purposes

When compiling data on a global-scale, it is helpful to have standard sub-divisions of the whole area for statistical purposes, to aid in dividing up the areas of the world in a

²⁹ Ibid., para 29.

³⁰ Data should record nominal catches, i.e. live weight equivalent of landings to be expressed in metric tons. Where data are not in live weight, States are to indicate such exceptions. Reported catches should cover all industrial, artisanal, subsistence fisheries, excluding aquaculture. Catches from recreational fisheries should also be included. Catches should exclude data on discards. Catches should include data on nominal catches of national flag vessels landed in foreign ports, but should exclude catches of foreign flag vessels landed in your port.

³¹ This issue of the aggregation of catches by taxa is a problem that affects the quality of FAO's global fisheries data, and will be further discussed later in the present Chapter.

³² The electronic availability and submission of FAO questionnaires is encouraged to improve the timeliness of national report submission. Timeliness of national reports and its impact on the dissemination of FAO's global fisheries data will be further discussed later in the present Chapter.

³³ FAO, *Report of the twentieth session of the Coordinating Working Party on Fishery Statistics*. Victoria, Seychelles, 21–24 January 2003, *FAO Fisheries Report 709* (Rome: FAO, 2003), paper presented at CWP20 'Report by FAO: Paper CWP-20/FAO'.

³⁴ Ibid. For example in regards to the return of capture production statistics, a European national reporting agencies may return fisheries statistics to FAO in three formats: the FISHSTAT-NS1 form; STATLANT form or in a form tailored by the country or following some other international standard such as the EUROSTAT standard.

logical and meaningful way. The partitioning the oceans of the world is not a simple task because there are a range of phenomena that could be observed, and it is difficult to define boundaries for sub-divisions of the world that would accommodate all potential useful divisions.³⁵ FAO uses twenty-seven major fishing areas for statistical purposes: eight major inland fishing areas covering the inland waters of the continents³⁶ and nineteen major marine fishing areas covering the waters of the Atlantic, Indian, Pacific and Southern Oceans, with their adjacent seas.³⁷ The FAO admits that its “FAO major fishing areas for statistical purposes are arbitrary areas, the boundaries of which were determined in consultation with international fishery agencies on various considerations.”³⁸

Figure 4-2 (over page) illustrates the major fishing areas used by FAO for statistical purposes. The boundaries of FAO’s major fishing areas for statistical purposes have been determined in taking into account a number of considerations, including the boundaries of existing regional fishery agency boundaries and the natural transitions between ecological factors.³⁹ Other factors that were considered in determining the boundaries of FAO’s major fishing areas are that: the boundaries should not cut through major fishing areas and they should lie in areas of low fishing intensity; historical time series of data should be able to be adjusted to the new fishing areas; and the boundaries should take into account the feasibility and ease of reporting

³⁵ A. Longhurst, *Ecological Geography of the Sea* (San Diego, California: Academic Press, 1998), p78.

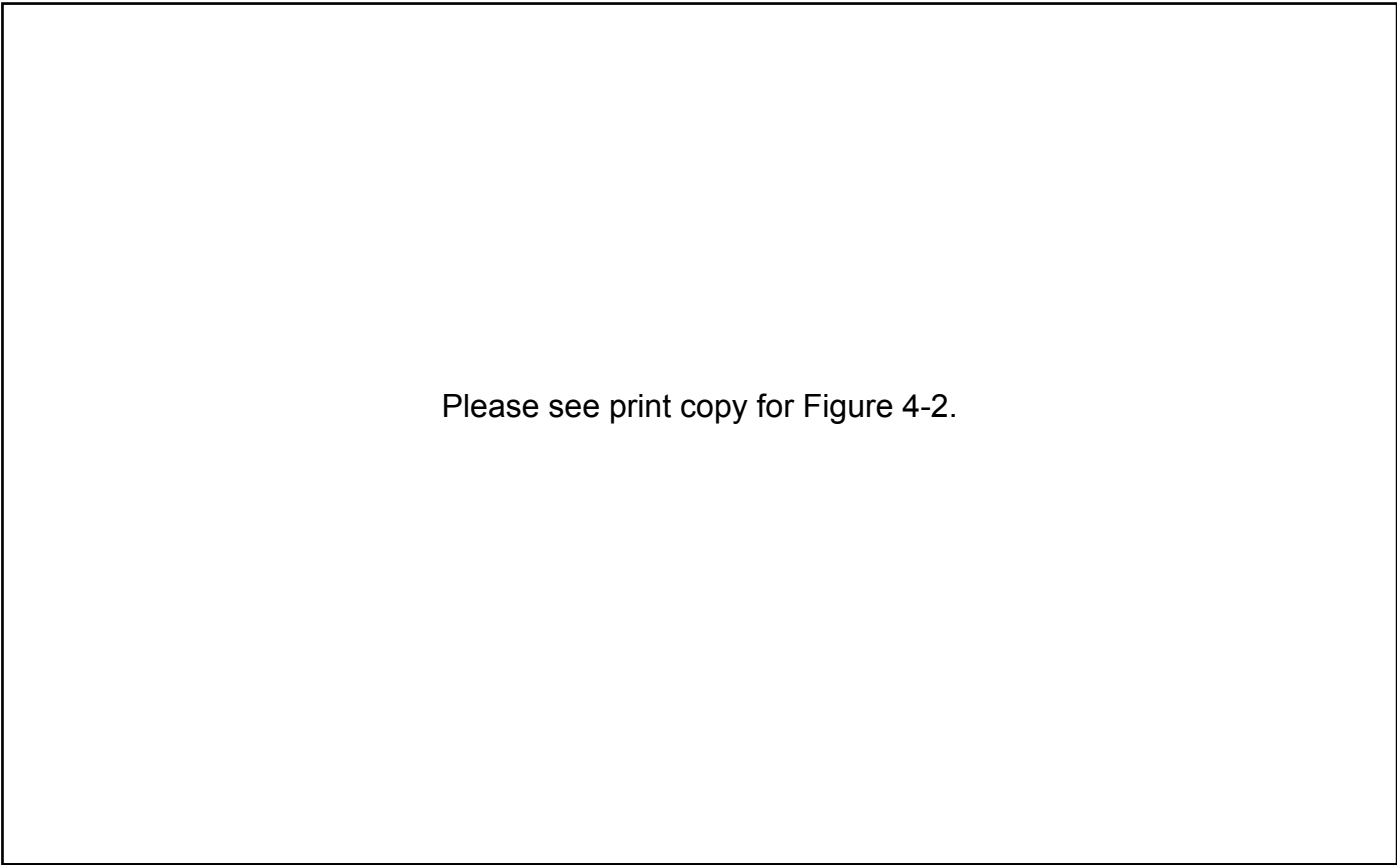
³⁶ Inland major fishing areas: 01 Africa-inland waters; 02 North America-inland waters; 03 South America- inland waters; 04 Asia-inland waters; 05 Europe-inland waters; 06 Oceania-inland waters; 07 Former USSR-inland waters (since 1988 statistics divided between 04 and 05); 08 Antarctica-inland waters.

³⁷ Major fishing areas: 18 Arctic Sea; 21 Northwest Atlantic; 27 Northeast Atlantic; 31 Western Central Atlantic; 34 Eastern Central Atlantic; 37 Mediterranean and Black Sea; 41 Southwest Atlantic; 47 Southeast Atlantic; 48 Atlantic, Antarctic; 51 Western Indian Ocean; 57 Eastern Indian Ocean; 58 Indian Ocean, Antarctic and Southern; 61 Northwest Pacific; 67 Northeast Pacific; 71 Western Central Pacific; 77 Eastern Central Pacific; 81 Southwest Pacific; 87 Southeast Pacific; 88 Pacific, Antarctic.

³⁸ FAO, *CWP Handbook of Fishery Statistical Standards* (Rome: FAO, 2005), Section G: Fishing Areas - General.

³⁹ Ibid. The factors considered in determining the boundaries of statistical areas include:

- (i) the boundary of natural regions and the natural divisions of oceans and seas;
- (ii) the boundaries of adjacent statistical fisheries bodies already established in inter-governmental conventions and treaties;
- (iii) existing national practices;
- (iv) national boundaries;
- (v) the longitude and latitude grid system;
- (vi) the distribution of the aquatic fauna; and
- (vii) the structure of the resources and the environmental conditions within an area.



Please see print copy for Figure 4-2.

Figure 4-2. FAO Major Areas for Statistical Purposes.

Source: FAO Fisheries website: accessed from <http://www/fao.org/fi/>

by flag States fishing in the area.⁴⁰

For practicality it is internationally accepted standard practice to divide the FAO major fishing areas for statistical purposes into subareas, then divisions and then subdivisions. The dividing of major fishing areas have, however, only been established formally for the Atlantic Ocean (within major areas 21, 27, 34, 37, 41, 47), the Antarctic (within major areas 48, 58, 88), the south-east Pacific (within major area 87) and more recently sub areas have been established in the Indian Ocean (within major areas 51, 57, 71, 81).⁴¹ Dividing up the major fishing areas has the advantage of improving the precision of the fisheries data that is obtained by reducing the overall size of the reporting area.

A recent study by Watson *et al* that examines the causal relationships between fishing and ecological change, produced maps of global fishery landings through spatially disaggregating FAO's aggregated global fisheries data using a rule-based approach and ancillary data. Watson *et al* criticised FAO's fishing areas for statistical purposes, for being too large for use in managing fisheries and the impacts of the fisheries on the marine environment, even with the sub-divisions.⁴² They estimate the average size of FAO's major fishing areas for statistical purposes to be twenty-one million square kilometres. Further they draw the conclusion that statistical areas of this size do not report data of fisheries with the spatial precision required to be of use for effectively monitoring and investigating impacts of fishing.⁴³

The boundaries of FAO major fishing areas are noted by FAO as having been determined taking into consideration a number of considerations that include ecological considerations, and also socio-political considerations. The ecological considerations include the boundary of natural regions and the natural divisions of oceans and seas; the distribution of the aquatic fauna; and the structure of the resources and the environmental conditions within an area.⁴⁴ The effectiveness of the FAO major fishing areas in accounting for ecological considerations can be evaluated by comparing to an

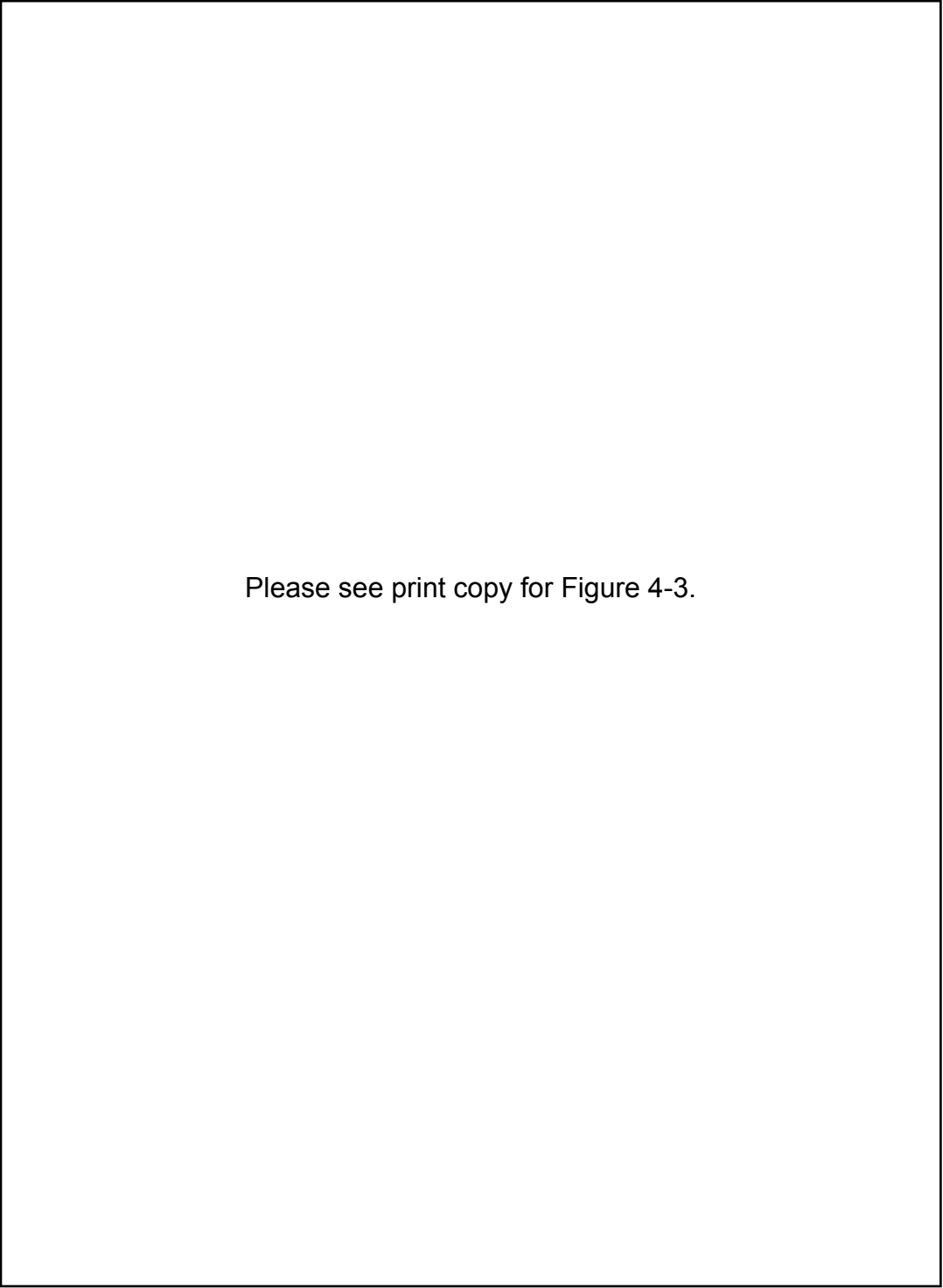
⁴⁰ FAO, *Report of the seventeenth session of the Coordinating Working Party on Fishery Statistics. Hobart, Tasmania, 3-7 March 1997*, FAO Fisheries Report 555 (Rome: FAO, 1997), FAO, *Report of the eighteenth session of the Coordinating Working Party on Fishery Statistics. Luxembourg, Grand Duchy, 6-9 July 1999*, FAO Fisheries Report 608 (Rome: FAO, 1999).

⁴¹ FAO, *CWP Handbook of Fishery Statistical Standards* (Rome: FAO, 2005), Section H: Fishing Areas for Statistical Purposes.

⁴² R. Watson et al., "Mapping global fisheries: sharpening our focus," *Fish and Fisheries* 5 (2004): 168-177, p169.

⁴³ *Ibid.*, 169.

⁴⁴ FAO, *CWP Handbook of Fishery Statistical Standards* (Rome: FAO, 2005).



Please see print copy for Figure 4-3.

Figure 4-3. The approximate boundaries of the 51 Longhurst Areas or global biogeochemical provinces, based on pelagic ecology and oceanography.

Source: Longhurst, A. *Ecological Geography of the Sea* (San Diego, California: Academic Press 1998) p400-401

alternative method of subdividing the oceans: 51 Longhurst Areas.⁴⁵ Longhurst Areas are an alternative way of partitioning the ocean into provinces, which are determined from the consideration of pelagic ecological factors; surface chlorophyll distributions; regional oceanography under different seasonal and meteorological conditions; plankton ecology and other sources of environmental data.⁴⁶ The rationale for Longhurst Areas, in the words of Longhurst are that

Apart from the problem that the compartments defined by most existing schemes have inadequately defined boundaries, the compartments of those actually used in practical applications have little basis in oceanography. Consider the partitioning of global fishery statistics among subareas of the ocean by the United Nations Food and Agriculture Organisation (FAO) for the past many decades. These compartments have been used ... as if they represented natural areas of the ocean, though a glance at the FAO map will show that they conform to no possible oceanographic reality.⁴⁷

Longhurst Areas are considered by many in the scientific community to be rigorous definitions for the ecological provinces of the world, and have been used in published studies to stratify the world's primary production and tuna catches, and to complement the coastal-focussed large marine ecosystem provinces.⁴⁸ More recently the Longhurst "Western Pacific Warm Pool Province (WARM)" biogeochemical province was used as the basis for changes to the stock assessment model areas for yellowfin tuna and bigeye tuna in the *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPFC).⁴⁹

Longhurst areas differ from FAO major fishing areas for statistical purposes in a

⁴⁵ For a comprehensive account of Longhurst Areas see A. Longhurst, *Ecological Geography of the Sea* (San Diego, California: Academic Press, 1998).

⁴⁶ For a comprehensive account of Longhurst Areas see Ibid.

⁴⁷ Ibid., p79. Longhurst used the example of FAO major fisheries statistical area 57 as the 'most extreme example' in support of his point that FAO areas do not conform to oceanographic realities. In the words of Longhurst "To put part of the Southern Ocean together with the Bay of Bengal for fishery purposes is a breathtaking denial of the natural order of the ocean and also of political reality."

⁴⁸ A. Fonteneau, *Atlas of Tropical Tuna Fisheries* (Paris: ORSTOM, 1998), D. Pauly, "Longhurst Areas - Ecological Geography of the Sea," *Trends in Ecology and Evolution* 14, no. 3 (1999): 118, R. Watson et al., "Chapter 16. Mapping Fisheries onto Marine Ecosystems for Regional, Oceanic and Global Integrations," in *Large Marine Ecosystems of the World*, ed. G. Hempel and K. Sherman (Elsevier, 2003), R. Watson et al., "Mapping global fisheries: sharpening our focus," *Fish and Fisheries* 5 (2004): 168-177.

⁴⁹ WCPFC, *Report of the First Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 8-19 August 2005*, WCPFC/Comm.2/22 (Noumea, New Caledonia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean,, 2005), Report of ME-SWG para 178.

A large rectangular box with a thin black border. In the center of the box, the text "Please see print copy for Figure 4-4." is written in a black, sans-serif font.

Please see print copy for Figure 4-4.

Figure 4-4. Illustration to compare the FAO major areas for statistical purposes (61, 67, 71, 77, 81, 87) with areas of competence of Inter-American Tropical Tuna Commission (IATTC) and Commission for the Conservation of Highly Migratory Fish Stocks of the Western and Central Pacific Ocean (WCPFC).

Source FAO Fisheries website: accessed from <http://www.fao.org/fi/>; (Accessed 28th October 2003 6.37pm ftp://ftp.fao.org/fi/maps/fig_h4_00_0.gif)

number of ways. First, the number of Longhurst Areas is almost double that of FAO major fishing statistical areas (fifty-one compared to nineteen). This is because the Longhurst scheme includes Coastal Provinces, recognising that the oceanography and ecology of coastal areas, relative to oceanic areas, are strongly influenced by topography and coastal wind regimes.⁵⁰ The divisions with the oceans are quite different, with more of an emphasis on latitudinal (horizontal) boundaries in the Longhurst Areas based on the prevailing wind conditions having a great influence on ocean circulation and therefore ecology. For example, the trade winds in the equatorial and central oceanic regions, or the western winds in the subtropical regions (see Figure 4-3). Second, the placement of boundaries differs (compare Figure 4-2 with Figure 4-3). Most longitudinal boundaries have different placements within the oceans, and the lack of longitudinal boundaries of Longhurst Areas within the Southern Ocean is a marked difference.

Given that fisheries data practices for tuna fisheries in the western and central Pacific Ocean is the feature of the rest of this thesis, the major fishing areas for statistical purposes currently used by FAO within the Pacific Ocean will be analysed. FAO has noted that an important consideration in the determination of the boundaries of FAO major fishing areas for statistical purposes is that the areas should as far as possible coincide with the areas of competence of existing regional fishery agencies, such as tuna regional fisheries management organisations (RFMOs).⁵¹ The advantage is that the fisheries data collected and compiled by tuna RFMOs could be used by FAO to report on trends in regional fisheries. Generally within other parts of the world, the boundaries of FAO major fishing areas for statistical purposes closely equate with, or are divisions of, the statistical areas of existing regional fishery agencies.⁵²

In the Pacific Ocean the boundaries of the FAO major fishing areas for statistical purposes do not match the boundaries of tuna RFMOs. See in Figure 4-4. The FAO major fishing areas for statistical purposes are shown in black lines in Figure 4-4, while the boundaries of the area of competence of Pacific Ocean tuna RFMOs are indicated in yellow for the *Inter-American Tropical Tuna Commission* (IATTC) which uses the

⁵⁰ A. Longhurst, *Ecological Geography of the Sea* (San Diego, California: Academic Press, 1998), p80. The Coastal Provinces occur where there are open and reasonably linear continental coastlines, marginal seas and archipelagos where islands are sufficiently large and numerous enough to influence ocean circulation and important areas of shallow water.

⁵¹ FAO, *CWP Handbook of Fishery Statistical Standards* (Rome: FAO, 2005), Section G: Fishing Areas - General.

⁵² Ibid.

eastern Pacific Ocean and *red* for the boundaries of the *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPFC) Convention Area. It is obvious from Figure 4-4 that within the Pacific Ocean, the boundaries of FAO major statistical fishing areas do not match up with the Pacific Ocean tuna RFMOs area of competence. Better consistency with mandates of tuna RFMOs would improve the relevance of FAO major statistical fishing areas within the Pacific Ocean and would simplify national reporting of fisheries data by major statistical fishing area and thus lessen the chances of double reporting or omitted data.⁵³ Possible revision of the Pacific Ocean FAO major fishing areas are being considered by FAO and relevant parties, and at the time of writing this thesis were not concluded.⁵⁴

4.3 Verifying global fisheries data

Verifying, or cross-checking fisheries data with other sources, is important to improving and checking the coverage and accuracy of fisheries data. FAO reports that landings data on fisheries that are held by FAO that are collected from national reporting offices are, whenever possible, verified by FAO using other sources, such as trade statistics, food balance sheets, or regional fishery bodies.⁵⁵ This is illustrated in Figure 4-1. FAO also notes that FAO's statisticians will produce estimates where data are lacking or are considered unreliable and often such estimates are based on the previous year reports

⁵³ FAO, *Report of the seventeenth session of the Coordinating Working Party on Fishery Statistics. Hobart, Tasmania, 3-7 March 1997*, FAO Fisheries Report 555 (Rome: FAO, 1997), para 125-130.

⁵⁴ FAO has previously noted that within the Pacific Ocean the FAO major statistical fishing area boundaries are not consistent with current regional fishery bodies mandated areas. FAO reports that these boundaries are still under consideration to alter the present boundaries to improve the cooperation between FAO and Pacific regional fishery bodies. *FAO Statistical Areas - maps*, [website] (FAO Fisheries Department, 2003 [cited 28 January 2004]); available from [Accessed from <ftp://ftp.fao.org/fi/maps/default.htm>](ftp://ftp.fao.org/fi/maps/default.htm) on 28 January 2004. Previous proposals have been received to modify the boundaries of the Pacific Ocean FAO Major Fishing Areas for statistical purposes, however, the proposed changes were not adopted at the time because it was seen to be better to wait for the conclusion of negotiations on the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean. Now that the WCPFC has been established it is likely that the boundaries of FAO major statistical fishing areas will be reviewed by FAO and could be changed to match the current EPO and WCPO areas.⁵⁴ At the time of writing this had not yet occurred. FAO, *Report of the nineteenth session of the Coordinating Working Party on Fishery Statistics. Nouméa, New Caledonia, 10-13 July 2001*, FAO Fisheries Report 656 (Rome: FAO, 2001), para 180.

⁵⁵ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics. La Jolla, California, USA, 13-16 December 1993*, FAO Fisheries Report 500 (Rome: FAO, 1994), p 11 para 38-41. Unlike confidentiality concerns, verification of data supplied to FAO is essential at both the FAO level and at regional and national levels.

rather than a model estimate.⁵⁶ FAO extensively uses foreign trade statistics to validate catches of species that are prominent in international trade, for example prawns and tuna.⁵⁷ Supply Utilization accounts can be used for validation of global fisheries data, but they tend to be of limited value being calculated at a broad level of species aggregation.

Collecting and compiling data on world fisheries is an international effort. International classifications and standardised data submission procedures are essential to ensuring that data is comparable across countries for summation and analyses at regional and global levels: this is one of the roles of the Coordinating Working Party on Fishery Statistics (CWP).⁵⁸ The specific terms of reference of the Coordinating Working Party on Fishery Statistics are threefold.⁵⁹ The first, is to keep under continuous review the requirements for fishery statistics (including aquaculture) for the purposes of research, policy-making and management, taking into account inter alia their purpose, usefulness, cost, burden in collection and collation, timeliness, quality, confidentiality needs and regional differences. Second, is to agree standard concepts, definitions, classifications and methodologies for the collection and collation of fishery statistics. The third is to make proposals and recommendations for action in relation to the collection, collation and dissemination of fishery statistics, recognising the need to coordinate activities so as to avoid duplication.

The Coordinating Working Party on Fishery Statistics originated in 1959 as a body then called the “Continuing Working Party”, which was formed following the Expert Meeting on Fisheries Statistics in the North Atlantic Area (Edinburgh, Scotland, 22-29 September 1959) organised by FAO and co-sponsored by International Council for the Exploration of the Sea (ICES) and International Commission for Northwest Atlantic Fisheries (ICNAF, which was the predecessor to the Northwest Atlantic

⁵⁶ FAO Fisheries Department, *Fishery Statistics: Reliability and Policy Implications* [website] (FAO Fisheries Department, 2002 [cited May 26 2003]); available from http://www.fao.org/fi/statist/nature_china/30jan02.asp accessed 26 May 2003.

⁵⁷ FAO, *Report of the nineteenth session of the Coordinating Working Party on Fishery Statistics. Nouméa, New Caledonia, 10-13 July 2001*, FAO Fisheries Report 656 (Rome: FAO, 2001), paper presented at CWP19 'Report by FAO: Paper CWP/19/FAO'.

⁵⁸ FAO Fisheries Department - Information, Data and Statistics Unit, [website] (FAO Fishery Department, [cited April 10 2002]); available from <http://www.fao.org/fi/struct/fidi.asp#FDESC>.

⁵⁹ FAO, *The Coordinating Working Party on Fishery Statistics; Its Origin, Role and Structure*, 903 (Rome: FAO, 1995), Annex 2 - Statutes Coordinating Working Party on Fishery Statistics.

Fisheries Organization (NAFO)).⁶⁰ The Statutes of Coordinating Working Party on Fishery Statistics were amended and approved by the FAO Council at its Hundred and Eighth Session in June 1995. The new statutes for Coordinating Working Party on Fishery Statistics were designed to provide a sound statistical basis for Coordinating Working Party on Fishery Statistics to meet the challenges resulting from the enhanced role of regional fishery organizations in relation to statistics following the adoption of the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks.⁶¹ These amendments removed the geographical limitations of the area of competence of Coordinating Working Party on Fishery Statistics so that there were no limits; therefore for all intents and purposes the area of competence of the Coordinating Working Party on Fishery Statistics is global in scope covering all fisheries, including aquaculture.

FAO describes the Coordinating Working Party on Fishery Statistics as having made a significant contribution to global fishery statistics, despite being largely focussed on Atlantic fishery statistical issues prior to 1995. In the words of FAO “while the CWP has confined its attention to the development and improvement of Atlantic fishery statistics, its procedures and concepts have served as models for fishing areas elsewhere.”⁶² Prior to 1995, the members of the Coordinating Working Party on Fishery Statistics had recognised that issues considered by the Coordinating Working Party on Fishery Statistics were commonly of global significance and resolution of these issues would benefit from input from regional agencies outside of the Atlantic.⁶³ Regional fishery agencies outside of the Atlantic also recognised the value of participation in Coordinating Working Party on Fishery Statistics and sought

⁶⁰ The CWP was formed by the adoption of Resolution 23/59 at the FAO Conference at its tenth session in 1959. For further details on the outcome of the 1959 Expert Meeting see Ibid, FAO, *CWP Handbook of Fishery Statistical Standards* (Rome: FAO, 2005).

⁶¹ FAO, *The Coordinating Working Party on Fishery Statistics; Its Origin, Role and Structure*, 903 (Rome: FAO, 1995), J. Swan, *Summary Information on the Role of International Fishery Organizations or Arrangements and Other Bodies Concerned with the Conservation and Management of Living Aquatic Resources*, FAO Fisheries Circular 985 (Rome: FAO, 2003).

⁶² FAO, *The Coordinating Working Party on Fishery Statistics; Its Origin, Role and Structure*, 903 (Rome: FAO, 1995), para 22 and 23.

⁶³ FAO, *Report of the fifteenth session of the Coordinating Working Party on Atlantic Fishery Statistics*. Dartmouth, Nova Scotia, Canada, 8-14 July 1992, FAO Fisheries Report 473 (Rome: FAO, 1992), para 22.

membership; the membership of the Coordinating Working Party on Fishery Statistics is now global and includes global as well as regional fisheries institutions.⁶⁴

The Coordinating Working Party on Fishery Statistics meets approximately biennially and various members host the sessions. A range of issues is discussed during sessions of the Coordinating Working Party on Fishery Statistics, all with the aim of improving the quality of global fisheries data through promoting international standards and inter-agency coordination ie. between regional fishery agencies within regions, between regional fishery agencies between regions, and between regional fishery agencies and FAO. Through the interagency collaboration encouraged through Coordinating Working Party on Fishery Statistics, FAO has been able to harmonise its tuna fishery data holdings with that held by tuna RFMOs, and consequently improved the accuracy and reliability of FAOs data.⁶⁵

Additionally through the inter-agency collaboration facilitated and encouraged by Coordinating Working Party on Fishery Statistics, FAO has collaboratively conducted discrepancy checks to harmonise its databases with those of regional fisheries agencies. Where discrepancies are found they are rectified through investigations by both agencies.⁶⁶ Discrepancy checks have the advantage in that they improve the credibility of data, additionally the objective scientific scrutiny of the data should ensure more reliable data. However because discrepancy checks are a time consuming and difficult task it is not feasible to do bulk revisions of catch databases

⁶⁴ CWP Secretariat, *Report of the Coordinating Working Party on Fishery Statistics Intersessional Meeting of CWP Agencies. Rome, Italy, 3-5 February 2004.*, Accessed from <http://www.fao.org/fi/body/rfb/CWP/cwp_home.htm> on Thursday, 3 June 2004 (Rome: FAO, 2004). Membership list was further updated from *Coordinating Working Party on Fishery Statistics Map and Membership*, Accessed from <http://www.fao.org/fi/body/rfb/CWP/cwp_mapandmem.htm> on 15 July 2005.

Global and Trans-Ocean Institutions include: Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR); Commission for the Conservation of Southern Bluefin Tuna (CCSBT); Food and Agriculture Organization of the United Nations (FAO); International Council for the Exploration of the Sea (ICES); International Whaling Commission (IWC); Organisation for Economic Co-operation and Development (OECD).

Regional Institutions include: International Commission for the Conservation of Atlantic Tunas (ICCAT); Northwest Atlantic Fisheries Organization (NAFO); North Atlantic Salmon Conservation Organisation (NASCO); Inter-American Tropical Tuna Commission (IATTC); Secretariat of the Pacific Community (SPC); Southeast Asian Fisheries Development Centre (SEAFDEC); Indian Ocean Tuna Commission (IOTC).

⁶⁵ The accuracy and reliability of FAO's fisheries statistical data has been questioned and RFMO data, particularly that of tuna RFMOs are renowned for being more accurate and reliable estimates of catches within their respective region. This will be further discussed within Section 4.4 beginning p162.

⁶⁶ FAO, *Report of the eighteenth session of the Coordinating Working Party on Fishery Statistics. Luxembourg, Grand Duchy, 6-9 July 1999*, FAO Fisheries Report 608 (Rome: FAO, 1999), para 80.

more than once per year and there is a risk in making errors while making adjustments to multiple data sets.

4.4 Disseminating global fisheries data

The dissemination of FAO's global fisheries is a process that commences once the data has been compiled into FAO's fishery statistical databases (see Figure 4-1). FAO disseminates fisheries statistics in a number of ways: as summary data available in publications such as the Bulletin of Fisheries Statistics and Yearbook of Fisheries Statistics, or as aggregated data available through the FAO website accessible using the downloadable FISHSTAT+ software.⁶⁷ Alternatively fisheries statistics can be analysed and the results published in regular publications such as the biennial State of World Fisheries and Aquaculture (SOFIA).⁶⁸ SOFIA is the FAO Fisheries Department's premier advocacy document based largely on global fisheries data. In the words of FAO SOFIA "is published every two years with the purpose of providing policy-makers, civil society and those who derive their livelihood from the sector a comprehensive, objective and global view of capture fisheries and aquaculture, including associated policy issues."⁶⁹ Additionally, one-off publications addressing specific issues are also produced by FAO, for example the 'World review of highly migratory species and straddling stocks' published in 1994 or the 2007 report on the "Global fishery resources of tuna and tuna-like species."⁷⁰ The timeliness of fisheries data that are cited in such FAO publications is important.

FAO has admitted that it has been unable to significantly improve the timeliness of fisheries data held in its databases.⁷¹ FAO has deadlines for submission of September for fisheries questionnaires that relate to the previous year.⁷² In spite of improved availability of statistical questionnaires on FAO websites and intensified

⁶⁷ See FAO Fisheries Statistics website: <http://www.fao.org/fi/statist/statist.asp>.

⁶⁸ The latest FAO Fisheries Department, *The State of World Fisheries and Aquaculture 2006* (Rome: The Food and Agriculture Organisation of the United Nations, 2006).

⁶⁹ See FAO SOFIA website: http://www.fao.org/sof/sofia/index_en.htm - accessed 6/10/2005 12:20 PM

⁷⁰ FAO Fisheries Department, *World review of highly migratory species and straddling stocks*, FAO Fisheries Technical Paper No. 337 (Rome: FAO, 1994), J. Majkowski, *Global fishery resources of tuna and tuna-like species*, FAO Fisheries Technical Paper No 483 (Rome: FAO, 2007).

⁷¹ FAO, *Report of the nineteenth session of the Coordinating Working Party on Fishery Statistics*. Nouméa, New Caledonia, 10-13 July 2001, FAO Fisheries Report 656 (Rome: FAO, 2001), paper presented at CWP19 'Report by FAO: Paper CWP/19/FAO'.

⁷² Ibid.



Please see print copy for Figure 4-5.

Figure 4-5. Schematic timeline that illustrates the time lag between catch in 2001 to dissemination as year 2001 global fisheries data by FAO⁷³

⁷³ Source:FAO, *Report of the twentieth session of the Coordinating Working Party on Fishery Statistics. Victoria, Seychelles, 21–24 January 2003, FAO Fisheries Report 709* (Rome: FAO, 2003), paper presented at CWP20 'Report by FAO: Paper CWP-20/FAO'.

email communication between FAO and national reporting offices, there are few national fishery questionnaires that are returned to FAO before the deadline.⁷⁴ Figure 4-5 illustrates the delay from catches being harvested in 2001 to when that fisheries data is published by FAO.⁷⁵ The figure shows that FAO publishes fisheries data a minimum of 15 months following the fishing event (fisheries data related to catches in December 2001 will be 15 months old, while fisheries data related to catches in January 2001 will be 27 months old).⁷⁶ Even 15 – 27 months following the catches that the fisheries data relate, the statistics may only be cited by FAO as estimates. The main reason is to allow States national statistical validation cycles to complete and for national reporting agencies to confirm the statistics.⁷⁷ Consequently it may be a additional 12 months to a couple of years, before fisheries data for a particular year is analysed and formally cited in FAO publications on status and trends reporting in fisheries, such as the biennial State of the World Fisheries and Aquaculture publication (SOFIA).⁷⁸

4.5 Quality of global fisheries data

FAO has a responsibility to ensure the quality of global fisheries data, because “FAO is the only source of comprehensive global fishery statistics and most reviews of the state of the world fisheries, past trends and future prospects rely on FAO statistics.”⁷⁹ Some of the factors affecting the quality of FAO’s data have been considered previously in the present Chapter. These include: the steps taken by FAO to verify and supplement national reports of fisheries landings; the discrepancies between FAO major fishery statistical areas and the ecologically-based biogeochemical provinces of Longhurst; and the delays in submission of national reports of fisheries landings. There is other

⁷⁴ FAO, *Report of the nineteenth session of the Coordinating Working Party on Fishery Statistics. Nouméa, New Caledonia, 10-13 July 2001*, FAO Fisheries Report 656 (Rome: FAO, 2001), paper presented at CWP19 'Report by FAO: Paper CWP/19/FAO'.

⁷⁵ FAO, *Report of the twentieth session of the Coordinating Working Party on Fishery Statistics. Victoria, Seychelles, 21–24 January 2003*, FAO Fisheries Report 709 (Rome: FAO, 2003), paper presented at CWP20 'Report by FAO: Paper CWP-20/FAO'.

⁷⁶ Ibid.

⁷⁷ Ibid.

⁷⁸ Ibid.

⁷⁹ FAO Fisheries Department - Information, Data and Statistics Unit, [website] (FAO Fishery Department, [cited April 10 2002]); available from <http://www.fao.org/fi/struct/fidi.asp#FDESC>.

pertinent information relating to FAO's global fisheries data that also affect the quality of FAO's global fisheries data.⁸⁰

In meeting the responsibility to ensure the quality of global fisheries data, FAO has sought on a regular basis to identify shortcomings in their data practices and to improve the quality of its fisheries data. On at least a biennial basis, meeting reports and papers of the Coordinating Working Party on Fishery Statistics document the steps that FAO has taken to identify and solve shortcomings in their processes and data practices.⁸¹ Criticisms by external commentators have sought to bring to public attention concerns about the quality of FAO's global fisheries data, which also raises the question of the accuracy of information derived from the data and that are used as the basis for international fisheries policies.⁸² Some of these commentaries will now be reviewed.

Systematic distortions in world fisheries catch trends

One of the notable criticisms about the accuracy and reliability of global fisheries data was that by R. Watson and D. Pauly in their 2001 article in *Nature*. The *Nature* article in 2001 and gained international attention with the claim that "As an intergovernmental organization, however, FAO must generally rely on the statistics provided by member countries, even if it is doubtful that these correspond to reality."⁸³ Using a statistical model to predict likely catches based on oceanographic patterns and other influences, Watson and Pauly postulated that China was overstating its catches, particularly during the 1995 – 1999 period, when in fact there was a declining trend. Furthermore, the authors also claimed that China seemed to acknowledge the problem in 1998 and placed

⁸⁰ It is difficult to comprehensively assess the reliability of FAO's global fisheries data without having studied the specific processes through which those national reports are derived; such an assessment is not the intent of this section, because such research would be a very large undertaking and is beyond the scope of this thesis. Therefore to complement the examination of the legal basis of the global fisheries data framework and the consideration of how FAO and States fulfil their obligations, this section will review criticisms by external commentators, and reports by FAO that relate to the reliability of FAO's global fisheries data.

⁸¹ For example FAO, *Report of the twenty second session of the Coordinating Working Party on Fishery Statistics. Rome, Italy, 26 February - 2 March 2007* (Rome: FAO, 2007).

⁸² The published articles have generally been criticisms in passing of FAO's global fisheries data, because the data has been a source used in the research examining global trends in and status of fisheries. D. L. Alverson and K. Dunlop, *Status of World Marine Fish Stocks, FRI-UW-1998* (Seattle, Washington: Fisheries Research Institute, University of Washington, 1998), D. Pauly et al., "The Future for Fisheries," *Science* 302 (2003): 1359-1361, R. Watson et al., "Mapping global fisheries: sharpening our focus," *Fish and Fisheries* 5 (2004): 168-177. The exception is the direct critique of FAO's global database and the concerns of the reliability of information derived from the data by R. Watson and D. Pauly, "Systematic distortions in world fisheries catch trends," *Nature* 414 (2001): 534-536.

⁸³ R. Watson and D. Pauly, "Systematic distortions in world fisheries catch trends," *Nature* 414 (2001): 534-536, p534.

a zero-growth policy in part to prevent over reporting of catches to FAO. Based on their analysis the authors postulated that there was global implications from the overstating of China's catches because China's large absolute catches strongly affect the world-wide total, which lead to reports based on the statistics that global catches are stable or rising, instead of falling, so global fisheries sustainability concerns are not as dire.⁸⁴ Therefore they concluded that the implications of the errors in a significant fishing nations catches engendered an international complacency that threatens global food security. For example "as long as global volumes are rising or stable, it seems reasonable to conclude that the exhaustion of local fishing grounds has been balanced by the opening of new grounds farther afield. The new research suggests that this is wrong."⁸⁵

The Nature article prompted a public response by the FAO Fisheries Department titled "Fishery Statistics: Reliability and Policy Implications".⁸⁶ FAO stated that it had realised that there were discrepancies between fish supply and consumption, and has been working with China to rectify it. In fact, FAO had mentioned in its report to the 19th Session of Coordinating Working Party on Fishery Statistics (in July 2001 prior to publication of the Nature article) that it had recognised errors in Chinese catch estimates and as a response FAO had held two seminars in China "to identify methodological shortcomings and possibly rectify the likely overestimation of fishery production."⁸⁷ Additionally FAO had also recognised the implications of the possible shortcomings, and noted that "there is increasing concern for the loss of reliability of statistics of some major fish producers, which requires shifting attention to statistical development work in that region."⁸⁸

⁸⁴ FAO Fisheries Department, *The State of World Fisheries and Aquaculture 2004* (Rome: The Food and Agriculture Organisation of the United Nations, 2004), p3-4, R. Watson and D. Pauly, "Systematic distortions in world fisheries catch trends," *Nature* 414 (2001): 534-536. In 2002 China remained by far the largest producer, with reported fisheries production of 44.3 million Mt in 2002 (16.6 and 27.7 million Mt from capture fisheries and aquaculture, respectively). Compared to the global total of 132.2 million Mt (90.3 and 41.9 million Mt from capture fisheries and aquaculture respectively).

⁸⁵ "Global fish stocks: Fishy Figures," *The Economist* 361, no. 8250 (2001): 99-100.

⁸⁶ FAO Fisheries Department, *Fishery Statistics: Reliability and Policy Implications* [website] (FAO Fisheries Department, 2002 [cited May 26 2003]); available from http://www.fao.org/fi/statist/nature_china/30jan02.asp accessed 26 May 2003.

⁸⁷ FAO, *Report of the nineteenth session of the Coordinating Working Party on Fishery Statistics. Nouméa, New Caledonia, 10-13 July 2001, FAO Fisheries Report 656* (Rome: FAO, 2001), para 40.

⁸⁸ Ibid. For example FAO and the SPC-OFP worked together in 1999-2000 to resolve discrepancies between the two databases, primarily between discrepancies in estimates of distant water fishing nations such as Japan, Korea and Chinese Taipei (T. Lawson, Principal Fisheries Scientist (Statistics), SPC, Personal Communication by Email, 20th September 2005.)

In regard to the claim that FAO relied on national landing fishery statistics without being able to check or improve them, FAO's response was that statistics supplied by national authorities are routinely corrected when mistakes are obvious and national reports are the main but not the only source of data used by FAO to maintain its fishery statistics database; these are part of FAO's verification mechanisms for the FAO global fisheries database described previously (see Figure 4-1).⁸⁹ Also when data are missing or unreliable estimates are derived from the best available information from any source, for example regional organisations, project documents, industry magazines and statistical interpolations.⁹⁰ FAO also pointed out that catch statistics are not the primary source for FAO global reviews of state of global stocks because there are often more direct indicators of the state of fishery resources other than catch. For example indications of state of fishery resources can come from working groups of FAO and non-FAO regional fishery agencies and other formal arrangements, scientific literature, supplemented by information from industry magazines and fishery independent data such as trade data.⁹¹

FAO did make some admissions regarding the reliability of FAO's global fisheries data. In the words of FAO "despite FAO's efforts, the fishery data available are not fully reliable. The outcome is far from perfect in terms of coverage, timeliness and quality. Data are often submitted to FAO with one or two years of delay. The general availability of data has not really improved during the last two decades. Statistics from artisanal and subsistence fishers are still a concern and many key statistics are missing, e.g. economic and social data, discards, fishing capacity."⁹² FAO claims that these deficiencies in data are in part due to funding constraints placed on national fishery statistical systems, despite the obligations related to statistical reporting and data submission increasing regionally and internationally. Nevertheless "the general trends are probably reliably reflected by the available statistics as shown by the good relations observed with global development trends or climatic changes ... but the annual figures and the assessments involve a certain degree of uncertainty and small

⁸⁹ FAO Fisheries Department, *Fishery Statistics: Reliability and Policy Implications* [website] (FAO Fisheries Department, 2002 [cited May 26 2003]); available from http://www.fao.org/fi/statist/nature_china/30jan02.asp accessed 26 May 2003.

⁹⁰ Ibid.

⁹¹ Ibid.

⁹² Ibid.

changes from year to year are probably not significant.”⁹³ Additionally, FAO notes that working with countries is the only way to improve the timeliness, accuracy and reliability of global fishery statistics. FAO identified three measures to improve quality of FAO fisheries data, these are “cooperation and collaboration of the national fishery data and information programmes; willingness of the Member countries to share and provide fishery data and information; and national capacity to collect and compile accurate, reliable and timely fishery data and information.”⁹⁴ However the rehabilitation of major national data collections will inevitably be a slow process.⁹⁵ Nevertheless as this discussion shows, FAO acknowledges the problem and steps are being taken by FAO to move that process forward.

Other quality concerns

Other concerns about the reliability of FAO’s global fisheries data have also been expressed by commentators. First, the identity of the harvested taxa (what species were caught?) in the landings data is poor. FAO admitted in the response to the Watson and Pauly article that there was a significant proportion of catches which were not identified to the species level “the proportion of catch identified at the level of individual species has tended to decrease with time, and the percentage of ‘unidentified fish’ in the declarations has increased as fisheries diversified and large stocks were depleted.”⁹⁶ Furthermore in 1998, as a technical comment on an analysis of FAO’s global fisheries data, staff of FAO Fisheries Department admitted that although FAO’s global fisheries data is the best estimates by countries, regional fishery agencies and FAO of species compositions of annual production “it is to be regretted that over 30% of all marine landings cannot be identified to the species level, and about 20% cannot even be assigned to the level of Family.”⁹⁷ Commonly when landings cannot be identified to species level, they are reported as highly aggregated categories such as miscellaneous fishes, molluscs or crustaceans, or even entire orders or classes of animals.⁹⁸ The lack

⁹³ Ibid.

⁹⁴ FAO Fisheries Department, *FAO Fisheries Department Information Strategy: Supporting Informed Decisions and Actions* (Rome: FAO, 2000).

⁹⁵ FAO Fisheries Department, *Fishery Statistics: Reliability and Policy Implications* [website] (FAO Fisheries Department, 2002 [cited May 26 2003]); available from http://www.fao.org/fi/statist/nature_china/30jan02.asp accessed 26 May 2003.

⁹⁶ Ibid.

⁹⁷ J. F. Caddy et al., "How Pervasive is "Fishing Down Marine Food Webs"?", *Science* 282 (1998): 1383a.

⁹⁸ R. Watson et al., "Mapping global fisheries: sharpening our focus," *Fish and Fisheries* 5 (2004): 168-177, p169.

of identity of harvested taxa, reduces the usefulness of FAO's global fisheries data for detailed and ecological analyses of impacts of fishing.⁹⁹

The second issue with FAO's global fisheries data is that FAO's landings data do not generally include a reliable estimate of discards. Pauly *et al.*, in a paper calling for action to address global ecosystem impacts of fishing referred to proportion of 30% of global landings as the estimated quantity of discarded bycatch in fishing operations.¹⁰⁰ In 2004, FAO revised the formal estimate of the quantity of global fisheries discards from 20 million tonnes (1996) to 7.3 million tonnes.¹⁰¹ FAO attributed the change in estimates possibly to the wide-implementation of measures to reduce incidental bycatch, including more selective gear and practices, and possibly greater utilisation of fish species that previously would be discarded by fishers.¹⁰² But on the whole, FAO was uncertain of why there was such a marked difference in the estimates.¹⁰³

Third are the concerns that relate to the analyses that are possible with FAO's global fisheries data. Many of criticisms of the reliability of FAO's global fisheries data have been studies investigating the ecological impacts of fishing on a global scale, and have found the quality of FAO's data to be wanting for the purposes that they intended. In the words of Watson *et al* "There are a number of approaches that can provide better catch statistics [than FAO's global landing fisheries data]. The most obvious is to improve current reporting systems. We need more than good recent data; however, analysis of spatial trends requires historical data. The release of currently confidential fine-scale data for analysis would assist investigations but this does not exist for most of

⁹⁹ Ibid.

¹⁰⁰ D. Pauly et al., "The Future for Fisheries," *Science* 302 (2003): 1359-1361, p1359.

¹⁰¹ G. Kourous, "New data show sizeable drop in numbers of wasted fish," *FAO newsroom*, 14th September 2004.

¹⁰² Ibid.

¹⁰³ FAO, *Report of the sixteenth session of the Coordinating Working Party on Atlantic Fishery Statistics. Madrid, Spain, 20-25 March 1995, FAO Fisheries Report 521* (Rome: FAO, 1995), para 97, G. Kourous, "New data show sizeable drop in numbers of wasted fish," *FAO newsroom*, 14th September 2004. This issue was considered by CWP16. "It is important to appreciate why estimates of catch used for assessment purposes differ from official landings statistics data since not all the difference is due to illegal incorrect-reporting or non-reporting to the relevant authorities. Official landings can often only represent a part of the actual catch from a stock. This may be due to: 1) A significant part of the catch may be discarded legally at sea and no accurate record kept of the quantities or species involved; 2) Part of the catch of a particular species or stock may be taken as incidental bycatch in another fishery. Small mesh industrial fisheries are one example. Such fisheries may take a significant part of the total catch of a human consumption species but be recorded only as weight within the category of the target industrial species in which the catch was taken; 3) Official landings are usually recorded by geographical or management unit area, not by biological stock unit. For assessment purposes this can be inappropriate and scientists may adjust official figures to reflect migration or different geographical areas more suited to the biological stock concerned."

the oceans of the world. The best hope is to make better use of existing, currently available data using novel methods”.¹⁰⁴

As discussed previously, FAO’s global fisheries data is public domain data, and generally of an aggregated form. Aggregated data is generally not informative for causal analyses, such as evaluating ecosystem impacts of fishing; depending on the complexity of the research question, operational level data is often preferable to absolutely necessary for such types of analyses.¹⁰⁵ However, often the availability of public domain data with the appropriate spatial stratification is confounded by confidentiality constraints. As noted by the United States National Research Council, “confidentiality of fisheries data is restrictive to the point of hindering both research and management.”¹⁰⁶ Therefore unless confidentiality constraints can be overcome, researchers are commonly left to develop novel approaches to test such research questions. In the words of Pauly “the time has come to look at the future of fisheries...the fisheries research community relied, for broad-based analyses, on a data set now shown to be severely biased.”¹⁰⁷ One of the novel methods proposed is the spatial disaggregation process applied to FAO global fisheries statistics and other available data sources using a scientific model.¹⁰⁸ But as pointed out by FAO’s response to publications of such novel methods, these methods are not entirely reliable either; they are another attempt to produce the best scientific evidence available on global fisheries status and trends.

¹⁰⁴ R. Watson et al., "Mapping global fisheries: sharpening our focus," *Fish and Fisheries* 5 (2004): 168-177, p169.

¹⁰⁵ WCPFC, *Report of the First Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 8-19 August 2005*, WCPFC/Comm.2/22 (Noumea, New Caledonia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2005), Report of ME-SWG para 182. “The ME-SWG also heard a report (WCPFC-SC1 ME WP-3) on the analysis of the SPC public domain 5° x 5° longline catch and effort data. The analysis revealed the difficulties in simple interpretations of the historical CPUE record. An important conclusion of this analysis is that longline catchability changed sharply during the [period] between 1950 and 1970. Causes of these changes are not clear but are probably related to changes in fishing practices and shifts in fishing areas within the 5° x 5° regions. The ME-SWG concluded that access to operational level data is absolutely necessary to interpret historical changes in the longline fishery.”

¹⁰⁶ National Research Council, *Improving the Collection, Management, and Use of Marine Fisheries Data* (Washington, D.C.: National Academy Press, 2000), p175.

¹⁰⁷ D. Pauly et al., "The Future for Fisheries," *Science* 302 (2003): 1359-1361, p1359.

¹⁰⁸ D. Pauly et al., "Fishing Down Marine Food Webs," *Science* 279 (1998): 860-863, D. Pauly et al., "The Future for Fisheries," *Science* 302 (2003): 1359-1361, R. Watson et al., "Chapter 16. Mapping Fisheries onto Marine Ecosystems for Regional, Oceanic and Global Integrations," in *Large Marine Ecosystems of the World*, ed. G. Hempel and K. Sherman (Elsevier, 2003), R. Watson et al., "Mapping global fisheries: sharpening our focus," *Fish and Fisheries* 5 (2004): 168-177, p169.

Potential implications of global fisheries data quality issues

The main purpose and usage of FAO statistics is for “describing the contribution of fisheries and aquaculture to food supply and to national economies, and to describe the status and trends of world fisheries.”¹⁰⁹ FAO provides the only comprehensive global fisheries statistical database and FAO’s global fisheries statistics are a heavily relied upon source of information on the status and trends of world fisheries. Therefore the FAO’s fisheries data and the reports interpreting them have had, and will continue to have, an influential role in the formulation of international policy and law. Owing to this large potential influence of global fisheries data held by FAO, the doubts about the reliability of these statistics have implications. Changes to the international legal framework for fisheries management over last two decades, beginning with the adoption of the United Nations Convention on the Law of the Sea, were revolutionary and these changes occurred on the basis of information derived from fisheries statistics such as those contained within the databases of FAO.

“Based on it, at least partly, member countries brought into force the 1982 Convention on the Law of the Sea (1994) and the UN Fish Stocks Agreement (2001); adopted the FAO Compliance Agreement (1993) and the FAO Code of Conduct for Responsible Fisheries (1995); aligned their national laws with these instruments; adopted and started implementing the precautionary approach; accepted the concept of ecosystem-based fisheries management; adopted four international plans of action (on management of fishing capacity, shark fisheries management, reducing by-catch of seabirds in longline fisheries, illegal/unreported/unregulated fishing) and will consider the possibility of adopting one on improvement of information on status and trends of capture fisheries.”¹¹⁰

Furthermore the implementation of these instruments relies upon integrated, reliable and timely data and information to support management decisions.¹¹¹ Concerns have also been raised about the reliability of FAO’s fisheries status reports and the reliance on them. Alverson and Dunlop state that “the fact that a significant number of scientists, fisheries managers, advocacy groups, and politicians use the FAO status reports as a barometer of the health of the world fishery resources suggests that these reports need to

¹⁰⁹ FAO, *Report of the twentieth session of the Coordinating Working Party on Fishery Statistics*. Victoria, Seychelles, 21–24 January 2003, *FAO Fisheries Report 709* (Rome: FAO, 2003), paper presented at CWP20 'Report by FAO: Paper CWP-20/FAO'.

¹¹⁰ FAO Fisheries Department, *Fishery Statistics: Reliability and Policy Implications* [website] (FAO Fisheries Department, 2002 [cited May 26 2003]); available from http://www.fao.org/fi/statist/nature_china/30jan02.asp accessed 26 May 2003.

¹¹¹ FAO Fisheries Department, *FAO Fisheries Department Information Strategy: Supporting Informed Decisions and Actions* (Rome: FAO, 2000).

be carefully reviewed, edited, and pruned of insupportable conclusions.”¹¹² Alverson and Dunlop called for the provision of additional resources and a formal international peer review process to assist FAO in more rigidly classifying the state of global marine fisheries resources.¹¹³ FAO argues that despite the errors in the dataset, the main global trends of overfishing have not been masked and the most important conclusions have emerged, because they are apparent at regional and national levels.¹¹⁴

Outcome of discrepancy checks with FAO and tuna regional fishery agencies

During the earlier discussion on verification processes used in global fisheries data and the role of the Coordinating Working Party on Fishery Statistics, mention was made of the inter-agency collaboration that has occurred through the Coordinating Working Party on Fishery Statistics, between FAO and regional fishery agencies. The main data discrepancies between the databases of FAO and regional fishery agencies have tended to be because of differences in the sources of data: FAO obtains its data primarily through national statistical agency reports whereas the data held by regional fishery bodies tends to be scrutinised by scientists before or during the use of the data for management purposes.¹¹⁵

Discrepancies can also arise because of difficulties faced by regional fishery agencies in compiling their data by FAO major fishing areas and due to variations in the time required for national agencies to finalise their fishing statistics.¹¹⁶ For example, Japan takes 18 months to complete its statistical validation cycle and will then revise its preliminary national catch statistics which are reported to FAO with the revised and validated data; other countries have different timings for their statistical validation cycles, so may not send catch statistics to FAO until they are final and official (see

¹¹² D. L. Alverson and K. Dunlop, *Status of World Marine Fish Stocks, FRI-UW-1998* (Seattle, Washington: Fisheries Research Institute, University of Washington, 1998), p29.

¹¹³ Ibid., p 29.

¹¹⁴ FAO Fisheries Department, *Fishery Statistics: Reliability and Policy Implications* [website] (FAO Fisheries Department, 2002 [cited May 26 2003]); available from http://www.fao.org/fi/statist/nature_china/30jan02.asp accessed 26 May 2003, "Global fish stocks: Fishy Figures," *The Economist* 361, no. 8250 (2001): 99-100. The Economist quote FAO's response as follows "Richard Grainger, the FAO's chief statistician, argues that global figures are not important, because fisheries are managed at a regional level. This means that any inaccuracies in the Chinese figures would affect only China and not perceptions of the state of other world fisheries. Because China is not a great importer or exporter of fish, the food-security implications are limited to the region. Anyway, he says, few people look at global figures without reference to regional trends."

¹¹⁵ FAO, *Report of the eighteenth session of the Coordinating Working Party on Fishery Statistics. Luxembourg, Grand Duchy, 6-9 July 1999, FAO Fisheries Report 608* (Rome: FAO, 1999), para 77.

¹¹⁶ Ibid., para 78.

Figure 4-5).¹¹⁷ Whereas, regional fishery agencies often would have logsheet data and other sources of data that are undergo scientific and technical scrutiny to produce estimate catches of the national fleets within the area of competence of the regional fishery agency, regardless of whether formal national reports have or have not been made to the regional fishery agency.¹¹⁸

In fact, on the basis of these discrepancy checks, the members of the Coordinating Working Party on Fishery Statistics in their 18th Session stated that, particularly with regard to tuna fisheries data, that “its members should in general regard as the most reliable source of data those data sets held by the regional body which has assessment responsibility for the stock.”¹¹⁹ As a possible solution to some of the accuracy and reliability concerns of FAO’s fisheries data, the Coordinating Working Party on Fishery Statistics members further recommended that FAO should introduce a more systematic way of adopting regional fishery agency data directly into the FAO fisheries databases.¹²⁰ FAO in the review of recommendations from CWP18 generally agreed with the views of the Coordinating Working Party on Fishery Statistics, but added that experience has shown that this is not always the case, particularly for stocks falling within the remit of a regional fisheries agency but which are not assessed by that agency, such as bycatch and other non-target species.¹²¹ Nevertheless FAO has made efforts to include in its database the fishery statistics provided by the regional bodies as much as possible: much of FAO data for the Antarctic is that disseminated by Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) and tuna fisheries data is often replaced by that from tuna RFMOs.¹²² However FAO’s decision was that “it is not appropriate to implement at this time a system of blanket

¹¹⁷ Ibid., para 77.

¹¹⁸ FAO, *Report of the Ad-Hoc Consultation on Global Tuna Statistics. Colombo, Sri Lanka, 6-7 December 1985.*, FAO Fisheries Report 365 (Rome: FAO, 1985), FAO, *Report of the fourteenth session of the Coordinating Working Party on Atlantic Fishery Statistics. Paris, 5-9 February 1990 and report of the second Ad-Hoc Consultation on Global Tuna Statistics. La Jolla, California, USA, 21-22 May 1987.*, FAO Fisheries Report 429 (Rome: FAO, 1990), FAO, *Report of the nineteenth session of the Coordinating Working Party on Fishery Statistics. Nouméa, New Caledonia, 10-13 July 2001*, FAO Fisheries Report 656 (Rome: FAO, 2001), Appendix 8 - Summary Tables on Statistical Programmes of CWP Agencies.

¹¹⁹ FAO, *Report of the eighteenth session of the Coordinating Working Party on Fishery Statistics. Luxembourg, Grand Duchy, 6-9 July 1999*, FAO Fisheries Report 608 (Rome: FAO, 1999), para 81.

¹²⁰ Ibid.

¹²¹ FAO, *Report of the nineteenth session of the Coordinating Working Party on Fishery Statistics. Nouméa, New Caledonia, 10-13 July 2001*, FAO Fisheries Report 656 (Rome: FAO, 2001), Appendix 6 - Review of Follow-Up to CWP-18 Requiring Action.

¹²² Ibid.

replacement of statistics reported by countries to FAO with regional agency statistics, as envisaged in the CWP recommendation.”¹²³

There were in fact three reasons given by FAO to the CWP19 as to why not all data provided by tuna RFMOs are not included in the FAO database. These reasons were that first the two types of databases have different sources; second they have different coverage; and third they have different timings of dissemination.¹²⁴ For example, fisheries capture statistics in FAO databases are provided by national statistical correspondents and those of tuna RFMOs are obtained from a variety of sources, including research institutes. FAO has strict dissemination policy and publishes estimates for incomplete data, whereas regional fishery agencies often will delay publication until final data is submitted.¹²⁵

FAO acknowledges that tuna RFMO data and FAO data can be markedly different. In spite of acknowledging that there are inaccuracies, FAO continues to include in its database data provided by national agencies data reported by major fishing countries: (Japan, Korea, Russian Federation/former USSR, Taiwan, USA), because “a) national time series are longer than those held by tuna agencies and therefore fit better FAO's requirements; and b) FAO needs to maintain a trustful relationship[s] with national officers, who would be offended by the mistrust in the quality of the data they have provided if such data were replaced by those obtained from other sources.”¹²⁶

Recent initiatives to improve global fisheries data and information

The 25th Session of COFI in February 2003 adopted the Strategy on Improving Information on Status and Trends of Capture Fisheries (FAO Strategy on Improving Information in Fisheries)¹²⁷. The Strategy seeks to address some of the quality concerns raised throughout previous sections of this Chapter on fishery statistics. The objective

¹²³ Ibid., paper presented at CWP19 'Report by FAO: Paper CWP/19/FAO'.

¹²⁴ FAO, *Report of the seventeenth session of the Coordinating Working Party on Fishery Statistics. Hobart, Tasmania, 3-7 March 1997*, FAO Fisheries Report 555 (Rome: FAO, 1997), para 113-118.

¹²⁵ Ibid.

¹²⁶ FAO, *Report of the nineteenth session of the Coordinating Working Party on Fishery Statistics. Nouméa, New Caledonia, 10-13 July 2001*, FAO Fisheries Report 656 (Rome: FAO, 2001), paper presented at CWP19 'Report by FAO: Paper CWP/19/FAO' p12.

¹²⁷ FAO, *Report of the twentieth session of the Coordinating Working Party on Fishery Statistics. Victoria, Seychelles, 21-24 January 2003*, FAO Fisheries Report 709 (Rome: FAO, 2003), 13-14 (paras 71-74). The initiative for development of the Strategy on Improving Information on Status and Trends of Capture Fisheries came from the FAO Advisory Committee of Fisheries Research in 1998, who prepared the draft originally as an International Plan of Action. A FAO Technical Consultation on Improving Information on Status and Trends of Capture Fisheries was held in March 2002, further reviewed the draft considering the full range of actions required and concluded that a Strategy was more appropriate because work pursuant to the task would be ongoing and broad ranging.

of the strategy is “to provide a framework for the improvement of knowledge and understanding of fishery status and trends as a basis for fisheries policy making and management for the conservation and sustainable use of fishery resources within ecosystems.”¹²⁸ The Strategy will be implemented at national, regional and global levels, generally through States working cooperatively to establish a global system for the sharing and dissemination of fisheries status and trends information under the auspices FAO.¹²⁹ FAO is allotted a specific role under the Strategy primarily to ensure the implementation of the Strategy, including assisting developing States with their fishery statistical systems.¹³⁰

One of the tools for implementing the Strategy for Improving Information in Fisheries is the Fisheries Global Information System (FIGIS), a sub-project of the World Agricultural Information Centre of FAO, which was established following the adoption of the Code of Conduct. The Fisheries Global Information System is a web-based information tool that was established to fulfil the need for reliable, high-quality and relevant information on the state of world fisheries.¹³¹ The objectives of Fisheries Global Information System are to: promote policy change towards the sustainable development of the world’s fishery resources by highlighting major issues, presenting possible solutions and providing the best scientific information available; offer a single and unique entry point to strategic data, information and analyses and reviews of issues and trends on a broad range of fisheries subjects; provide quality-controlled, harmonized, streamlined and comprehensive information.¹³²

¹²⁸ FAO Strategy on Improving Information in Fisheries, para 12.

¹²⁹ Ibid., para 13 “The Strategy will be implemented through agreements between States, directly or through their participation in regional fishery bodies and arrangements, and FAO working cooperatively to assemble information on the status and trends of fisheries, and using modern information technology to manage and disseminate it. These agreements should be established at various geographic scales, ranging from local, to national, to regional, and should be linked to form a global system under the auspices of FAO. Wherever and whenever possible, existing organizations should be used as the basis of the arrangements.”

¹³⁰ Ibid., para 49 and 50 “FAO will, as and to the extent directed by its Conference, and as part of its Regular and Field Programme activities, support States and regional fishery bodies and arrangements in the implementation of this Strategy. FAO will, as and to the extent directed by its Conference, support member States’ implementation of this Strategy, through in-country technical assistance projects using Regular Programme funds and by use of extra-budgetary funds made available to the Organization for this purpose. For better conservation and management of fishery resources, FAO should prepare a specific programme for establishing effective and sustainable systems for data collection, processing and analysis in developing countries, including in particular the least developed among them.”

¹³¹ FIGIS can be accessed from the website:

<http://www.fao.org/figis/servlet/static?dom=root&xml=index.xml>

¹³² FAO, *Fisheries Programme: Fisheries Global Information System* FAO Fisheries Information, Data and Statistics Unit (FIDI), 15 Dec 2003 2004 [cited 29 June 2004]; available from <http://www.fao.org/figis/servlet/static?dom=root&xml=index.xml>.

Fisheries Global Information System is to be implemented in two phases, the first phase is to improve and streamline global flow of information about fishery resources and stock status trends, between FAO, regional fisheries management organisations and national centres of excellence. The second phase will include the provision of methodological and operational tools that will assist the production of fishery statistical data at its source. This second phase is crucial to filling the gaps in national capacity and statistical systems that were identified by Evans as a drawback of the Fisheries Global Information System when it was reviewed in pre-2001.¹³³ In regards to tuna fisheries data, Fisheries Global Information System has a Global Tuna Nominal Catch internet-based query system that can draw up figures and maps of nominal catches by gear. Regional fishery agencies provide this data under the Fishery Resources Monitoring System initiative.¹³⁴

The Fishery Resources Monitoring System (FIRMS) is a satellite of the Fisheries Global Information System, which is aimed at providing policy-makers with timely, reliable strategic information on fishery status and trends on a global scale.¹³⁵ Fishery Resources Monitoring System is designed as a policy-based information system that includes information domains such as species, fishing technology, resources, fisheries, vessels and management. Although Fishery Resources Monitoring System is a database, the information is presented as fact sheets with text, maps, illustrations and statistical graphics constructed from available time series. Initially the maintenance of the information will be through partnerships between international organizations, regional fishery bodies and national scientific institutions, collaborating within a formal agreement that facilitates reporting and sharing information on status and trends of fishery resources within their mandate. Eventually it is envisaged that the Fishery Resources Monitoring System will allow States to fulfil their reporting obligations according to international requirements through the use of internet technologies. It is

¹³³ D. W. Evans, *Status and trends reporting in fisheries: A review of progress and approaches to reporting the state of world fisheries*, FAO Fisheries Circular 967 (Rome: FAO, 2001).

¹³⁴ FAO, *Fisheries and Aquaculture Collection: Global Tuna Nominal Catches 1950-2002* FAO Fisheries Department, 3 October 2002 2004 [cited 29 June 2004]); available from http://www.fao.org/figis/servlet/static?dom=collection&xml=tuna-nomcatch.xml&xp_detail=med.

¹³⁵ M. Taconet, *The World Fisheries Resource Monitoring System (FIRMS)* [Internet] (FAO, 2005 [cited 15/07/2005]; available from http://www.oceansatlas.com/world_fisheries_and_aquaculture/html/resources/capture/wrm/default.htm.

hoped that the flow of fisheries information should eventually be streamlined from the State to the relevant regional body through to the global level.¹³⁶

Conclusion

This Chapter has examined the fisheries data practices at the global level. FAO is the centre of these data practices, as a competent international organisation with expert staff and dedicated sub-bodies. FAO's global fisheries data is not yet fully reliable. Through FAO's own initiatives, such as through its normative programmes and through assistance to members, the quality of the information derived on the basis of FAO global fisheries data has improved. FAO's global fisheries data is highly dependent on the quality of national reports submitted by members to FAO, but FAO has and does undertake verification and discrepancy checks to ensure that the FAO's global fisheries data is of the best quality available. Public criticisms about the reliability of FAO's global fisheries data and reports of global fisheries status and trends serve to remind the international community that some degree of caution is required in the interpretation of FAO's global fisheries data, as well as information and advice that are underpinned by such fisheries data. For data on tuna fisheries, discrepancy checks between data held by FAO and data held by tuna RFMOs occurs regularly, so the two datasets are more consistent than is the case for data on other fisheries. However, there is a greater reliance on the quality of data available to tuna RFMOs, which in recent times through the experience of *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT) and *International Commission for the Conservation of Atlantic Tuna* (ICCAT) have been demonstrated to not be without fault. The further implementation of the Strategy on Status for Improving Information on Status and Trends of Capture Fisheries, through *inter alia* Fisheries Global Information System (FIGIS) and Fisheries Resource Monitoring System (FIRMS) is expected to continue to improve the quality of the best available global information on fisheries status and trends.

¹³⁶ Ibid.

Chapter 5. Western central Pacific Ocean tuna fisheries and Pacific Island States: an overview of challenges for fisheries data

This Chapter provides a profile of the Pacific Islands region and the fisheries for principal market tunas of the western and central Pacific Ocean. This profile will provide the necessary background for subsequent analyses in the present thesis of the fisheries data practices of Pacific Island States and of the *Commission for the Conservation and Management of High Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPFC). The Chapter will comprise four parts. First, the characteristic features of the Pacific Island State region will be reviewed. Second, available information on the history and development of western and central Pacific tuna fisheries will be reviewed. Third, the importance of western and central Pacific Ocean tuna fisheries to Pacific Island States will be examined. Fourth, the challenges that Pacific Islands States face in respect of collecting, compiling, analyzing and disseminating data on tuna fisheries will be examined.

5.1 Characteristics of the Pacific Islands region and Pacific Island States

The Pacific Islands region is characterized by small-island States and Territories scattered within large expanse of ocean (see Figure 5-1).¹ The ratio is approximately thirty million

¹ Note that the *Pacific Islands region* refers to an approximate area where the fourteen Pacific Island States and their exclusive economic zones are found (as illustrated in Figure 5-1); the Pacific Islands region is a subpart of the more traditional *western and central Pacific Ocean (WCPO)* area that is used for the collation of tuna fisheries statistics (as illustrated in Figure 5-1). There is a third more recent regional area that is relevant to Pacific Island States tuna fisheries which is the *WCPFC Statistical Area*: the statistical area that covers the WCPFC Convention Area. The WCPFC Statistical Area, and not the western and central Pacific Ocean, will be considered in some parts of this Chapter due to the availability of current statistics. Often the western and central Pacific Ocean is used because statistics can be added to eastern Pacific Ocean statistics to produce statistics for the entire Pacific Ocean. This arises because of the small areas of overlap between the eastern Pacific Ocean and the WCPFC Statistical Area. It is for this reason that the WCPFC currently reports fisheries statistics for both the WCPFC Statistical Area and the western and central Pacific Ocean.

A large rectangular box with a thin black border, centered on the page. Inside the box, the text "Please see print copy for Figure 5-1." is written in a standard black font.

Figure 5-1. Map of the Pacific Islands region (right). For comparison the insert map (left) also indicates the borders of the western central Pacific Ocean (WCPO), the eastern Pacific Ocean (EPO) and the WCPFC Statistical Area in bold dashed line.

Source: Pacific Islands region map adapted from M. Tsamenyi and L. Manarangi-Trott, "Chapter 10: Role of Regional Organizations in Meeting LOS Convention Challenges: The Western and Central Pacific Experience," in *Oceans Management in the 21st Century*, ed. D. R. Rothwell and A. Oude Elferink (The Hague: Kluwer Law Academic Press, 2004), p188. Insert map adapted from P. Williams and C. Reid, Overview of the tuna fisheries in the Western and Central Pacific Ocean (WCPO), including economic conditions - 2007, WCPFC-SC3 GN WP-1 (Kolonja, Federated States of Micronesia: WCPFC, 2007), p1 figure 1

km² of Pacific Ocean relative to 550,000 km² of land.² The islands of the western and central Pacific Ocean share similar ecologies and similar political histories; all except Tonga have been colonies of major metropolitan powers.³ Within the Pacific Islands region the islands are at different stages of political and economic development. Twelve are politically independent but with substantial dependence on foreign aid (Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu).⁴ Two are independent but affiliated with New Zealand (Cook Islands, Niue).⁵ This thesis will be referring to these fourteen small-island States with political independence, when using the term *Pacific Island States*.⁶ It should be noted that there are also another eight groups of islands in the Pacific Islands region that will not be considered by this thesis: one is part of New Zealand (Tokelau); three are dependent territories of the United States of America (American Samoa, Guam and Northern Marianas), three are overseas countries of France (French Polynesia, New Caledonia and Wallis and Futuna) and one is a dependent territories of the United Kingdom (Pitcairn Islands).⁷

² SPC, *Selected Pacific Economies - A Statistical Summary SPESP: Table 1: Pacific Island countries—principal physical and economic features* Secretariat of the Pacific Community, 2001 [cited 25/11/2005 2:49 p.m. 2005]; available from

http://www.spc.int/statsen/English/Publications/Spess14/Download_Excel_Tables_E.htm. The cited figure for area of the Pacific Ocean refers to the approximate sum of the sea areas of the exclusive economic zones of Pacific Island States and Territories, and the cited figure for land area refers to the sum of the land areas of the Pacific Island States and Territories.

³ G. Kent, *The Politics of Pacific Island Fisheries*, A Westview replica ed. (Colorado, United States of America: Westview Press, 1980), p12.

⁴ Tuvalu became independent from Britain in 1978; Kiribati gained full independence from Britain in 1979 (formerly Gilbert, Line and Phoenix Islands); Nauru gained independence in 1968; Vanuatu gained full independence from Britain and France in 1980 (formerly New Hebrides); Papua New Guinea gained full independence from Australia in 1975; Solomon Islands gained full independence in 1978; Tonga was a self-governing protectorate of Great Britain and gained full independence in 1970; Samoa, formerly Western Samoa, achieved independence from New Zealand in 1962; Federated States of Micronesia, Marshall Islands and Palau were all a part of the Trust Territory of the Pacific Islands, and Federated States of Micronesia and Marshall Islands were granted internal self government in a status of compact association with the United States in 1986; Palau was granted internal self government in a status of compact association with the United States in 1994.

⁵ Cook Islands was granted internal self government in a status of free association with New Zealand in 1965; Fiji became independent and joined the Commonwealth in 1970; and Niue was granted internal self government in a status of free association with New Zealand in 1974.

⁶ *Pacific Island States*: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

⁷ M. Tsamenyi and L. Manarangi-Trott, "Chapter 10: Role of Regional Organizations in Meeting LOS Convention Challenges: The Western and Central Pacific Experience," in *Oceans Management in the 21st Century*, ed. D. R. Rothwell and A. Oude Elferink (The Hague: Kluwer Law Academic Press, 2004), p189.

Table 5-1. Pacific Island States country profile summaries, including recent average (2000-2004) catches of the four principal market tuna species in national waters of Pacific Island States and an estimated value. For comparison the recent average (2000-2004) catch by that Pacific Island States national fleet in the WCPFC Convention Area of the four principal market tuna species are also included.ⁱ

Pacific Island State <i>Capital City</i>	Land (sq km)	EEZ (million sq km)	Population (2003 est.)	Primary National Economic Activities	Average (2000-2004) of the four principal market tuna species combined catch in national waters (Mt) (proportion harvested by main fishing method)	estimated value of catch from national waters (US \$ million)	catch by national fleet in WCPFC Convention Area (Mt)
Cook Islands <i>Avarua</i>	240	1.80	19,000	Agriculture, Black Pearls, Offshore Financial Services, Tourism	2,595 (55% longline)	5.19	1,081
Federated States of Micronesia <i>Pohnpei</i>	700	2.90	112,000	Agriculture, Fisheries	136,203 (94% purse seine)	144.80	23,950
Fiji <i>Suva</i>	18,272	1.26	775,000	Agriculture, Clothing, Fisheries, Forestry, Tourism, Sugar	9,160 (92% longline)	28.63	12,140
Kiribati <i>Tarawa</i>	726	3.60	88,000	Copra, Fisheries, Seaweed	200,554 (90% purse seine)	230.97	8,723
Republic of Marshall Islands <i>Majuro</i>	181	2.10	54,000	Agriculture, US Military spending	34,924 (67% purse seine)	58.14	33,360
Nauru <i>Yaren</i>	21	0.32	12,000	Phosphate, Fisheries	63,100 (100% purse seine)	50.13	9
Niue <i>Alofi</i>	259	0.39	1,650	Agriculture, Banking, Telecommunications, Tourism	39 (100% longline)	0.10	0
Palau <i>Koror</i>	487	0.60	20,000	Fisheries, Tourism	3,535 (55% purse seine)	13.92	72

Pacific Island State <i>Capital City</i>	Land (sq km)	EEZ (million sq km)	Population (2003 est.)	Primary National Economic Activities	Average (2000-2004) of the four principal market tuna species combined		
					catch in national waters (Mt) (proportion harvested by main fishing method)	estimated value of catch from national waters (US \$ million)	catch by national fleet in WCPFC Convention Area (Mt)
Papua New Guinea <i>Port Moresby</i>	462,000	2.4	5.6 million	Agriculture, Fisheries, Forestry, Mining	269,638 (99% purse seine)	224.35	129,732
Samoa <i>Apia</i>	2,934	0.12	179,000	Agriculture, Fisheries, Manufacturing, Tourism	3,261 (98% longline)	9.06	4,028
Solomon Islands <i>Honiara</i>	28,000	1.6	450,000	Agriculture, Fisheries, Forestry	47,356 (73% purse seine)	56.18	20,090
Tonga <i>Nuku'alofa</i>	688	0.70	101,000	Agriculture	1,124 (100% longline)	3.83	1,186
Tuvalu <i>Funafuti</i>	26	0.76	10,000	Agriculture, Fisheries, Philatelic Sales	23,913 (95% purse seine)	22.41	0
Vanuatu <i>Port Vila</i>	12,190	0.68	204,000	Agriculture, Fisheries, Tourism	7,720 (96% longline)	22.74	34,219

ⁱ Notes: Detail included under the headings of “Land area”, “EEZ area”, “Population and Primary Economic activities” are taken from Pacific Islands Forum Secretariat, *Pacific Islands Forum Secretariat Member Countries Profiles* [website] (Pacific Islands Forum Secretariat, 2008 [cited 3 January 2008]); available from <http://www.forumsec.org/pages.cfm/about-us/member-countries>.

Figures for “average catch by national waters” and “average catch by national fleet”, as well as “average estimated value of catch” are sourced from Pacific Islands Forum Fisheries Agency, *Value of WCPFC Tuna Fisheries - March 2007* [website and Microsoft Excel spreadsheet file] (2007 [cited 24 December 2007]). Note value estimates are indicative estimates only and prices used are selected as indicative prices for the given species, gear type and market. Obviously not all products will be sold at the indicative price used. Further it is important to bear in mind that all prices are all “delivered” prices in that they reflect the price received at entry to the country in which they are usually sold.

Pacific Island States are recognised as “small-island developing States” (SIDS). SIDS generally refers to “small island and low-lying coastal countries that share similar development challenges, including small population, lack of resources, remoteness, susceptibility to natural disasters, excessive dependence on international trade and vulnerability to global developments. In addition they suffer from lack of economies of scale, high transportation and communication costs, and costly public administration and infrastructure.”⁸ SIDS are a subcategory of developing States. Chapter 3 discussed that developing States have special requirements which must be recognised including *inter alia* through provision of assistance in regards to fisheries conservation and management.⁹ As SIDS, Pacific Island States are also recognised by the international community as being in need of particular financial and technical assistance to fulfil *inter alia* international commitments of international legal fisheries instruments.

Country profile details, including individual primary national economic activities, for each Pacific Island State are included in Table 5-1. Despite their similarities, Pacific Island States characteristics are diverse. There are wide ranging differences between total land area (which range from 21–462,000 km²), size of EEZ areas (which range from 0.12–3.6 million km²) and population size (1,650–5.6 million people). One feature that is common amongst Pacific Island States is the importance of fisheries. Fisheries activities are noted as being a primary economic activity for the majority of Pacific Islands States. However, the average catches of tuna and the average value in national waters in recent years, vary considerably between Pacific Island States (recent average annual catch ranges from 39–269,638 Mt, and recent average annual value estimates range from US \$ 0.1–230.97 million). The primary method of harvest for catches of tuna varies between Pacific Island States as does the proportion harvested by national fleets or non-national fleets (see Table 5-1).

The Pacific Islands region is isolated from major commercial centres and shipping routes. Pacific Island States have small populations and limited industrialization. Given the characteristics of the Pacific Islands region it is not surprising that marine fisheries are the

⁸ *Small Island Developing States (SIDS): List of Islands*, 2005 [cited 29/09/2005 2005]); available from <http://www.sidsnet.org/2.html>.

⁹ See Chapter 3 3.5 *Special requirements of developing States*.

primary economic activity, and that tuna fisheries are considered by Pacific Island States to be a resource of significant current and future potential.¹⁰

5.2 The tuna fisheries of the western and central Pacific Ocean

This section reviews available information on fisheries for the principal market tunas in the western and central Pacific Ocean, with an emphasis on the Pacific Islands region. The four principal market tunas of relevance to the *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the western and central Pacific Ocean* (WCPFC) and to Pacific Island States are skipjack (*Katsuwonus pelamis*), yellowfin (*Thunnus albacares*), albacore (*T. alalunga*), and bigeye (*T. obesus*) tuna species. The characteristic biological features of the principal market tunas were discussed in Chapter 1.¹¹

There are four parts to this section. The contribution of western and central Pacific Ocean tuna fisheries to the global harvest of principal market tunas will first be reviewed. Second the specific features of western and central Pacific Ocean tuna fisheries will be examined, particularly the development trends, composition of catches, methods of harvest, and nature of the fisheries. Third the contribution of the Pacific Island region to catches of principal market tunas in the western and central Pacific Ocean will be reviewed. Fourth, the most recent scientific advice on impacts of tuna fishing on principal market tunas will be reviewed. Note that at the time of writing, the most recent complete statistics available were for 2005. Most statistics for 2006 and 2007 were provisional estimates. Where possible, provisional statistics have not been used, instead the statistics presented are the most recent complete statistics.

Pacific Ocean fisheries for principal market tunas, including bluefin tuna species

As was discussed in Chapter 1 (*1.1 The fisheries for tuna and billfishes since 1950*), the

¹⁰ P. Holden, M. Bale, and S. Holden, *Swimming Against the Tide? An Assessment of the Private Sector in the Pacific.*, ed. A. D. Bank (Manila, Philippines: Asian Development Bank, 2004), M. Tsamenyi and K. Mfodwo, "South Pacific Island States and the New Regime of Fisheries Issues of Law, Economy and Diplomacy," in *The Law of the Sea in the Asian Pacific Region - developments and prospects*, ed. J. Crawford and D. R. Rothwell, *Publications on Ocean Development* (Dordrecht, The Netherlands: Kluwer Academic Publishers, 1995), 121-155.

¹¹ See Chapter 1 *1.1 The tuna and billfish species*

Please see print copy for Figure 5-2.

Figure 5-2. Catches of principal market species of tuna, including bluefin tunas by oceans in 2005. Catches of each species in each ocean are expressed in metric tonnes and as a percentage of the total world catch of that species. Comparable figures for all principal market species and bluefin tunas for each ocean are given in the pie chart.

Source: WCPFC, DRAFT: Western and Central Pacific Fisheries Commission Tuna Fishery Yearbook 2006 (Western and Central Pacific Fisheries Commission, 2007 [cited 1 December 2008]); available from <http://www.wcpfc.int/statistics/bulletins.htm>, except that bluefin catches are from FAO Fisheries and Aquaculture Information and Statistics Service, Capture production 1950-2005. FISHSTAT Plus - Universal software for fishery statistical time series [online or CD-ROM] (Version 2.3. 2000) (Food and Agriculture Organization of the United Nations, Data: Capture Production 1950-2005 released March 2007 2007 [cited January 1 2008]); available from <http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp>.

Pacific Ocean is the largest ocean in the world and produces the greatest harvest of the principal market tunas. In 2005, the catches of principal market tunas and bluefin tunas from the Pacific Ocean were 2.9 million Mt (65% of the global total). In comparison 1.2 million Mt was harvested from the Indian Ocean (26%) and 0.4 million Mt was harvested from the Atlantic Ocean (10%) (see Figure 5-2). Figure 5-2 shows that in 2005 more than half of the global catches of each principal market tunas by weight were harvested from the Pacific Ocean. For the bluefin tunas, Atlantic bluefin are limited in distribution to the Atlantic Ocean and for Southern bluefin the majority was caught in the Indian Ocean with smaller quantities harvested in the Atlantic and Pacific Oceans.¹² Pacific bluefin (*T. orientalis*) is the most relevant of the three bluefin tuna species to the WCPFC. Pacific bluefin spawn in the tropical western Pacific and are also valuable fisheries that are under the purview of the WCPFC, 4387 Mt was caught in the Pacific Ocean in 2005. Except for albacore, the Indian Ocean had higher proportionate catches of each principal market tunas by weight than the Atlantic Ocean (see Figure 5-2).

The relative contributions of the eastern and western halves of the Pacific Ocean to catches of the principal market tunas, excluding bluefin tuna species are illustrated in Figure 5-3.¹³ Figure 5-3 highlights first, that in 2005, total catches of the four principal market tuna species from the western and central Pacific Ocean (WCPO) were dominant by weight at nearly 2.2 million Mt, which was equivalent to 76% of total Pacific Ocean catches of principal market tunas. Second, similar quantities by weight of bigeye were harvested in the WCPO compared to the Eastern Pacific Ocean (EPO) in 2005; approximately one hundred and thirty thousand metric tonnes of bigeye were harvested in the WCPO and one hundred and fourteen thousand metric tonnes were harvested in the

¹² FAO Fisheries and Aquaculture Information and Statistics Service, *Capture production 1950-2005. FISHSTAT Plus - Universal software for fishery statistical time series [online or CD-ROM]* (Version 2.3. 2000) Food and Agriculture Organization of the United Nations, Data: Capture Production 1950-2005 released March 2007 [cited January 1 2008]; available from <http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp>.

¹³ The division of the Pacific Ocean approximately along the 150°W parallel originated from historical separate events. For instance the Inter-American Tropical Tuna Commission was established in 1949 with its designated area of responsibility the conservation of tuna stocks is a region eastward from the 150°W parallel (Eastern Pacific Ocean). Also the Secretariat of the Pacific Community collects and collates tuna fisheries statistics on behalf of the Pacific Island States and Territories, and all but one of the Territories are found in the region westward of the 150°W parallel (Western Central Pacific Ocean).

Please see print copy for Figure 5-3.

Figure 5-3. Catches of principal market species of tuna, excluding the bluefin species, in the Pacific Ocean in 2005. Catches of each species in each ocean are expressed in metric tonnes and as a percentage of the total world catch of that species. Comparable figures for Pacific Ocean principal market species combined are given in the pie chart.

Source WCPFC, DRAFT: Western and Central Pacific Fisheries Commission Tuna Fishery Yearbook 2006 (Western and Central Pacific Fisheries Commission, 2007 [cited 1 December 2008]); available from <http://www.wcpfc.int/statistics/bulletins.htm>].

EPO. Third, the major difference in catch composition of the principal market tunas, by weight, between the WCPO and EPO stems from the significantly higher catches of skipjack; in 2005 within the WCPO approximately 1.5 million Mt of skipjack were harvested which comprised approximately 61% of the global catch of skipjack, compared to approximately two hundred and eighty thousand metric tonnes of skipjack in the EPO (see Figure 5-3). Fourth, relative to the proportion of other principal market tunas harvested, the quantity of skipjack catches is approximately three times that of yellowfin catches in the WCPO (see Figure 5-3). This predominance of skipjack catches in WCPO tuna fisheries appears to be characteristic for the WCPO. In the EPO, Atlantic Ocean and Indian Ocean the quantity of skipjack harvested tend to be similar to the quantity of yellowfin harvested (see Figure 5-3 and Figure 5-2).

Fifth, the quantity of albacore harvested in the WCPO in 2005 was approximately one hundred thousand metric tonnes (approximately 48% of the global harvest of albacore), compared to approximately twenty-five thousand metric tonnes of albacore reported for the EPO in 2005.¹⁴ Finally, the quantity of yellowfin harvested in the EPO in 2005 was approximately three-quarters of that harvested in the WCPO: approximately two hundred and ninety thousand metric tonnes (approximately 22% of the global harvest of yellowfin) in the EPO, compared to approximately four hundred and forty thousand metric tonnes (one-third of global harvest of yellowfin by weight) in the WCPO.

WCPO tuna fisheries for principal market tuna species

The principal market tunas for Pacific Island States are skipjack, yellowfin, bigeye and albacore tuna species.¹⁵ The WCPO, a commonly used fishery statistical area that includes the Pacific Islands region, is considered to be the most important tuna fishing area in the

¹⁴ WCPFC, *DRAFT: Western and Central Pacific Fisheries Commission Tuna Fishery Yearbook 2006* Western and Central Pacific Fisheries Commission, 2007 [cited 1 December 2008]; available from <http://www.wcpfc.int/statistics/bulletins.htm>. Note the albacore figures reported in Table 5-2 are sourced from derived estimates rather than catch and effort data or national reports. Albacore in the Pacific Ocean is commonly considered to be made up of a northern stock and a southern stock, generally targeted by separate fisheries. The Tuna Fisheries Yearbook derived estimates for the WCPO catches of albacore by subtracting the reported EPO albacore catches from the combined estimates for the northern and southern albacore fisheries.

¹⁵ Individual large Pacific bluefin tuna harvested by longline and carefully handled, while potentially providing substantial financial rewards, are very occasionally caught in Pacific Island States fisheries but are not a target fishery for Pacific Island States so will not be considered in this analysis.

Please see print copy for Figure 5-4.

Please see print copy for Figure 5-5.

[Source: WCPFC, DRAFT: Western and Central Pacific Fisheries Commission Tuna Fishery Yearbook 2006 (Western and Central Pacific Fisheries Commission, 2007 [cited 1 December 2008]); available from <http://www.wcpfc.int/statistics/bulletins.htm>]

world: total annual catches of the four principal market tunas (skipjack, yellowfin, bigeye and albacore) in 2005 was estimated to be 2,195,290 Mt, which equates to approximately 76% of total estimated catches of these species in the Pacific Ocean in 2005 (2,9065,670 Mt). The western central Pacific Ocean catch is equivalent to almost 50% of global catches of these same four species (provisionally estimated to be 4.4 million Mt), (see Figure 5-3).¹⁶

Figure 5-4 and Figure 5-5 illustrate the breakdown of WCPO harvests of the four main tuna species from 1950 to 2005, by gear type and by species respectively. There has been a significant increase in the harvested quantities of the four main tuna species since 1950. The total harvest in the WCPO of the four primary market tunas in 2005 is on the whole six times what it was in the 1950-60s (see Figure 5-4 and Figure 5-5). But the relative proportion of four primary market tunas have not changed significantly since 1950; skipjack has always dominated catches by weight at approximately 55 – 65% over the period, but yellowfin has slightly increased its dominance since the 1950s at the expense of albacore and bigeye (see Figure 5-5). As was considered previously, skipjack is and has been the dominant species harvested by weight in the WCPO: in 2005 it was estimated that 1.53 million Mt were harvested, which is approximately 70% of combined catches of the four main tuna species in the WCPO (see Figure 5-5). Yellowfin is the next dominant species, with 21% of the combined catches of the four main tuna species in the WCPO in 2005 (just over four hundred and thirty thousand metric tonnes). Albacore and bigeye harvests have each increased since 1950, an approximately three-fold increase in quantity from 1950 to the most recent catch by weight in 2005 (see Figure 5-4 and Figure 5-5). Increases in the quantities harvested of albacore and bigeye tuna have been lesser, than the increases in skipjack and yellowfin (see Figure 5-5).

Similar to trends in other oceans, in the 1950s the primary fishing methods used in the WCPO were longline and pole-and-line targeting tuna for canneries (see Figure 5-4).¹⁷

¹⁶ WCPFC, *DRAFT: Western and Central Pacific Fisheries Commission Tuna Fishery Yearbook 2006* Western and Central Pacific Fisheries Commission, 2007 [cited 1 December 2008]; available from <http://www.wcpfc.int/statistics/bulletins.htm>. Note that the estimated catch statistics provided here have been compiled for an area termed the western and central Pacific Ocean (WCPO), being the oceanic areas of the Pacific Ocean west of 150°W longitude (the WCPO area is illustrated in Figure 5-1).

¹⁷ See Appendix 3 for a chronological summary of development and management trends for tuna fisheries, also see Chapter 1 *1.2 The fisheries for tuna and billfishes since 1950*.

Purse-seining began its dominance in the WCPO in the early 1980s marked by an increase in the quantity of skipjack harvested (Figure 5-4 and Figure 5-5). In 2005, 69% (or 1.5 million Mt) of the four principal market tuna species in the WCPO were harvested using the purse seine method. In the WCPO, purse seine fisheries target skipjack with small quantities of juvenile yellowfin and juvenile bigeye found associated in skipjack schools and incidentally harvested as a bycatch.¹⁸ This differs from the eastern Pacific Ocean (EPO), which has a greater proportion of larger-sized yellowfin in purse seine catch. The difference could be attributed to the particular oceanic conditions of the WCPO, that has characteristically clear water and a deep thermocline in the equatorial waters, which results in conditions more favourable for smaller faster moving tunas.¹⁹ As a result the catch composition in WCPO purse seine catches includes a predominance of skipjack, as well as quantities of juvenile bigeye and juvenile yellowfin.

In 2005, pole-and-line fisheries harvested approximately two hundred and five thousand metric tonnes or nearly 10% of the four principal market tuna species in the WCPO. Similar to purse seine, pole-and-line fisheries primarily target skipjack.²⁰ In 2005, longline fisheries harvested 11% or nearly two hundred and forty thousand metric tonnes in the WCPO, which would have been comprised of relatively larger sized or adult tunas with

¹⁸ WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC/2007/9* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 2007). The target of WCPO purse seine fisheries is primarily skipjack species. However by their nature skipjack are found in schools that also contain small proportions of juvenile bigeye and yellowfin tunas, particularly when found in association with FADs (fishing aggregate devices). It is these 'bycatch' bigeye and yellowfin tunas, and not skipjack species, which have the stock status concerns. In spite of the small proportion of juvenile bigeye and yellowfin in total purse seine catches, there is still a significant impact from the purse seine fishery on the depletion of bigeye and yellowfin tuna stocks in the WCPO. Scientific research continues in the WCPFC to minimise the impact of purse seine fishing on juvenile bigeye and yellowfin.

¹⁹ R. Gillett, *A short history of industrial fishing in the Pacific Islands* (Bangkok: Asia-Pacific Fishery Commission, FAO Regional Office for Asia and the Pacific, 2007), p6. An alternative hypothesis attributes this difference in size and species composition of catches to spawning grounds in the western equatorial Pacific, such as the archipelagic waters of Indonesia and Philippines (P. M. Martusubroto, Special Adviser to Ministry of Marine Affairs and Fisheries, Indonesia, Personal Communication, 5 August 2008.)

²⁰ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p37, R. Gillett and A. Langley, *Tuna for Tomorrow? Some of the Science Behind an Important Fishery in the Pacific Islands* (Noumea: Asian Development Bank and Secretariat of the Pacific Community, 2007), 3-4, J. Joseph, W. Klawe, and P. Murphy, *Tuna and Billfish - fish without a country*, 2nd ed. (La Jolla, California: Inter-American Tropical Tuna Commission, 1980), 12-13.

a greater proportion of yellowfin, bigeye and albacore as well as other higher value species such as the billfishes and small quantities of bluefin.²¹

As the WCPO tuna fisheries have expanded throughout time the trends in the proportion of harvests of principal market tunas in the WCPO by the fleets of different States has varied, particularly in the last two decades. Table 5-2 provides a snapshot of the national fleet composition in WCPO tuna fisheries at three points in time over the last two

Table 5-2. Catches of four principal market tuna species by ten main fishing fleets and as a percentage of total catch for WCPFC Statistical Area in 1985, 1995 and 2005.²²

Please see print copy for Table 5-2.

²¹ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p37, R. Gillett and A. Langley, *Tuna for Tomorrow? Some of the Science Behind an Important Fishery in the Pacific Islands* (Noumea: Asian Development Bank and Secretariat of the Pacific Community, 2007), 3-4, J. Joseph, W. Klawe, and P. Murphy, *Tuna and Billfish - fish without a country*, 2nd ed. (La Jolla, California: Inter-American Tropical Tuna Commission, 1980), 12-13.

²² WCPFC, *DRAFT: Western and Central Pacific Fisheries Commission Tuna Fishery Yearbook 2006* Western and Central Pacific Fisheries Commission, 2007 [cited 1 December 2008]; available from <http://www.wcpfc.int/statistics/bulletins.htm>.

decades. Since 1985, Japan, Chinese Taipei, Korea, Indonesia, Philippines and the United States of America have individually harvested the greatest quantities of the four principal market tuna species combined in the WCPFC Statistical Area (see Table 5-2). The dominance of Japan and United States, is not surprising seeing that they were the pioneers of industrial fishing methods in the WCPO, for longline and purse seine fishing methods respectively.²³ Recent increases in Philippines and China are probably due to expansion of purse seine fisheries especially beyond their areas of national jurisdiction. Also, noting the potential for expansion under the access agreements that Spain has concluded with some Pacific Island States, further increases in purse seine catches by Spain are expected.

Indonesia's catches have primarily been by coastal fleets. Whilst catches by Japan, Chinese Taipei, the United States of America, Korea and the Philippines have been harvested by a combination of coastal fleets and offshore distant-water fleets operating in the WCPO.²⁴ These offshore distant-water fleets have harvested tuna from the high seas and also under licence arrangements have fished within coastal States EEZs, including Pacific Island States EEZs.²⁵ Over time there has been a decline in the dominance of traditional fishing nations such as Japan and United States, but not necessarily a decline in total weight of catches by these States. There has been a general increase in the number of State participants in tuna fisheries, which combined with the sustained catches of traditional fishing nations, have together contributed to the increase in total catches of principal market tunas in the WCPO over time (as illustrated generally in Figure 5-4). Similar trends over time have been apparent in tuna fisheries in other oceans, with increases in catches later in

²³ R. Gillett, *A short history of industrial fishing in the Pacific Islands* (Bangkok: Asia-Pacific Fishery Commission, FAO Regional Office for Asia and the Pacific, 2007), M. P. Miyake, N. Miyabe, and H. Nakano, *Historical trends of tuna catches in the world, FAO Fisheries Technical Paper No.467* (Rome: Food and Agriculture Organisation of the United Nations, 2004).

²⁴ A. Langley, P. Williams, and J. Hampton, *The Western and Central Pacific Tuna Fishery: 2005 overview and status of stocks, Tuna Fisheries Assessment Report No.7* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2006), P. Williams and C. Reid, *Overview of the tuna fisheries in the Western and Central Pacific Ocean (WCPO), including economic conditions - 2007, WCPFC-SC3 GN WP-1* (Kolonias, Federated States of Micronesia: WCPFC, 2007).

²⁵ R. Gillett, *A short history of industrial fishing in the Pacific Islands* (Bangkok: Asia-Pacific Fishery Commission, FAO Regional Office for Asia and the Pacific, 2007), A. Langley, P. Williams, and J. Hampton, *The Western and Central Pacific Tuna Fishery: 2005 overview and status of stocks, Tuna Fisheries Assessment Report No.7* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2006), P. Williams and C. Reid, *Overview of the tuna fisheries in the Western and Central Pacific Ocean (WCPO), including economic conditions - 2007, WCPFC-SC3 GN WP-1* (Kolonias, Federated States of Micronesia: WCPFC, 2007).

the history of the fisheries being attributed in part to sustained higher catches by traditional fishing nations combined together with expanded involvement of other States, including developing coastal State fleets.²⁶ It should be noted that the catch data included in Table 5-3 does not include Vietnam, which is estimated to export approximately 50,000 Mt of tuna products.²⁷

Distribution of tuna fisheries in the western and central Pacific Ocean

Figure 5-6 shows the distribution of catches of skipjack tuna, yellowfin tuna and bigeye tuna in the WCPFC Statistical Area, over the period 1999 – 2005. The majority of skipjack and yellowfin catches were taken in the equatorial areas by purse seine fisheries. This area of high purse seine catches corresponds to the Pacific Islands region, and the majority of the area is comprised of the national waters of many Pacific Island States (compare with Figure 5-1). It should be noted that the spatial distribution of purse seine catches are affected by the El Nino Southern Oscillation (ENSO) conditions.²⁸ For example, with El Nino events purse seine fishing effort tends to be typically distributed further to the east and fishing effort will tend to contract towards the west during La Nina periods.²⁹ As can be seen in Figure 5-6, on average there is a significant concentration of yellowfin and skipjack catches in Indonesian and Philippine waters harvested by a variety of fishing methods. Also a concentration of skipjack catches off the coast of Japan by pole-and-line method.

Bigeye is harvested over a much wider spatial range of the WCPFC Statistical Area and the predominant method of harvest by weight is longline (Figure 5-6). Smaller quantities of smaller bigeye (20–60 cm) are taken by the purse seine fishery in the

²⁶ Chapter 1 discussed the development trends in global tuna and billfish fisheries, and provided a summary of trends in the top ten fishing nations in global catches by weight. Chapter 1 also included figures that illustrated the trends in the development of different fleets over time by ocean. See Chapter 1 *1.2 The fisheries for tuna and billfishes since 1950*.

²⁷ A. Lewis, Fisheries Consultant, Personal Communication by Email, Sat, 16 Feb 2008. The reasons for lack of catch data are socio-political. Vietnam is located on the border of the south China Sea, and thus is considered by some Asian States to be located outside the WCPFC Convention Area. The reasons are also that the data is not available, because Vietnam is a developing State with poorly developed fisheries statistical systems.

²⁸ P. Williams and C. Reid, *Overview of the tuna fisheries in the Western and Central Pacific Ocean (WCPO), including economic conditions - 2007*, WCPFC-SC3 GN WP-1 (Kolonias, Federated States of Micronesia: WCPFC, 2007), 5-11.

²⁹ Ibid.

Please see print copy for Figure 5-6.

Figure 5-6. Distribution of catches for skipjack tuna (top-left), yellowfin tuna (top-right) and bigeye tuna (bottom) in the WCPFC Convention Area from 1999-2005. Note the spatial grids refer to the areas that are used in the stock assessments by SPC-OFP.

Source: P. Williams and C. Reid, Overview of the tuna fisheries in the Western and Central Pacific Ocean (WCPO), including economic conditions - 2007, WCPFC-SC3 GN WP-1 (Kolonias, Federated States of Micronesia: WCPFC, 2007), Figures 48 (p29), 52 (p32) & 57 (p37)

equatorial waters, and longline fisheries in those same regions harvest larger sized bigeye tuna.³⁰ Similar to skipjack and yellowfin, in Indonesian and Philippine waters bigeye are harvested by a variety of methods.

Impacts of tuna fishing

The scientific advice from the WCPFC Scientific Committee's 2007 Regular Session was that the WCPO bigeye stock was not yet in an overfished state, although there is a very high probability that current fishing mortality rates are greater than what is predicted to be sustainable over the long-term, and that overfishing of bigeye tuna stocks in the WCPO is occurring.³¹ Furthermore the Scientific Committee maintained its recommendation from 2006 that a 25% reduction in fishing mortality is required, from average levels in 2001 – 2004, to prevent the stock from becoming overfished in the future. Scientific advice is that fishery impacts on the bigeye stock are greatest in the equatorial regions, and the longline fishery is having the greatest impact in the WCPFC Statistical Area. The purse seine fishery whilst having a lesser impact on the stock, still has a substantial impact particularly those operations using fish aggregation devices (FADs).

In respect of yellowfin tuna, the advice from the Scientific Committee was that overfishing may be occurring but the WCPO yellowfin stock is not yet in an overfished state.³² As a precautionary measure the Scientific Committee advised that reductions in fishing mortality are recommended. The scientific advice is that unlike what is the case for the bigeye stock, the purse seine fishery is having the greatest impact on the western and central Pacific Ocean yellowfin stock. Also, the Indonesia and Philippine fisheries and the western and central Pacific Ocean longline fisheries are having lesser but substantial impacts on the yellowfin stock.

The scientific advice is that stocks of skipjack and South Pacific albacore tuna in the western and central Pacific Ocean are neither overfished nor is overfishing occurring.³³

³⁰ Ibid., p37.

³¹ WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2007).

³² Ibid.

³³ Ibid.

Both stocks can sustain higher levels of fishing mortality in the western and central Pacific Ocean; however there are circumstances which should also be taken into account. In respect of skipjack tuna, the most recent stock assessment for the western and central Pacific Ocean was conducted in 1995, and included data from 1972 – 2004. Scientific advice is that there was a very high probability that overfishing is not occurring and the stock is not overfished; the scientific analysis indicates that the skipjack stock in the western and central Pacific Ocean is moderately exploited relative to the stocks biological potential. However, the Scientific Committee notes that any increases in purse seine catches of skipjack may result in a corresponding increase in fishing mortality for yellowfin and bigeye tunas.³⁴

In the case of South Pacific albacore, the scientific advice is that similar to skipjack, overfishing is not occurring nor is the stock in an overfished state, and the fishery impacts on the stock are quite moderate. However, the Scientific Committee notes that given the age-specific mortality of the longline fleets for South Pacific albacore, any significant increase in effort would reduce catch per unit effort (CPUE) to low levels with only moderate increases in yields of South Pacific albacore. This is of particular concern to Pacific Island States with longline interests (including Cook Islands, Fiji, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga) because reductions in CPUE are likely to result in reduced economic viability of South Pacific albacore fisheries.³⁵

Therefore, in respect of the current status of stocks of the principal market tuna species in the WCPO, two of the four principal market tuna stocks have associated

³⁴ This very trade-off in potential harvest yields of skipjack tuna to address sustainability concerns of bigeye tuna and yellowfin tuna goes to the heart of the current conservation and management debate in the WCPFC. Commission members, including amongst the Pacific Island States, have divergent interests in this trade-off in the WCPO. For this reason FFA has given the impact of various management scenarios on Pacific Islands States thorough consideration, particularly in recent years as part of FFA preparations in 2006 and 2007 for the Regular Annual Sessions of the WCPFC. From the authors personal experience, also for some recent published analyses on this topic see C. Reid, "Tuna Resource Management: Economic Implications and trade-offs in achieving maximum sustainable yield for bigeye and yellowfin tuna in the Western and Central Pacific Ocean," *Pacific Economic Bulletin*, 21, no. 3 (2006): 31-45, C. Reid, S. Sauni, and L. Clark, "Economic and Management Implications of Stock Assessments on Key Tuna Stocks in the WCPO WCPFC-SC3-SA SWG/WP-8" (paper presented at the Third Regular Session of the WCPFC Scientific Committee, 13-24 August, Honolulu, Hawaii, 2007).

³⁵ WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean,, 2007).

sustainability concerns (bigeye tuna and yellowfin tuna) and albacore may have economic concerns. As has been discussed previously in this Chapter, bigeye tuna and yellowfin tuna are caught in the WCPO using a range of gear types: small-sized bigeye tuna and yellowfin tuna are caught as bycatch, in surface fisheries by purse seine and pole-and-line gear generally targeting skipjack; and larger/older bigeye tuna and yellowfin tuna are caught in deeper waters using longline gear.³⁶ Table 5-3, next page, provides, for reference, a summary of the key features of the four principal market tunas, including typical size at capture, estimated catch levels in 2005 in the WCPO, stock status and some notes about the fisheries and methods that target each of the principal market tuna species.³⁷

5.3 Importance of tuna fisheries to Pacific Island States

It was discussed previously in this Chapter that Pacific Island States have exclusive economic zones (EEZs) that cover a significant portion of the key fishing grounds in the WCPO (for example, compare Figure 5-1 and Figure 5-6). However, historically Pacific Island States through their national fleets have not directly harvested a comparative proportion of the four principal market tuna species from the WCPO (see Table 5-2). For example, in 1985 Pacific Island State vessels harvested only 4%, or approximately forty-two thousand metric tonnes of the four principal market tuna species in the WCPFC Statistical Area. In 1995 despite the combined weight of principal market tunas increasing by 50%, the share of catch harvested by Pacific Island States national fleets was only a

³⁶ R. Gillett and A. Langley, *Tuna for Tomorrow? Some of the Science Behind an Important Fishery in the Pacific Islands* (Noumea: Asian Development Bank and Secretariat of the Pacific Community, 2007), A. Langley, P. Williams, and J. Hampton, *The Western and Central Pacific Tuna Fishery: 2005 overview and status of stocks, Tuna Fisheries Assessment Report No.7* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2006), WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 2007).

³⁷ See Chapter 1 1.2 *The fisheries for tuna and billfishes since 1950* for further detail on main types of tuna fishing methods. The short paper by R. Gillett, *A short history of industrial fishing in the Pacific Islands* (Bangkok: Asia-Pacific Fishery Commission, FAO Regional Office for Asia and the Pacific, 2007), provides a useful overview of the historical development of large-scale tuna fishing in the Pacific Islands region.

Table 5-3. Summary of the main characteristics of the Principal Market Tuna Species in the WCPO tuna fisheries³⁸

	Typical size captured	WCPO Catch in 2005 (Mt)	Stock status in the WCPFC as recommended by the WCPFC Scientific Committee (2007)	Notes on the fisheries in the WCPO
Skipjack (<i>Katsuwonus pelamis</i>)	40-70 cm (45cm or 1.5 yrs at maturity)	1,532,361 (69.8% of total WCPO catch)	Overfishing is not occurring and the stock is not in an overfished state, and exploitation is modest relative to the stocks biological potential.	Mainly caught on the surface by purse seine and pole-and-line gear and used for producing canned tuna. Most fish caught are one to three years old. In the WCPO there are more skipjack (biomass) than the other three main tuna species combined.
Yellowfin (<i>Thunnus albacares</i>)	40-70 cm & 90-160 cm (105cm or 2.8 yrs at maturity)	435,875 (19.8% of total WCPO catch)	Overfishing may be occurring (47% probability), but the stock is not yet overfished (93.8%). Fisheries with the greatest impact are Indonesia and Philippines fisheries, and purse-seining. Longline fisheries also have an impact (10%).	Small yellowfin are caught on the surface by purse seine and pole-and-line gear, while larger/older fish are caught deeper using longline gear. Small fish are used mainly for canning while high quality larger fish are often shipped fresh to overseas markets. Most fish caught are from one to six years old.
Bigeye (<i>T. obesus</i>)	40-70 cm & 90-160 cm (115cm or 3.5 yrs at maturity)	132,151 (6.0% of total WCPO catch)	A high probability that overfishing is occurring (>99% probability) but the stock is not yet overfished (>99% probability). A 25% reduction in fishing mortality from average levels for 2001-2004 is recommended to prevent the stock becoming overfished in the future. Fisheries with the greatest impact are the longline fisheries, but also purse seine fisheries particularly with FADs. Greatest impact by both methods in the equatorial regions of the WCPO.	Small bigeye are caught on the surface by purse seine and pole-and-line gear, while larger/older fish are caught deeper using longline gear. Small fish are used mainly for canning while high quality larger fish are especially valuable as fresh fish in the Japanese market. Most fish caught are from one to ten years old. Bigeye tuna account for a relatively small proportion of the total tuna catch in the region, but these tuna are extremely valuable; their economic value probably exceeds USD51 billion annually.
Albacore (<i>T. alalunga</i>)	60-110 cm (90cm or 4.5 yrs at maturity)	94,974 (4.3% of total WCPO catch)	Overfishing is not occurring and the stock is not in an overfished state. Overall, fishery impacts on the total biomass are low (10%) although given the age-specific mortality of the longline fleets, any significant increase in effort would reduce CPUE to low levels with only moderate increases in yields.	Small albacore are caught by trolling at the surface in cool water outside the tropics, while larger fish are caught deeper and mainly at lower latitudes using longline gear. Most of the catch is used for producing "white meat" canned tuna. Fish caught are typically from 1.5 to ten years old. This was the fish at the centre of the driftnet issue.

³⁸ Sources: FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), see table on 4-6, R. Gillett, *A short history of industrial fishing in the Pacific Islands* (Bangkok: Asia-Pacific Fishery Commission, FAO Regional Office for Asia and the Pacific, 2007), R. Gillett and A. Langley, *Tuna for Tomorrow? Some of the Science Behind an Important Fishery in the Pacific Islands* (Noumea: Asian Development Bank and Secretariat of the Pacific Community, 2007), see table on p2, WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 2007), Executive Summary.

proportional increase to 6% or approximately ninety-one thousand metric tonnes (see Table 5-2).³⁹ The majority of the catch is taken from Pacific Island States EEZs under licence arrangements with foreign fleets, including Japan, Chinese Taipei, Korea, the United States of America and the Philippines as well as others.⁴⁰

Since the late 1980s and early 1990s there has been some evidence of the success of efforts by Pacific Island States to encourage domestic development of fisheries activities through means such as on-shore processing facilities and the basing of foreign-flagged fishing vessels in Pacific Island States, in order to improve financial returns to Pacific Island States from western central Pacific Ocean tuna fisheries.⁴¹ Pacific Island States have sought greater spin-off benefits from tuna fishing operations such as from increased export earnings and increased local employment opportunities. In seeking these benefits, Pacific Island States have often offered incentives to fishing companies, for example lower fishing licence fees, tax incentives, fuel and utility discounts. These benefits are intended to make it more attractive for fishing companies to base operations within Pacific Island States rather than offshore.

The effect of these efforts by Pacific Islands States can be seen in reports that since the mid 1990s there has been an increasing proportion, by number, of purse seine and longline vessels that are classed as part of the Pacific Island State national fleet in the

³⁹ A. Langley, P. Williams, and J. Hampton, *The Western and Central Pacific Tuna Fishery: 2005 overview and status of stocks*, *Tuna Fisheries Assessment Report No.7* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2006), P. Williams and C. Reid, *Overview of the tuna fisheries in the Western and Central Pacific Ocean (WCPO), including economic conditions - 2007*, WCPFC-SC3 GN WP-1 (Kolonia, Federated States of Micronesia: WCPFC, 2007).

⁴⁰ A. Langley, P. Williams, and J. Hampton, *The Western and Central Pacific Tuna Fishery: 2005 overview and status of stocks*, *Tuna Fisheries Assessment Report No.7* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2006), P. Williams and C. Reid, *Overview of the tuna fisheries in the Western and Central Pacific Ocean (WCPO), including economic conditions - 2007*, WCPFC-SC3 GN WP-1 (Kolonia, Federated States of Micronesia: WCPFC, 2007).

⁴¹ This objective was originally and remains a primary focus of the Pacific Island Forum Fisheries Agencies (FFA) role in support of Pacific Island States. The current mission of FFA is “to support and enable our members to achieve sustainable fisheries and the highest level for social and economic benefits in harmony with the broader environment.” (Pacific Islands Forum Fisheries Agency, *FFA Strategic Plan 2005 - 2020: Responsible Fisheries and Sustainable Benefits - Strength through Co-operation* (Honiara, Solomon Islands: FFA, 2005).) In the 2007 Forum Leaders Communiqué, the Vava’u Declaration “Our Fish Our Future”, Forum Leaders stated that reaffirmed the importance of fisheries to the economies of all Pacific Forum countries, and *inter alia* “commit to PROMOTING DOMESTIC FISHERIES, in particular the development of national tuna industries, in the context of a phased introduction of rights-based management arrangements supported by an appropriate management and regulatory framework;” (Pacific Islands Forum Secretariat, “The Vava’u Declaration on Pacific Fisheries Resources “Our Fish, Our Future”,” in *Forum Communiqué* (Nuku’alofa, Kingdom of Tonga: 38th Pacific Islands Forum: 16-17 October, 2007).)

WCPFC Statistical Area.⁴² Annual catch statistics also demonstrate that there has been an increase in the quantity by weight and relative proportion of catch harvested by fishing vessels flagged to Pacific Island States over the last decade: in 2005 Pacific Island State vessels harvested 19% of the total catch of the four main tunas in the WCPFC Statistical Area or just over four hundred and twenty thousand metric tonnes, a more than four-fold increase over the decade 1995 to 2005, and about a ten-fold increase from 1985 to 2005 (see Table 5-2).

As well as being of global significance the annual catch of tuna in the WCPO has an estimated current value of 11% of the combined gross domestic product (GDP) of all the countries in the region (US \$1.9 billion in 1998) equivalent to half the value of all exports from the region.⁴³ Tuna fisheries produce other spin-off benefits to Pacific Island States such as employment, economic benefits from locally-based fishing vessels, transshipments, export benefits and other social benefits such as nutrition.⁴⁴

One of the major financial benefits from tuna resources has been in the revenue gained through access fees paid by foreign fishing vessels that fish for tuna in the EEZs of Pacific Island States. Most licences are in the form of bilateral licensing arrangement, with the exception of the “Treaty on Fisheries Between the Government of Certain Pacific Islands States and the Government of the United States of America” (Multilateral Treaty on Fisheries).⁴⁵ Countries such as Federated States of Micronesia, Papua New Guinea, Kiribati, Tuvalu, Nauru and the Marshall Islands receive the highest amounts of revenue

⁴² A. Langley, P. Williams, and J. Hampton, *The Western and Central Pacific Tuna Fishery: 2005 overview and status of stocks*, *Tuna Fisheries Assessment Report No.7* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2006), P. Williams and C. Reid, *Overview of the tuna fisheries in the Western and Central Pacific Ocean (WCPO), including economic conditions - 2007*, *WCPFC-SC3 GN WP-1* (Kolonias, Federated States of Micronesia: WCPFC, 2007), p3, p20. Estimations from figures in the report indicate that about 1,000 longline vessels out of about 5,000 are classed by SPC as domestic and foreign Pacific Island-based that are considered to be part of the national fleet of Pacific Island States. In respect of purse seiners the paper reports there are about 63 out of about 200 purse seine vessels in the WCPF Convention Area that are classed by SPC as Pacific Island-based. Note that there are diverse differences in the size and power of fishing vessels operating in the WCPFC Convention Area, and the number of vessels alone do not provide an accurate proxy for the level of potential fishing effort of Pacific Island State fishing fleets, relative to non-Pacific Island fleets.

⁴³ R. Gillett et al., *Tuna: A Key Economic Resource in the Pacific Islands*, ed. A. D. Bank (Manila, Philippines: Asian Development Bank, 2001), p5.

⁴⁴ For further detail see Ibid.

⁴⁵ Treaty on Fisheries Between the Government of Certain Pacific Islands States and the Government of the United States of America and its subsidiary agreements, of 15 June 1993, Revised Edition of the Multilateral Treaty on Fisheries incorporating all amendments agreed between the United States and the Pacific Island Parties up to 15 June 1993, as published by FFA, Honiara, 1994 (Multilateral Treaty on Fisheries,)

from access fees.⁴⁶ Access fees have an estimated value of US \$ 60–70 million annually to Pacific Island States.⁴⁷ For many Pacific Island States access fees are a significant and crucial component of government revenue (access fees can comprise up to 20–65% of government revenue), particularly to those States with no abundant natural resources other than tuna.⁴⁸

The reliance by Pacific Island States on tuna resources is not surprising given that, as can be seen from Table 5-1, a number of Pacific Island States have relatively small land areas and significantly large EEZs, so have few alternative options for economic development. Also many Pacific Island States EEZs are located in areas that are tuna fisheries-rich (see Figure 5-6). Pacific Islands States have differing national circumstances so the interests of Pacific Island States differ across WCPO tuna fisheries: some are primarily purse seine focussed whereas others are primarily longline focussed, whilst others are combinations of both (see Table 5-1); some Pacific Islands States have national policies exclusively focussed on national fleets, whereas for other States their circumstances necessitate pursuing benefits in foreign access agreements, and for other a combination of both suits national circumstances.⁴⁹

Nevertheless, Pacific Island States share long-held aspirations to improve the economic returns from western and central Pacific Ocean tuna fisheries. Additionally, it has been estimated that Pacific Island States could receive far greater returns from the

⁴⁶ R. Gillett et al., *Tuna: A Key Economic Resource in the Pacific Islands*, ed. A. D. Bank (Manila, Philippines: Asian Development Bank, 2001), 13-15, Pacific Islands Forum Fisheries Agency, (paper presented at the 19th Annual Treaty Consultation Meeting: Internal Meeting of the Pacific Island Parties 12-16 March, Port Vila, Vanuatu, 2007), Information Paper C - Report of the Treaty Administrator. The levels of access fees in 2003 for the mentioned States were estimated by AusAid to range from USD15.7 million to USD 3.3 million (AusAID Australian Government, *Valuing Pacific fish: A framework for fisheries-related development assistance in the Pacific* (Canberra: Commonwealth of Australia, 2007), p44 Table 5.

⁴⁷ AusAID Australian Government, *Valuing Pacific fish: A framework for fisheries-related development assistance in the Pacific* (Canberra: Commonwealth of Australia, 2007), p4.

⁴⁸ R. Gillett et al., *Tuna: A Key Economic Resource in the Pacific Islands*, ed. A. D. Bank (Manila, Philippines: Asian Development Bank, 2001), 13-15, Pacific Islands Forum Fisheries Agency, (paper presented at the 19th Annual Treaty Consultation Meeting: Internal Meeting of the Pacific Island Parties 12-16 March, Port Vila, Vanuatu, 2007). Since 2004 the Multilateral Treaty on Fisheries pays USD21 million, part of which is used to cover costs of administering the Treaty, but a substantial portion is provided directly to Pacific Island States and other Parties to the Treaty (New Zealand in respect of Tokelau, and to Australia).

⁴⁹ Authors personal experience. For example the Cook Islands has had a policy for some time of not allowing foreign fishing vessels access to fish in the Cook Islands EEZ, so as to preserve opportunities for Cook Islands companies and nationals. Whereas Palau and Kiribati are heavily reliant on foreign fishing vessel access and have little domestic fisheries operations in-country.

fisheries.⁵⁰ The perceived low level of return from tuna fisheries has necessitated continuing efforts by Pacific Island States to improve and maximise these returns for the future, whilst also being concerned for the long-term sustainability of the resource and the benefits to Pacific Island States. For instance, the vision set out in the 2004 Pacific Island Regional Ocean Policy states the desire for “a healthy ocean that sustains the livelihoods and aspirations of Pacific Island Communities.”⁵¹ More recently, the significance of tuna resources to Pacific Island States has been formally recognised at the level of regional leaders: the Leaders of the Pacific Islands Forum. In the 2007 Forum Leaders Communiqué, the Vava’u Declaration “Our Fish Our Future”, Forum Leaders reaffirmed the importance of fisheries to the economies of all Pacific Forum countries, and *inter alia* stated that they “commit to promoting domestic fisheries, in particular the development of national tuna industries, in the context of a phased introduction of rights-based management arrangements supported by an appropriate management and regulatory framework.”⁵²

Recognising the diversity among Pacific Island States, but also the common goal of effectively conserving and managing tuna stocks, so as to meet the visions of the Forum Leaders has been a long-standing challenge for Pacific Island States. To this end, the Pacific Islands Forum Fisheries Agency (FFA) was established in 1979, to provide assistance to Pacific Island States to secure the benefits from tuna resources for Pacific Island States.⁵³ Consistent with the statements of vision by the Forum Leaders and set out in the Pacific Islands Regional Oceans Policy, the FFA’s current mission to the year 2020

⁵⁰ K. Barclay and I. Cartwright, "Governance of tuna industries: The key to economic viability and sustainability in the Western and Central Pacific Ocean," *Marine Policy* 31 (2007): 348-358, R. Gillett et al., *Tuna: A Key Economic Resource in the Pacific Islands*, ed. A. D. Bank (Manila, Philippines: Asian Development Bank, 2001), R. Hannesson, "The exclusive economic zone and economic development in Pacific Island Countries," *Marine Policy* (Article in press) (2008), V. Ram-Bidesi and M. Tsamenyi, "Implications of the tuna management regime for domestic industry development in the Pacific Islands States," *Marine Policy* 28 (2004): 383-392, C. Reid, S. Sauni, and L. Clark, "Economic and Management Implications of Stock Assessments on Key Tuna Stocks in the WCPO WCPFC-SC3-SA SWG/WP-8" (paper presented at the Third Regular Session of the WCPFC Scientific Committee, 13-24 August, Honolulu, Hawaii, 2007).

⁵¹ Pacific Islands Regional Ocean Policy, Adopted by Pacific Island Forum Leaders in 2002, accessed from <http://www.spc.int/pioccean/forum/New/welcome.htm> on 3 March 2008.

⁵² Pacific Islands Forum Secretariat, "The Vava'u Declaration on Pacific Fisheries Resources "Our Fish, Our Future", in *Forum Communique* (Nuku'alofa, Kingdom of Tonga: 38th Pacific Islands Forum: 16-17 October, 2007).

⁵³ The role of the Pacific Islands Forum Fisheries Agency will be further examined in Chapter 6 *6.1 Regional institutions and instruments that assist Pacific Island States*.

is: “to support and enable our members to achieve sustainable fisheries and the highest level for social and economic benefits in harmony with the broader environment.”⁵⁴

The discussions above have shown that ensuring the long-term conservation and sustainable use of western and central Pacific tuna fisheries is an important priority for Pacific Islands States. Effective data practices are essential to ensure the availability of quality fisheries data on these fisheries to support scientific analyses of impacts of tuna fishing. The next section will briefly outline the challenges for data practices in the Pacific Island region.

5.4 The challenges of fisheries data practices for western and central Pacific Ocean tuna fisheries

The collection of data on all fishing activities conducted within an ocean area of approximately 30 million km² is a challenge. This challenge becomes immense when the sum total of the land mass from which to base approaches to address this challenge are small islands spread throughout the waters. The land areas would together comprise a total land area of just over five percent of the water area that must be covered. The EEZs of Pacific Island States cover a significant portion of the Pacific Islands region, and are important to the broader WCPO. The United Nations Convention for the Law of the Sea (LOS Convention) granted Pacific Island States, as coastal States, sovereign rights to exploit, conserve and manage the marine living resources found within their EEZ.⁵⁵ But with these rights, Pacific Island States are obliged to ensure the conservation of these marine living resources. However Pacific Island States individually have limited financial resources, manpower and technical expertise to contribute towards tuna fisheries conservation and management.

⁵⁴ Pacific Islands Forum Fisheries Agency, *FFA Strategic Plan 2005 - 2020: Responsible Fisheries and Sustainable Benefits - Strength through Co-operation* (Honiara, Solomon Islands: FFA, 2005). As will be discussed in Chapter 6, some Pacific Island States have also adopted a number of subregional treaties that seek to maximise economic returns from purse seine fisheries. See Chapter 6 *6.1 Regional institutions and instruments that assist Pacific Island States*.

⁵⁵ United Nations Convention on the Law of the Sea of 10 December 1982, entered into force from 16 November 1994 (1982) 21 *ILM* 1261 (LOS Convention,).

Adding to these challenges, the WCPO tuna fishery has historically been dominated by the fishing fleets of States other than Pacific Island States. Japan, China, Chinese Taipei, Korea, the United States of America and the Philippines have traditionally harvested the majority of the catches of the four main tuna species from the WCPO (Table 5-2).⁵⁶ A substantial proportion of catches are harvested from Pacific Islands States EEZs by these foreign fleets under bilateral or multilateral licence arrangements.⁵⁷ Ensuring the compliance of foreign fishing vessels with licence terms and conditions, including the provision of catch and effort logsheets, was a challenge for many Pacific Island States and remains a challenge for those Pacific Island States that remain dependent on the access fees paid by these fishing vessels.⁵⁸ For States with more of a focus on domestic fleet development, the challenge has been to secure and maintain compliance by domestic vessels with national licence requirements to provide data on fishing activities.

The small islands, small populations, undeveloped economies, large ocean areas under their national jurisdiction and high dependence on revenue obtained from fishing access fees are the characteristics that create the greatest challenges for Pacific Islands States in managing their tuna fisheries. Such characteristics mean that, despite the significance of the access fees to the economies of Pacific Islands States, most Fisheries Departments are only afforded minimal budgetary resources much of which would be taken up by administration and wages.⁵⁹

Most Fisheries Departments within Pacific Island States would have on average three to four experienced fishery scientists/marine biologists qualified to Bachelor-level as managers of particular divisions within the Fisheries Department. Within such divisions

⁵⁶ A. Langley, P. Williams, and J. Hampton, *The Western and Central Pacific Tuna Fishery: 2005 overview and status of stocks, Tuna Fisheries Assessment Report No.7* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2006), P. Williams and C. Reid, *Overview of the tuna fisheries in the Western and Central Pacific Ocean (WCPO), including economic conditions - 2007, WCPFC-SC3 GN WP-1* (Kolonias, Federated States of Micronesia: WCPFC, 2007).

⁵⁷ A. Langley, P. Williams, and J. Hampton, *The Western and Central Pacific Tuna Fishery: 2005 overview and status of stocks, Tuna Fisheries Assessment Report No.7* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2006), P. Williams and C. Reid, *Overview of the tuna fisheries in the Western and Central Pacific Ocean (WCPO), including economic conditions - 2007, WCPFC-SC3 GN WP-1* (Kolonias, Federated States of Micronesia: WCPFC, 2007).

⁵⁸ R. Gillett et al., *Tuna: A Key Economic Resource in the Pacific Islands*, ed. A. D. Bank (Manila, Philippines: Asian Development Bank, 2001), p13-15. Access fees can comprise up to twenty to sixty-five percent of government revenue to Pacific Island States, particularly to those States with no abundant natural resources other than tuna.

⁵⁹ Authors personal experience.

there may be anywhere from five to fifteen lower-level fisheries officers, who may have graduated with Diploma or Bachelor degree in marine science or marine resource management and be of varying levels of practical experience (it is common for fisheries officers, who may even hold senior positions, to have no formal qualifications but instead have practical experience). Management and development of tuna fisheries, like in Fisheries Departments elsewhere around the world, tends to be only one part of the work programme for these Fisheries Departments, which further limits the available staff and resources from the pool described above.

Even fewer human and financial resources are available for data tasks such as fisheries data collection, compilation and analysis. A few of the larger Pacific Island State Fisheries Departments may have dedicated data entry personnel, this better utilises the skills and expertise of qualified scientists. Nevertheless to ensure data quality at least one highly skilled and experienced person should be responsible for checking and analysing the data for anomalies, gaps and errors after entry; but more often this latter person, if available at all, is the sole person performing the data entry leaving less time available for data quality assurance.⁶⁰ Circumstances such as these are common to Pacific Island States, and Pacific Islands States also have a common interest in ensuring the effective conservation and management of western and central Pacific tuna fisheries.

These are the very real challenges faced by the fourteen Pacific Islands States in respect of collecting and compiling data on tuna fishing activities for western and central Pacific tuna fisheries, all of which face even further challenges as small-island developing States. Pacific Island States were among the last nations in the world to gain formal independence. Yet, in spite of their independence, Pacific Islands States have sensibly recognised that as small island States and mid-ocean States they face common challenges in managing and developing tuna fisheries for the benefit of their people, particularly in collecting and compiling data relevant to the management of these fisheries. To this end regional legal and policy frameworks have been established that *inter alia* assist Pacific Island States collect, collate and analyse fisheries data on activities within their EEZ and by fishing vessels flying their flag which is relevant to tuna fishery conservation and

⁶⁰ Authors personal experience.

management. The subregional approaches taken by Pacific Island States to overcome the data on tuna fisheries challenge is the subject of Chapters 6.

It should also be noted that collection of fisheries data on western and central Pacific tuna fisheries is also a challenge for other developing coastal States in the region. Indonesia and the Philippines tuna fisheries are large and diverse, and range from small scale artisanal fisheries, involving tens of thousands of fishers and hundreds of landing sites across the country, to industrial fishing activities often venturing beyond their area of national jurisdiction. The multiple scale diverse artisanal fisheries pose particular challenges for accurate statistical data collection, with some activity undertaken on a quasi-legal basis, and not susceptible to close monitoring.⁶¹ The catches taken by these fisheries is not insignificant: In 2005, the Philippines annual catch estimates were over 300,000 Mt (14% of total catches in western and central Pacific Ocean) and Indonesia annual catch estimates were over 280,000 Mt (13%). Furthermore, the catches from Indonesia, Philippines and Vietnam⁶² have been estimated to be 30% of tuna catches of the western and central Pacific Ocean tuna fisheries.⁶³ It is not surprising that the lack of fisheries data from these fisheries has been a significant source of uncertainty in assessments of the stocks of tuna in the western and central Pacific Ocean.

Conclusion

This Chapter has shown that western and central Pacific Ocean tuna fisheries are of current and future potential to global tuna supply, but also to Pacific Island States who consider these stocks in whose national waters the majority of the tuna stocks are found to be “Our fish, our future’. The present Chapter has provided a profile of western and central Pacific Ocean tuna fisheries, and has highlighted the current and future economic potential of

⁶¹ A. D. Lewis, *Review of tuna fisheries and the tuna fishery statistical system in the Philippines* (Noumea, New Caledonia: SPC-OFP, 2004), p39, SPC-OFP, *Proposal for Monitoring the Catches of Highly Migratory Species in the Philippines and the Pacific Ocean waters of Indonesia*. (Noumea, New Caledonia: 2003), p14.

⁶² *Report of the Third Meeting of the Steering Committee of the Indonesia and Philippines Data Collection Project (4, 8 August 2005, Manila Philippines)*, (Noumea, New Caledonia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2006). Also in the Report of that meeting the Executive Director of WCPFC is noted as reporting that anecdotal evidence suggests that catches of pelagic tunas in Vietnam had increased to about 40,000 Mt in recent years, yet no annual catch estimates, catch and effort data or size data were available.

⁶³ Ibid.

theses fisheries to Pacific Island States. Pacific Island States national waters comprise a significant proportion of the principal fishing grounds for principal market tunas in the western and central Pacific Ocean. The collection of fisheries data for these fisheries is essential for the long-term conservation and sustainable use of tuna fisheries in the western and central Pacific Ocean.

It has also been shown in this Chapter that Pacific Island States have faced and still face challenges with respect to collecting, compiling and analyzing fisheries data on western and central Pacific Ocean tuna stocks. This data and other information is significant to the future conservation and management of western and central Pacific Ocean tuna resources, and now with the establishment of the WCPFC there are further regional obligations requiring Pacific Island States as members of the Commission to provide certain data and information. The Chapter that immediately follows will examine the contribution of cooperative approaches among Pacific Island States to establish effective data practices on tuna fisheries in the western and central Pacific Ocean.

Chapter 6. Analysis of Pacific Island State practices for data on tuna fisheries

The tuna fisheries of the Pacific Islands region¹ contribute significantly to global supply of principal market tunas, over 20% of global catch is taken within waters under the national jurisdiction of Pacific Island States.² As was discussed in Chapter 5, these tuna fisheries also contribute significantly to the economies of many Pacific Island States, some 11% of the combined gross domestic product of Pacific Island States.³ Pacific Island States, as coastal States have a duty to ensure that the best fisheries data is available to support scientific analyses of impacts of fishing. Quality scientific advice is essential to ensuring that the effective long-term conservation and sustainable use of western and central Pacific Ocean tuna fisheries is achieved for the benefit Pacific Islands States. This Chapter will document and analyse the data practices that are established in Pacific Island States for data on tuna fisheries, particularly covering those fishing activities that occur in areas under the national jurisdiction of Pacific Island States. The structure of the analyses of the fisheries data practices of Pacific Island States follows the analytical framework for this thesis which was outlined earlier in the *Introduction* to this thesis.

The present Chapter will comprise three parts. First, the relevant regional institutions and instruments that have assisted Pacific Islands States establish practices for data on tuna fisheries will be reviewed. The first section of this Chapter will be necessarily descriptive, in order to provide a useful context for the analyses of Pacific Island data practices in subsequent sections of the Chapter. Second, the data practices that implement

¹ A map of the Pacific Islands region can be found in Chapter 5, (see Figure 5-1 *Map of the Pacific Islands region*.)

² A. Langley, P. Williams, and J. Hampton, *The Western and Central Pacific Tuna Fishery: 2005 overview and status of stocks*, *Tuna Fisheries Assessment Report No.7* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2006), WCPFC, *DRAFT: Western and Central Pacific Fisheries Commission Tuna Fishery Yearbook 2006* Western and Central Pacific Fisheries Commission, 2007 [cited 1 December 2008]); available from <http://www.wcpfc.int/statistics/bulletins.htm>.

³ “Pacific Island States” refer to the fourteen independent island States: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. For further detail on the importance of tuna fisheries to Pacific Island States see Chapter 5, 5.3 *Importance of tuna fisheries to Pacific Island States*.

international legal requirements to collect data on tuna fisheries that are needed to support scientific analyses of impacts of fishing data will be analysed. Third, the data practices for the compilation, verification and exchange of data on tuna fisheries will be analysed.

6.1 Regional institutions and instruments that have assisted Pacific Island States

This section will comprise two parts. First, the regional institutions that assist Pacific Island States with practices for data on tuna fisheries will be introduced and their roles identified. Second, the legal and policy instruments that have been established among Pacific Island States, and which are relevant to data practices for western and central Pacific Ocean tuna fisheries, will be examined.

Regional institutions for Pacific Island States

In the Pacific Islands region, regional institutions have been established to assist Pacific Island States collect, collate and analyse data on tuna fishing activities within their exclusive economic zones (EEZ) and by fishing vessels flying their flag which are relevant to tuna fishery conservation and management. These institutions were established through the support of developed countries such as New Zealand, Australia, France and the European Community. Two of the primary institutions involved in tuna fisheries data are the *Secretariat of the Pacific Community* (SPC) and the *Pacific Islands Forum Fisheries Agency* (FFA). Associated with these two institutions are two regional committees that have also been involved in assisting Pacific Island States to collect, collate, analyse and exchange tuna fisheries data. The practical roles of these two institutions and two committees in assisting Pacific Island States in respect of tuna fisheries data will now be considered.

Secretariat of the Pacific Community – Oceanic Fisheries Programme

The Secretariat of the Pacific Community (formerly the South Pacific Commission) (SPC), located in Noumea, New Caledonia, is the oldest of the regional institutions in the Pacific Islands region. The SPC was created in 1947 and has evolved from a coordinating group of former colonial powers to a regional organization on which both metropolitan powers and

independent regional governments are represented and to which observers from interested States and organizations outside the region have access.

The *Agreement establishing the South Pacific Commission* (Canberra Agreement) was adopted in 1947 by the colonial governments of the Pacific.⁴ SPC was established “to encourage and strengthen international cooperation in promoting the economic and social welfare and advancement of the peoples of the non-self-governing territories in the South Pacific administered by them.”⁵ The Canberra Agreement has been amended to reflect changes in the view of participants regarding administrative matters of SPC and to accommodate the changes in governance that followed many Pacific Island States gaining independence.⁶ The objective of SPC has not changed and it is to be “a consultative and advisory body to the participating Governments in matters affecting the economic and social development of the territories within the scope of the Commission and the welfare and advancement of their peoples.”⁷ The current membership of SPC is broader than the fourteen Pacific Island States. The membership of SPC also includes Australia, New Zealand and its territory (Tokelau), France and its overseas countries (French Polynesia, New Caledonia, Wallis and Futuna), the United Kingdom and its territory (Pitcairn Islands) and the United States of America and its territories (American Samoa, Guam and Northern Marianas).

The mission of the SPC is to “strive to develop the technical, professional, scientific, research, planning and management capability of Pacific Islands people to enable

⁴ The ‘Agreement establishing the South Pacific Commission of 6 February 1947 (Canberra Agreement,) in force 29 July 1948 *ATS (1948) 15*. The colonial governments were Australia, French Republic, Kingdom of the Netherlands, New Zealand, United Kingdom of Great Britain and Northern Ireland, and the United States of America.

⁵ Ibid., Preamble.

⁶ The Canberra Agreement has been amended five times, and the most recent consolidated version (August 1984) is available on SPC website: http://www.spc.int/corp/index.php?option=com_docman&Itemid=79. The amendments are titled as follows: Agreement extending the Territorial Scope of the South Pacific Commission of 7 November 1951; Agreement relating to the frequency of sessions of the South Pacific Commission of 5 April 1954; Agreement amending the agreement establishing the South Pacific Commission of 6 February 1947, as amended of 6 October 1964; Agreement amending the Agreement establishing the South Pacific Commission of 6 February 1947, as amended of 12 October 1978 and entered into force 4 June, 1980. In 1997 there was a Resolution adopted by the South Pacific Conference to establish more orderly operational procedures for SPC. These procedures entered into force in July 1999.

⁷ Canberra Agreement, Article IV.

them to make informed decisions about their future development and well-being.”⁸ SPC’s role includes the study, formulation and recommendation of measures for the development of, and where necessary the coordination of services affecting, the economic and social rights and welfare of the inhabitants of the territories within the scope of SPC in respect of *inter alia* fisheries.⁹ SPC also provides for and facilitates research in technical, scientific, economic and social fields within the Pacific Islands region, and provides technical assistance, advice and information (including statistical and other material) for the participating Governments.¹⁰

The Marine Resources Division of SPC shares the vision of the Pacific Island Regional Ocean Policy “A healthy ocean that sustains the livelihoods and aspirations of Pacific Island communities.”¹¹ The Oceanic Fisheries Programme of the SPC (SPC-OFP), a part of the Marine Resources Division, is responsible for matters concerning tuna, billfish and related species. The goal of the SPC-OFP is to contribute to vision of the Pacific Island Regional Ocean Policy; specifically “that fisheries exploiting the region’s resources of tuna, billfish and related species are managed for economic and ecological sustainability using the best available scientific information.”¹² In relation to data on tuna fisheries the SPC-OFP *inter alia* maintains a regional tuna statistical database;¹³ provides assistance to SPC member countries and territories with data entry and verification, technical support (remote and one-on-one); maintenance of secure national webpages with regular updates,

⁸ “SPC’s Role: An International Development Organisation serving the Pacific Islands” [website] ([cited May 1 2003]); available from <<http://www.spc.int/role.htm>>.

⁹ Canberra Agreement, Article IV(6a).

¹⁰ Ibid., Article IV(6b & d).

¹¹ SPC, *SPC Corporate Plan 2003-05* (Noumea: Secretariat of the Pacific Community, 2005). At the time of writing SPC’s current Corporate Plan covers the period 2003–2006. The new Corporate Plan 2007–2012 period was available on the website but remained in draft form, so was yet to be finalised and formally implemented. (Source: SPC website: www.spc.int, last updated 28 October 2007, and accessed 9 March 2008).

¹² SPC, *Secretariat of the Pacific Community - Oceanic Fisheries Programme Strategic Plan 2006 - 2008 Version 1 - November 2005. As endorsed by the 34th SPC Committee of Representatives of Governments and Administrations in Palau on 19th November 2005* (Noumea: Secretariat of the Pacific Community, 2005).

¹³ T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002), p2. The regional tuna statistical database was established during SPC’s Tuna and Billfish Assessment Programme that was implemented in the period 1981-1994 and which was the precursor to the Oceanic Fisheries Programme. The database contains logsheet catch and effort data provided primarily by SPC member countries and territories, and aggregated catch and effort data provided primarily by distant-water fishing nations. There is also data from Pacific Island States national and regional port sampling and observer programmes.

data transfer via dedicated File Transfer Protocol (FTP) pages;¹⁴ and provides informal technical and financial support for port sampling and observer programmes in SPC member countries and territories.¹⁵ In addition to the Statistical and Monitoring Section within SPC-OFP that handles data, the remaining two sections of SPC-OFP the Stock Assessment and Modelling Section and the Tuna Ecology and Biology Section, often utilise data for stock assessment and other scientific analyses, whilst also gathering data in support of stock assessment. Data are held by SPC-OFP are maintained in the regional tuna statistical database.

The Canberra Agreement does not prescribe any direct obligation on members of SPC to provide fisheries data to SPC. Instead the role of SPC in assisting Pacific Island States to collect, compile, analyse and disseminate tuna fisheries data arises from the interpretation of the functions of SPC that were prescribed in Article IV of the Canberra Agreement.¹⁶ These functions include the ability of SPC to study and facilitate research in fisheries-related areas.¹⁷ Also that SPC has the responsibility to “provide technical

¹⁴ A. Lewis, Fisheries Consultant, Personal Communication by Email, Wed, 24 Nov 2004. FTP is a common abbreviation which stands for File Transfer Protocol, and refers to a system that enables the transfer of files across a network.

¹⁵ T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002), p2. The technical support included training port samplers and observers, and compiling and processing port sampling and observer data.

¹⁶ Canberra Agreement, Article IV(para 6) “The Commission shall be a consultative and advisory body to the participating Governments in matters affecting the economic and social development of the territories within the scope of the Commission and the welfare and advancement of their peoples. To this end, the Commission shall have the following powers and functions: (a) to study, formulate and recommend measures for the development of, and where necessary the coordination of services affecting, the economic and social rights and welfare of the inhabitants of the territories within the scope of the Commission, particularly in respect of agriculture (including animal husbandry), communications, transport, fisheries, forestry, industry, labour, marketing, production, trade and finance, public works, education, health, housing and social welfare; (b) to provide for and facilitate research in technical, scientific, economic and social fields in the territories within the scope of the Commission and to ensure the maximum cooperation and coordination of the activities of research bodies; (c) to make recommendations for the coordination of local projects in any of the fields mentioned in the previous subparagraphs which have regional significance and for the provision of technological assistance from a wider field not otherwise available to a territorial administration; (d) to provide technical assistance, advice and information (including statistical and other material) for the participating Governments; (e) to promote cooperation with non-participating Governments and with non-governmental organisations of a public or quasi-public character having common interests in the area, in matters within the competence of the Commission;”

¹⁷ Ibid., Article IV(para 6a).

assistance, advice and information (including statistical and other material)” and “provide for and facilitate research in technical, scientific, economic and social fields”.¹⁸

In addition to these support roles to Pacific Island States, SPC-OFP also has a contractual role to the WCPFC. SPC-OFP is contracted as ‘data contractor’ and as ‘scientific service provider’ to the WCPFC. This arrangement is a transitional arrangement for the WCPFC until the Commission is fully functioning, and is subject to an independent review “to determine the effectiveness of the science structure and recommend changes as appropriate.”¹⁹ This review will be undertaken by the Commission in 2008 and 2009.²⁰ Also SPC-OFP is recognised as the pre-eminent organisation in the handling of data and undertaking of scientific research on the major tuna stocks covered by the Commission, with a demonstrated capacity to do the kind of work that the Commission will need.²¹ The details of the arrangements between SPC-OFP and WCPFC and their possible continuance into the future will be further discussed in Chapter 8 (8.1 *Compiling data on tuna fisheries*).

Pacific Islands Forum Fisheries Agency

The Pacific Islands Forum Fisheries Agency (formerly the South Pacific Forum Fisheries Agency) (FFA) was established under the *South Pacific Forum Fisheries Agency Convention* (FFA Convention), with its headquarters located in Honiara, Solomon Islands.²² The FFA Convention was adopted in 1979, at a time when the law of the sea was changing; unilateral extensions of fishing zones of up to 200 nautical miles were becoming the norm and changes in the legal regime were being considered at the ongoing third United Nations Conference on the Law of the Sea.²³ The FFA Convention was an initiative of the then twelve members of the South Pacific Forum (now known as the Pacific Islands

¹⁸ Ibid., Article IV(para 6(b & d)).

¹⁹ *Final Report of Working Group II: WCPFC/PrepCon/45, WCPFC/PrepCon/41* (Pohnpei, Federated States of Micronesia: 2004), para 16.

²⁰ WCPFC, *Summary Record of the Fourth Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 3-7 December 2007* (Tumon, Guam, USA: 2007). The terms of reference for the WCPFC Independent Review of Scientific Structure and Function are attached herein as Appendix 9.

²¹ *FFA Negotiation Brief for the Fifth Session of the Preparatory Conference (Rarotonga, Cook Islands. 29 September – 3 October 2003)*, FFA54/WP1 (Honiara: Pacific Islands Forum Fisheries Agency, 2003), 89-91, P. Ward, N. Tsirbas, and R. Kearney, *Getting Science into Regional Fisheries Management - A Global View* (Canberra, Australia: Bureau of Research Sciences, 1998), p75.

²² South Pacific Forum Fisheries Convention of 10 July 1979 (FFA Convention,) 1579 UNTS 307.

²³ The United Nations Conference on the Law of the Sea, was the process that lead to the adoption of the United Nations Convention on the Law of the Sea, of 10 December 1982.

Forum).²⁴ FFA was established in recognition of the limitations of individual Pacific Island States to respond to these changes in the law of the sea.²⁵ Also recognised were the potential benefits that could be gained by regional cooperation and intra-regional coordination, particularly in fisheries management, fisheries development, fishing access negotiations and enforcement.²⁶ The membership of FFA now is seventeen: the fourteen Pacific Island States, Australia, New Zealand and Tokelau (the dependent territory of New Zealand).

The mission of FFA is “to support and enable our members to achieve sustainable fisheries and the highest level of social and economic benefits in harmony with the broader environment.”²⁷ FFA consists of a Forum Fisheries Committee (FFC) and a Secretariat.²⁸ Since June 2005 (FFC59), it is regular practice for a Fisheries Ministers FFC session to be convened to formally consider and adopt the outcomes of the regular annual FFC sessions.²⁹ The functions of the FFC are to provide detailed policy and administrative guidance and direction to the FFA, to provide a forum for FFA members to consult together on matters of common concern in fisheries and to carry out other functions to give effect to

²⁴ The twelve members of the then South Pacific Forum that adopted the FFA Convention were Australia, Cook Islands, Fiji, Kiribati, Nauru, New Zealand, Niue, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu.

²⁵ I. Kawaley, "Implications of Exclusive Economic Zone Management and Regional Cooperation Between South Pacific Small Midocean Island Commonwealth Territories," *Ocean Development and International Law* 30 (1999): 333-377, p344-345, G. Kent, *The Politics of Pacific Island Fisheries*, A Westview replica ed. (Colorado, United States of America: Westview Press, 1980), 166-172, C. Mizukami, "Fisheries problems in the South Pacific region," *Marine Policy* 15, no. 2 (1991): 111-121. One of the major issues during the negotiations of the FFA Convention, 1976-1978, was in regards to the character of the organization; some negotiations had the participation, in addition to South Pacific Forum members, of the United States of America, Great Britain, France and Chile. Two types of organization possibilities emerged: the first was one had the primary aim of ensuring the conservation and promoting optimum utilisation of the living resources throughout the sea in which they occur (pursuant to United Nations Convention of the Law of the Sea, Article 64) and thus would include coastal States, colonial States in respect of their territories and distant water fishing nations. The second type of organization would aim primarily to ensure the maximum benefit for the peoples of the coastal countries in the region and for the region as a whole, which would be comprised of countries in the South Pacific that is Forum members. In the end it was the latter that prevailed.

²⁶ Ibid.

²⁷ FFA, *FFA Strategic Plan 2005 - 2020: Responsible Fisheries and Sustainable Benefits - Strength through Co-operation* (Honiara, Solomon Islands: FFA, 2005).

²⁸ FFA Convention, Article I.

²⁹ FFA, *Record of Ministerial FFC - Inaugural Meeting, Majuro, Marshall Islands 9 June 2005 (in association with FFC58)* (Honiara: Pacific Islands Forum Fisheries Agency, 2005), para 70. This decision sought to implement a prior directive from Forum Leaders for Ministerial oversight over fisheries issues, and reflects the importance of tuna fisheries to Pacific Islands States future.

the FFA Convention.³⁰ The FFC shall also promote intra-regional coordination and cooperation in harmonisation of fisheries management policies, cooperation in respect of relations with distant-water fishing countries, cooperation in surveillance and enforcement and cooperation in respect of access to the exclusive economic zones (EEZs) of other FFA members.³¹ The functions of the FFA Secretariat, are subject to direction by the FFC but shall include the collection, analysis, evaluation and dissemination of various types of information that are relevant to the management, conservation and use of tuna resources by Pacific Island States within the Pacific Islands region.³² Also the FFA has facilitated the establishment of a number of subregional instruments that have sought to maximise the benefits to Pacific Islands States from the harvest of tuna and to ensure the compliance of foreign-fishing vessels fishing in the Pacific Islands region. These are the instruments adopted among Pacific Island States which are examined in the next part of the present section.

Noting that FFA and SPC have complementary roles in respect of conservation, management and development of tuna fisheries, the two organisations have maintained a formal memorandum of understanding since 1997, entitled *Memorandum of Understanding between the Pacific Islands Forum Fisheries Agency and the Secretariat of the Pacific Community concerning Collaboration in the Development, Conservation and Management of the Tuna and related Resources of the Western and Central Pacific* (FFA/SPC memorandum of understanding).³³ The FFA/SPC memorandum of understanding is

³⁰ FFA Convention, Article V(1).

³¹ Ibid., Article V(2a, b, c & f).

³² Ibid., Article VII “Subject to direction by the Committee the Agency shall: (a) collect, analyse, evaluate and disseminate to Parties of relevant statistical and biological information with respect to the living marine resources of the region and in particular the highly migratory species; (b) collect and disseminate to Parties relevant information concerning management procedures, legislation and agreements adopted by other countries both within and beyond the region; (c) collect and disseminate to Parties relevant information on prices, shipping, processing and marketing of fish and fish products; (d) provide, on request, to any Party technical advice and information, assistance in the development of fisheries policies and negotiations, and assistance in the issue of licences, the collection of fees or in matters pertaining to surveillance and enforcement; (e) seek to establish working arrangement with relevant regional and international organisations, particularly the South Pacific Commission; and (f) undertake such other functions as the Committee may decide.”

³³ Memorandum of Understanding between the Pacific Islands Forum Fisheries Agency and the Secretariat of the Pacific Community concerning Collaboration in the Development, Conservation and Management of the Tuna and related Resources of the Western and Central Pacific, of 18 November 2007, accessed from http://www.spc.int/mrd/asides/Other_orgs/index.html on 9 March 2008 (FFA/SPC memorandum of

attached herein as Appendix 4. Importantly the FFA/SPC memorandum of understanding identifies that it may be necessary for SPC and FFA to access fisheries data, or the information products of that data, which may be held by the other organisation.³⁴ It states “FFA and SPC hereby agree to freely exchange information and documentation on, and to keep each other fully informed of, their activities and programmes of work on oceanic resources, subject always to such arrangements as may be necessary for safeguarding information of a sensitive or confidential nature as agreed by the owners of that information, including the member countries and territories of both organizations.”³⁵ The detail of the types of data that may be exchanged, as well as the conditions for the handling of that data are specified in an annex to the FFA/SPC memorandum of understanding. These will be further discussed later in this Chapter, within the section that relates to arrangements for exchange and sharing of data on tuna fisheries.³⁶

Tuna Fishery Data Collection Committee

The Tuna Fishery Data Collection Committee (commonly abbreviated as “DCC”) was established at the Ad Hoc Meeting on Tuna Fisheries Data Collection Forms, 11-14 December 1995, Australia, which was attended by staff of FFA and SPC.³⁷ The Tuna Fishery Data Collection Committee is an internal SPC and FFA committee responsible to the Director of FFA and to the Manager of SPC-OFP.³⁸ The Tuna Fishery Data Collection Committee reviews, revises and monitors the implementation of standard FFA/SPC regional data collection forms used throughout the western and central Pacific Ocean tuna fisheries; logsheets, observer forms, port sampling forms, other forms (recreational fishing, artisanal fishing) and the FFA Vessel Register forms.³⁹ The use of standard forms in a

understanding,) The memorandum of understanding has had three routine revisions since the initial memorandum of understanding was signed between SPC and FFA in 1997.

³⁴ “Information products” refers to the range of outputs from analyses of fisheries data, including simple summations to stock assessment modelling outputs.

³⁵ FFA/SPC memorandum of understanding, para 3.

³⁶ See 6.4 *Analysis of arrangements post-collection of data on tuna fisheries in Pacific Island States*

³⁷ *Report of the Ad Hoc Meeting on Tuna Fisheries Data Collection Forms, 11-14 December 1995, Brisbane, Australia*, (Noumea, New Caledonia and Honiara: Oceanic Fisheries Programme, South Pacific Commission and Forum Fisheries Agency, 1996).

³⁸ Ibid.

³⁹ Ibid. The FFA Vessel Register, formerly the FFA Regional Register, was developed on 1 September 1983 as a cost-effective mechanism to assist with the surveillance and monitoring of foreign fishing fleets within the exclusive economic zones of FFA members. The FFA Vessel Register forms referred to, contain useful

fishery, such as tuna fisheries of the Pacific Islands region, greatly enhances the utility of data collected on those forms. The reasons are that across the range of the fishery the data are collected in the same way and include the same information, units and details so data is compatible throughout the fisheries. On average FFA/SPC regional logsheets have been revised every four years.⁴⁰ The Tuna Fishery Data Collection Committee encourages Pacific Island States to implement the most recent version of FFA/SPC regional logsheets in their domestic fisheries and in access agreements with foreign fishing vessels. To date there have been seven meetings of the Tuna Fishery Data Collection Committee.⁴¹

Standing Committee on Tuna and Billfish

The Standing Committee on Tuna and Billfish (commonly abbreviated as “SCTB”) was originally established in 1988 to be an advisory body to the Tuna and Billfish Assessment Programme, the predecessor to the SPC-OFP.⁴² This role was later revised to providing “a forum for scientists and others with an interest in the tuna stocks of the western and central Pacific region to meet to discuss scientific issues related to data, research and stock assessment.”⁴³ In this regard it was a gathering of scientists from research agencies and national governments (coastal State and fishing States) that collaborated to improve the

information on the vessel and gear characteristics of foreign fishing vessels that are applying to for ‘good standing’ and for a licence to fish in the waters of a FFA member.

⁴⁰ SPC-OFP, “An update on the Implementation of the Regional Logsheets Forms in Western and Central Pacific Tuna Fisheries,” in *Seventh Meeting of the Tuna Fishery Data Collection Committee (DCC7)*, 12-16 November (Brisbane, Australia: 2007). The first version of the FFA/SPC regional logsheets was 1996, following DCC1. Minor revisions were made to the forms and released as 2000 versions of the FFA/SPC regional logsheets. The most recent version is 2004 version, however three years on from the formal adoption of this version by the Tuna Fishery Data Collection Committee, SPC-OFP reports that no fishing fleet is reporting catch and effort data using the 2004 version of the FFA/SPC regional logsheets (they are reporting on either 1996 or 2000 versions of the FFA/SPC regional logsheets).

⁴¹ 1st Meeting was the Ad Hoc Meeting on Tuna Fisheries Data Collection Forms, 11-14 December 1995, Brisbane, Australia; 2nd Meeting 11-13 December 1998 in Brisbane, Australia; 3rd Meeting 9-10 December 1998 in Brisbane, Australia; 4th Meeting 6-8 December 2000 in Brisbane, Australia; 5th Meeting 2-6 December 2002 in Brisbane, Australia; 6th Meeting 16-20 November 2004 in Brisbane, Australia. 7th Meeting November 2007 in Brisbane, Australia.

⁴² The role of SCTB “*was to be purely advisory and consultative, to assist in the conduct of pelagic fisheries research through the provision of expertise, information and technical advice*”. Standing Committee on Tuna and Billfish <www.spc.int/OceanFish/Html/SCTB/index.htm> (6 May 2003) The SCTB under its original terms of reference was responsible for reviewing the activities of Tuna and Billfish Assessment Programme (and SPC-OFP) and for promoting collaborative research, data exchange and assessment of tuna resources in the Western and Central Pacific Ocean. The review role was relinquished in 1997, at SCTB10, in favour of triennial independent reviews of SPC-OFP by SPC itself. (P. Ward, N. Tsirbas, and R. Kearney, *Getting Science into Regional Fisheries Management - A Global View* (Canberra, Australia: Bureau of Research Sciences, 1998), p38.)

⁴³ Standing Committee on Tuna and Billfish <www.spc.int/OceanFish/Html/SCTB/index.htm> (6 May 2003).

quality of scientific information on the status of tuna stocks in the WCPO. Pacific Island States regularly participated in Standing Committee on Tuna and Billfish meetings.⁴⁴

Specifically, in relation to tuna fisheries data, the Standing Committee on Tuna and Billfish aimed to “coordinate fisheries data collection, compilation and dissemination according to agreed principles and procedures’ and ‘provide opinion on various scientific issues related to data, research and stock assessment of western and central Pacific Ocean tuna fisheries.”⁴⁵ The Standing Committee on Tuna and Billfish also aimed to be a body to enable peer review of tuna-related research including research on impacts of tuna fishing on the target tuna and billfish stocks and the marine ecosystem. Also the Standing Committee on Tuna and Billfish sought to foster collaborative efforts in research so as to improve information on tuna and their stock status in the western and central Pacific Ocean.⁴⁶ The seventeenth and final meeting of the Standing Committee on Tuna and Billfish was held in August 2004 and many of the functions of Standing Committee on Tuna and Billfish are now subsumed within the mandate of the Scientific Committee of the WCPFC.⁴⁷ The Standing Committee on Tuna and Billfish has been described as having made a significant contribution to *inter alia* the collection, collation, analysis and exchange of fisheries data relevant to tuna fisheries conservation and management throughout the western and central Pacific Ocean.

⁴⁴ It was common practice for funding to be directed through SPC-OFP which covered an airfare and subsistence for one national government representative from each Pacific Island State to participate in the particular SCTB session.

⁴⁵ Standing Committee on Tuna and Billfish <www.spc.int/OceanFish/Html/SCTB/index.htm> (6 May 2003)

⁴⁶ Standing Committee on Tuna and Billfish <www.spc.int/OceanFish/Html/SCTB/index.htm> (6 May 2003) “review research on the biology, ecology, environment and fisheries for tuna and associated species in the western and central Pacific Ocean; identify research needs and provide a means of coordination, including the fostering of collaborative research, to most efficiently and effectively meet those needs; review information pertaining to the status of stocks of tuna and associated species in the western and central Pacific Ocean, and to produce statements on stock status where appropriate;”

⁴⁷ The SCTB met annually, and consisted of a Statistics Working Group headed by the SPC-OFP Statistician, Fishing Technology Working Group, Methods Working Group (stock assessment methods), Skipjack Research Group, Yellowfin Research Group, Bigeye Research Group, Albacore Research Group and Billfish and Bycatch Research Group. More recently the SCTB provided advice on the status of the four main tuna stocks to the Preparatory Conference Scientific Coordinating Group. The Statistics Working Group of SCTB, in particular, was responsible for coordinating the collection, compilation and dissemination of tuna fisheries data.

Regional instruments amongst Pacific Island States

The adoption of regional instruments has been one approach taken by Pacific Island States in their capacity as FFA members, to address some of the challenges they collectively face in conserving, managing and developing their tuna fisheries. There are four instruments, each with their own characteristics, that have been adopted by Pacific Island States: (i) a subgroup of the Pacific Island States have adopted a series of treaties to address specific challenges faced in the purse seine fishery; (ii) Pacific Island States collectively have adopted regionally agreed standards for conditions of fisheries access; (iii) Pacific Island States have adopted a binding treaty supporting the enforcement of such terms of access and facilitating cooperation in fisheries enforcement including data exchange; and (iv) Pacific Island States have collectively negotiated a multilateral treaty with a foreign nation that supports these collective terms and conditions of fisheries access. Each of the four instruments will now be examined.

Nauru Agreement Concerning Cooperation in the Management of Fisheries of Common Interest and related subregional arrangements

The Parties to the Nauru Agreement (PNA) is a subregional group within the Pacific Islands region that was formalised on 11 February 1982 through adoption of the *Nauru Agreement concerning Cooperation in the Management of Fisheries of Common Interest* (Nauru Agreement).⁴⁸ The membership of the PNA is comprised of a subgroup of the Pacific Island States in whose EEZs a significant proportion of the purse seine fisheries are located: namely the Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands and Tuvalu. The Nauru Agreement aims to coordinate and harmonise the management of common fisheries stocks within the EEZs of the PNA subregion for the benefit of their people by developing minimum terms and conditions under which foreign fishing vessels are licenced with the EEZs of the PNA subregion.⁴⁹ In addition to the Nauru Agreement two further arrangements were adopted

⁴⁸ Nauru Agreement concerning Cooperation in the Management of Fisheries of Common Interest of 11 February 1982, entered in force 4 December 1982 (Nauru Agreement,). Reprinted in D. J. Doulman, "15. Fisheries Cooperation: The Case of the Nauru Group," in *Tuna Issues and Perspective in the Pacific Island Region*, ed. D. J. Doulman (Honolulu: East-West Center, 1987), 273-277.

⁴⁹ Nauru Agreement, Article II(b) The PNA subsequently adopted two implementing arrangements to elaborate these minimum terms and conditions of fishing access: 'An Arrangement Implementing the Nauru Agreement Setting Forth Minimum Terms and Conditions of Access to the Fisheries Zones of the Parties of

for the tuna purse seine fishery within the PNA subregion: the Palau Arrangement for the Management of the Western Pacific Purse Seine Fishery of 2 October 1992 (Palau Arrangement) and the Federated States of Micronesia Arrangement for Regional Fisheries Access of 29 November 1994 (FSM Arrangement).⁵⁰ These two arrangements aim to improve cooperation between the PNA in fisheries management and compliance, to promote greater participation by nationals of the PNA in tuna fisheries and to assist in the development of the national tuna fisheries industries of the PNA.

A primary aim of the Palau Arrangement is to formalise subregional criteria for the allocation of licences, that promote domestically owned, operated and based and compliant purse seine fishing vessels over completely foreign-owned, operated and based and non-compliant vessels.⁵¹ The Palau Arrangement, as a management measure to limit fishing effort in the Pacific Islands tuna purse seine fishery, relies on the provision of catch and effort fisheries data so that the management meetings of the Parties can review the status of tuna stocks and determine the maximum number of licences or other equivalent measure of fishing effort (eg days fished), that can be issued pursuant to the Arrangement.⁵² In late 2005 the PNA endorsed a memorandum of understanding to vary the implementation of the Palau Arrangement from vessel licences to vessel days: the scheme was appropriately named the “Vessel Days Scheme” (VDS).⁵³ The implementation of the Vessel Days

16 March 1982’ and ‘A Second Arrangement Implementing the Nauru Agreement Setting Forth Additional Terms and Conditions of Access to the Fisheries Zones of the Parties, of 19 September 1990’ Reprinted in Campbell B. and Lodge M., ed. *Regional Compendium of Fisheries Legislation (Western Pacific Region)* vol. III, (Rome: Food and Agriculture Organisation, 1993), 1704-1708.

⁵⁰ Palau Arrangement for the Management of the Western Pacific Purse Seine Fishery of 2 October 1992 (Palau Arrangement,) reprinted in Forum Fisheries Agency Report No. 92/114 and the Federated States of Micronesia Arrangement for Regional Fisheries Access of 29 November 1994 (FSM Arrangement,) reprinted in Forum Fisheries Agency Report No. 95/1.

⁵¹ Palau Arrangement, Article 5 and Article 6 For a comprehensive analysis see T. Aqorau and A. Bergin, "Ocean governance in the Western Pacific purse seine fishery - the Palau Arrangement," *Marine Policy* 21, no. 2 (1997): 173-186, M. W. Lodge, "The development of the Palau Arrangement for the management of the western Pacific purse seine fishery," *Marine Policy* 22, no. 1 (1998): 1-28.

⁵² Palau Arrangement, Article 3.

⁵³ ‘Western Pacific Purse Seine Fishery Management Progressed’, FFA Website press release, <<http://www.ffa.int/node/609>> Accessed 23/01/2006 1:33 PM. For further information see L. Rodwell, "FFA Initiatives related to the Palau Arrangement, purse seine management and the management of bigeye fishing mortality in the WCPO (SCTB17 Working Paper FTWG-6)," in *17th Standing Committee on Tuna and Billfish, Majuro, Marshall Islands* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2004). In 2005, the Commission adopted WCPFC Conservation and Management Measure 2005-01, in which PNA members agreed to the application of a Vessel Days Scheme which will ensure that levers of purse seine effort do not exceed either 2004 levels or average of 2001-2004 levels within PNA members waters. This limit came into effect on 1 December 2007. WCPFC, *Summary Record of the*

Scheme relies on near-real time monitoring of the vessels operating under the Palau Arrangement, particularly through the FFA-operated vessel monitoring system (FFA VMS).⁵⁴

The FSM Arrangement sought to further promote the domestic development aspirations of PNA members by providing further incentive for domestic industry development within PNA countries through provision of favourable treatment to purse seine fishing enterprises that are based in a PNA country.⁵⁵ The FSM Arrangement relies on the provision of catch and effort fisheries data by fishing vessels operating under the regional licence arrangement, because the catch of fish by a vessel within the licensing period determines the size of the regional access fee paid by vessels to FFA Secretariat.⁵⁶ The FFA Secretariat apportions the access fees to the PNA countries on the basis of the catches harvested by vessels within their EEZ.⁵⁷

Treaty on Fisheries between the Governments of certain Pacific Islands States and the Government of the United States of America

The *Treaty on Fisheries between the Governments of Certain Pacific Island States and the Government of the United States of America of 15 June 1993* (Multilateral Treaty on Fisheries) is a multilateral arrangement giving a maximum of fifty US purse seine vessels access to the exclusive economic zones of all the Pacific Island States under specified terms and conditions.⁵⁸ Under the Multilateral Treaty on Fisheries the United States of America

Second Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 12-16 December (Pohnpei, Federated States of Micronesia: 2005), Attachment D Conservation and Management Measures for Bigeye and Yellowfin Tuna in the Western and Central Pacific Ocean (CMM 2005-01, para 10(i)).

⁵⁴ 'Parties to the Nauru Agreement Press Release' FFA website press release, <http://www.ffa.int/> Accessed 28 February 2008, dated 15 February 2008. PNA members stated in the press release that progress is being made on the automation system for calculating days from VMS.

⁵⁵ FSM Arrangement, Preamble: Parties also stated their commitment to cooperating to secure for their nationals and for the region as a whole the maximum sustainable economic benefits from the tuna resources of the Pacific Islands region. For a comprehensive analysis of the FSM Arrangement see T. Aqorau and A. Bergin, "The Federated States of Micronesia Arrangement for Regional Fisheries Access," *The International Journal of Marine and Coastal Law* 12, no. 1 (1997): 37-80.

⁵⁶ FSM Arrangement, Annex IV. The fee is calculated for three size class of vessel (less than 700 GRT, 700-1000 GRT and greater than 1000 GRT): FEE = average regional catch per vessel x average price of tuna x 5%.

⁵⁷ Ibid.,

⁵⁸ Treaty on Fisheries Between the Government of Certain Pacific Islands States and the Government of the United States of America and its subsidiary agreements, of 15 June 1993, (US Multilateral Treaty on Fisheries,) *Reprinted in* Revised Edition of the Multilateral Treaty on Fisheries incorporating all amendments agreed between the United States and the Pacific Island Parties up to 15 June 1993, as published by FFA, 214

accepts the flag State responsibility to ensure that vessels licensed pursuant to the Multilateral Treaty on Fisheries comply with the terms and conditions of the Multilateral Treaty on Fisheries including the relevant national legislation and regulations of Pacific Island State parties.⁵⁹ The Multilateral Treaty on Fisheries ensures the provision of logsheet catch and effort data for all fishing activities in Pacific Island States exclusive economic zone, conducted pursuant to the Treaty. Additionally there is a minimum coverage of 20% of fishing activities by observers as well as comprehensive port sampling.

Niue Treaty on Cooperation in Fisheries Surveillance and Law Enforcement in the South Pacific Region

The *Niue Treaty on Cooperation in Fisheries Surveillance and Law Enforcement in the South Pacific Region* (Niue Treaty) is a tool to facilitate intra-regional coordination and cooperation in fisheries surveillance and enforcement between FFA members.⁶⁰ The Niue Treaty recognises the vast areas of ocean under the jurisdiction of Pacific Island States and the desire of Pacific Island States to enhance their ability to enforce their fisheries laws and deter breaches of such laws.⁶¹ The objective of the Niue Treaty is to facilitate cooperation between the Parties in the enforcement of fisheries laws and regulations and to develop regionally agreed procedures for the conduct of fisheries surveillance and law enforcement.⁶² The general framework of the Niue Treaty sets out the parameters within which joint and reciprocal surveillance may be undertaken as well as mechanisms designed

Honiara, 1994. The Multilateral Treaty on Fisheries was first signed in 1988 for a period of five years (original 26 *ILM* 1048 (1987)), and was extended for 10 years in 1993 (to expire in June 2003). A further extension of the Multilateral Treaty on Fisheries was negotiated earlier in 2003 at the 15th Annual Consultation of the Multilateral Treaty on Fisheries resulting in an increase in the annual access fee from US\$15 million to US\$18 million.

⁵⁹ Ibid., Article 4 and 5 The Multilateral Treaty on Fisheries is cited as an example of how the regional negotiating power of the Pacific island States can produce a better outcome for the sustainable use of tuna fisheries and a better return to Pacific island States from the harvest of such stocks. The agreement by the U.S. purse seine fleet, in 1991, to all the minimum terms and conditions under the Multilateral Treaty on Fisheries, is noted as giving Pacific Island States greater bargaining power and a strong ally in promoting the minimum terms and conditions as a measure of sustainability. M. W. Lodge, "Harmonised minimum conditions for foreign fishing access" (paper presented at the Fisheries access in West Africa. Proceedings of two workshops held in Senegal and Mauritania, 2001).

⁶⁰ Niue Treaty on Cooperation in Fisheries Surveillance and Law Enforcement in the South Pacific Region of 9 July 1992 (Niue Treaty,), 32 *ILM* (1993) 136 entered into force 20 May 1993. As of March 2008 the parties to the Niue Treaty are: Australia, Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu (source: <http://www.oceanlaw.net/texts/summaries/niue.htm>)

⁶¹ Ibid., Preamble.

⁶² Ibid., Article III(1).

to encourage greater cooperation and coordination in the regional surveillance effort.⁶³ Parties shall also implement harmonised minimum terms and conditions of fisheries access as may be agreed upon from time to time, including ensuring that foreign fishing vessels licensed to fish under foreign fishing agreements are, as a minimum, required to provide reports in accordance with the standard forms of reporting as set out in such harmonised minimum terms and conditions.⁶⁴

One of the lesser-known applications of the Niue Treaty is in sharing of fisheries data, including vessel monitoring system (VMS) data. The exchanges of information can and have been facilitated between Parties to the Niue Treaty through the conclusion of subsidiary agreements under the Niue Treaty. To date, seven subsidiary agreements have been concluded under the Niue Treaty.⁶⁵ It has been noted that the current subsidiary agreements have *inter alia* provided an effective mechanisms for sharing fisheries information and data between the States that have concluded subsidiary agreements.⁶⁶ Future developments stemming from the Niue Treaty have the potential to increase the benefits from the exchange of data on tuna fisheries further.⁶⁷

The Harmonised Minimum Terms and Conditions for Foreign Fishing Vessel Access

The *Harmonised Minimum Terms and Conditions for Foreign Fishing Vessel Access* (FFA Minimum Terms and Conditions of Fishing), are a list of rules that Pacific Island States

⁶³ FFA, "Niue Treaty" (paper presented at the 20th Annual Treaty Consultation Meeting: Internal Meeting of the Pacific Island Parties 3-4 March, Rarotonga, Cook Islands, 2008).

⁶⁴ Niue Treaty, Article IV(1 and 3)

⁶⁵ The subsidiary agreements under the Niue Treaty are between Tonga and Tuvalu; Australia and Papua New Guinea; Samoa and Cook Islands; and Federated States of Micronesia, Republic of Marshall Islands and Palau; Federated States of Micronesia and Nauru; Kiribati and Nauru; Samoa and Tokelau. At the time of writing two draft subsidiary agreements were being discussed amongst Fiji, Tuvalu, Tonga, Samoa and Vanuatu; and between Papua New Guinea, Solomon Islands, Vanuatu, Fiji and New Caledonia.

⁶⁶ FFA, "Niue Treaty" (paper presented at the 20th Annual Treaty Consultation Meeting: Internal Meeting of the Pacific Island Parties 3-4 March, Rarotonga, Cook Islands, 2008).

⁶⁷ Ibid. Noting these and other benefits arising from the Niue Treaty, at the time of writing the concept of a multilateral type agreement was being considered by the Parties to the Niue Treaty. It is anticipated that such a multilateral type agreement could *inter alia* facilitate exchange of data more readily between Parties. In October 2007, the Parties also took a significant decision, agreeing to allow the United States and France to accede to the Niue Treaty, thus creating the opportunity for future data exchanges between Pacific Island States and United States and France under the Niue Treaty. Note in this specific instance France and the United States would first have to accede to the Niue Treaty. Pursuant to Article V of the Niue Treaty, data exchange could take place following the conclusion of a subsidiary agreement under the Niue Treaty, or some other arrangement amongst relevant States.

have agreed to impose on all foreign fishing vessels operating in their EEZ.⁶⁸ The FFA Minimum Terms and Conditions of Fishing are an innovative way of ensuring that distant-water fishing nations comply with regional standards, which include among others the provision of logsheet catch and effort data, participation in regional observer programmes, allow port sampling, compliance with national laws and regulations when fishing within the EEZ of FFA member State.⁶⁹ Later analyses in the present Chapter will show that the FFA Minimum Terms and Conditions of Fishing have been effective in collecting data on tuna fisheries activities in areas under national jurisdiction of Pacific Island States.⁷⁰

The next section commences the analysis of the data practices of Pacific Island States to ensure that the best scientific information is available to underpin efforts to effectively ensure the long-term conservation and sustainable use of western and central Pacific tuna fisheries.

6.2 Collection of data on tuna fisheries by Pacific Island States

This section will analyse how Pacific Island States have met their international requirements to collect data on tuna fisheries that are needed to support scientific analyses of tuna fishing in the western and central Pacific Ocean.⁷¹ As was elaborated in Chapter 2,

⁶⁸ The Harmonised Minimum Terms and Conditions for Foreign Fishing Vessel Access, as amended by FFC59 (6-10 June 2005), FFA Report #05/20 (FFA Minimum Terms and Conditions of Fishing,)

⁶⁹ The concepts of having minimum terms and conditions for fishing access were first proposed by the PNA group, under the Nauru Agreement, before being adopted by the FFC as regional standards D. J. Doullman, "15. Fisheries Cooperation: The Case of the Nauru Group," in *Tuna Issues and Perspective in the Pacific Island Region*, ed. D. J. Doullman (Honolulu: East-West Center, 1987).

⁷⁰ See 6.2 *Collection of data on tuna fisheries*.

⁷¹ At the time of writing this thesis, all Pacific Island States were contracting parties to the United Nations Convention on the Law of the Sea of 10 December 1982, entered into force from 16 November 1994 (1982) 21 *ILM* 1261 (LOS Convention). Also of the fourteen Pacific Island States Palau, Tuvalu and Vanuatu were not yet contracting Parties to the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks of 4 December 1995, entered into force from 11 December 2001 (1995) 34 *ILM* 1542 (UN Fish Stocks Agreement). Source: *Chronological list of Ratifications of the United Nations Convention on the Law of the Sea and the related Agreements*, [website] (Oceans and Law of the Sea - Division for Ocean Affairs and the Law of the Sea, 26th October 2007 2008 [cited 25th January 2008]); available from http://www.un.org/Depts/los/reference_files/chronological_lists_of_ratifications.htm. Also of the Pacific Island States only the Cook Islands was a contracting Party to Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas of 24 November 1993, entered into force from 24 April 2003 (1994) 33 *ILM* 968 (FAO Compliance Agreement). Source: *Agreement to promote compliance with International Conservation and Management Measures by Fishing*

Pacific Island States are obliged under international law to collect data on tuna fisheries covering fishing activities that occur within their EEZs and also covering fishing activities by vessels flying their flag.⁷² Collection of data on tuna fisheries is a first and crucial step, towards fulfilment of a broader obligation for States to cooperate through the *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPFC) to ensure that the tuna fisheries of the western and central Pacific Ocean are effectively conserved and managed. The analyses herein will focus on data practices in Pacific Island States to collect quality fisheries data to support scientific analyses of tuna fishing the western and central Pacific Ocean and to fulfil international legal requirements. It should be noted that the implications for Pacific Islands States of the WCPFC data practices will be analysed in Chapters 7 and 8, so will not be considered here.

As was discussed in Chapter 2, there are four groups of data on tuna fisheries that are required for scientific assessments of sustainability of tuna fisheries: catch and effort data; biological data; vessel and gear data; and data related to impact of fishing on non-target, associated and dependent species. This section will comprise four parts. Each part will analyse the practices in Pacific Island States to collect a particular group of data.

Collection of catch and effort data on tuna fisheries

Chapter 2 clearly established that catch and effort data are the baseline data to be collected for any fishery.⁷³ Catch represents the removals from the fishery due to fishing. Catch and effort data together can be used to estimate rate of removal from a fish stock due to fishing. In terms of collecting catch and effort data on fishing operations, as was discussed in Chapter 2, logbooks are a key source for all relevant catch and effort data that are required for stock assessments, because the catch and effort data are recorded on a per-trip or per-set basis. Flag States are obliged to ensure that fishing vessels flying their flag provide the flag State with logbooks in a timely manner, so that the flag State can meet their regional and international obligations.⁷⁴ Coastal States in the exercise of their sovereign rights in the

Vessels on the High Seas, [website] (FAO Legal Office Treaties, 2008 [cited 5 February 2008]); available from <http://www.fao.org/legal/treaties/012s-e.htm>.

⁷² See Chapter 2 2.2 *Analysis of international legal framework for data on tuna fisheries*.

⁷³ See Chapter 2 2.3 *Catch and effort data to be provided to tuna RFMOs*.

⁷⁴ UN Fish Stocks Agreement, Article 14(1) and Annex I Article 5, FAO Compliance Agreement, Article III(7), Code of Conduct, Article 6.11.

EEZ, can require as a term and condition of a fishing licence, that all fishing vessels provide the coastal State with copies of logbooks covering fishing activities in the EEZ.⁷⁵

The assistance from the Tuna Fishery Data Collection Committee ensures that the standard forms for collection of logsheet catch and effort data that are used by Pacific Islands States, are designed to collect the necessary and appropriate data on tuna fisheries.⁷⁶ Logbooks should compile information on the gear configuration on each set of the gear (for longline) and for the trip (for purse seine and pole-and-line).⁷⁷ For example, there are separate and distinct 'FFA/SPC Regional Logsheets' for purse seine, longline and pole-and-line fishing methods, which are tailored to the specific characteristics of the method.⁷⁸ The main benefit all Pacific Island States using standard forms is that it ensures that data on tuna fisheries are comparable at national and subregional levels.⁷⁹

There are primarily three types of fishing vessels that can operate within a Pacific Island States EEZ: national fishing vessels, locally-based foreign fishing vessels and foreign fishing vessels. All Pacific Islands States should have implemented, either through legislation, regulations or standard procedures, the ability to require as a condition of a fishing licence that fishing vessels shall provide the licensing State with catch and effort data using the FFA/SPC regional standard logsheets.⁸⁰ To assist Pacific Islands States to implement this requirement the FFA Secretariat has provided legal assistance and advice, at the request of a Pacific Island State, on the best way to implement this requirement at a national level.⁸¹ Therefore regardless of the nationality of the vessel it should be a basic condition of fishing licences for tuna fishing vessels to provide to Pacific Island States (as

⁷⁵ LOS Convention, Article 62(4(a, c and e)).

⁷⁶ This is the role of the Tuna Fishery Data Collection Committee. The Tuna Fishery Data Collection Committee reviews, revises and monitors the implementation of standard FFA/SPC regional data collection forms used throughout the WCPO; logsheets, observer forms, port sampling forms, other forms (recreational fishing, artisanal fishing) and the FFA Vessel Register forms.

⁷⁷ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p54.

⁷⁸ At the time of writing, the latest versions of the FFA/SPC Regional Logsheets was December 2004

⁷⁹ The use of standard forms in a fishery greatly enhances the utility of data collected on those forms, because data are collected in the same way and include the same information, units and details.

⁸⁰ IPOA-IUU, paras 47(5) and 51(5).

⁸¹ Authors personal experience. This task is the responsibility of the Legal Division of the FFA Secretariat. In practice, Pacific Island States have utilized the advice and assistance in legislative drafting to differing degrees. For example, the Cook Islands received assistance with drafting of its latest legislation from outside FFA, whereas other Pacific Island States have sought assistance from FFA to draft legislation.

the relevant licensing coastal State), complete and accurate logsheets covering all fishing activities in that EEZ.

Additionally fishing vessels that are flagged to Pacific Island States may be authorised to fish beyond the EEZ, such as on the high seas or in another coastal States waters. As was discussed in Chapter 2, in these instances Pacific Island States have flag State obligations to require the submission of complete and accurate catch and effort logsheets from their flag vessels that cover the fishing activities of these vessels, regardless of where they fish.⁸² This requirement for submission of logsheets from vessels flying their flag should also be implemented by Pacific Island States through either legislation, regulations or standard procedures.

However, in spite of Pacific Islands States having the necessary legislative or regulatory powers to require that fishing vessels provide catch and effort data through submission of logsheets to national fisheries authorities, there are outstanding challenges for Pacific Island States to obtain this catch and effort data. One of the biggest challenges for Pacific Island States in the 1980s, was in enforcing the requirement in the licences for foreign fishing vessels to submit logsheets.

Overcoming the challenge to ensure that foreign fishing vessels provide logsheets

The challenge of enforcing the requirement of a licence for foreign fishing vessels to submit logsheets arises in part from the dependence of many Pacific Island States on the access fees received from these vessels. Chapter 5 noted that fishing access fees have an estimated value of USD 60 – 70 million annually in the Pacific Islands region. Also noted in Chapter 5 was that access fees are a significant and crucial component of government revenue for many Pacific Island States (can be up to 20 – 65%). So in these circumstances it was at the time unlikely that the threat of termination of fishing access agreement could be used by a Pacific Island State to ensure the provision by foreign fishing vessel of complete and accurate catch and effort data. This was because the foreign vessel, first recognized the dependence of Pacific Island States on the access fees, and second they realized that they had the option of negotiating access into a neighbouring Pacific Island State EEZ where the terms might be more favourable. Hence, the adoption of the FFA

⁸² UN Fish Stocks Agreement, Article 14(1) and Annex I Article 5.

Minimum Terms and Conditions of Fishing by the members of the FFA was crucial in preventing Pacific Islands States from being played-off against one another. The FFA Minimum Terms and Conditions of Fishing also ensured that foreign fishing vessels furnished catch and effort data covering their fishing operations in the EEZs of Pacific Island States.

The FFA Minimum Terms and Conditions of Fishing are a harmonisation tool used by Pacific Island States to *inter alia* ensure the provision of data and reports on the fishing activities of foreign fishing vessels operating under licence or access agreement within the EEZs of Pacific Island States. The FFA Minimum Terms and Conditions of Fishing recommend, as a minimum, that foreign fishing vessels, particularly the operator, provide logsheet catch and effort data to the Pacific Island State covering fishing activities in their EEZ. These are described in the FFA Minimum Terms and Conditions of Fishing as “daily reports on the prescribed forms of all catch in the zone of a licensing country and on the high seas and shall certify that such information is true, complete and accurate.”⁸³ The operator of the fishing vessel should also provide on prescribed forms, preliminary trip reports within fourteen days of the completion of a trip and final trip reports within 45 days of the completion of a trip.⁸⁴

For vessels licensed under the Multilateral Treaty on Fisheries and FSM Arrangement these arrangements require that vessels provide catch reports to the FFA Secretariat which acts as Administrator of the treaties.⁸⁵ The Multilateral Treaty on Fisheries and FSM Arrangement requires that completed catch and effort logsheets be posted to FFA within fourteen days of the unloading of catch.⁸⁶ The next section will examine the success these efforts by Pacific Island States to obtain catch and effort data.

Current coverage levels of logsheet data and timeliness of submission

Pacific Island States have received support and assistance from SPC-OFP and FFA towards collection of catch and effort data on tuna fisheries through logsheets. SPC-OFP has provided technical and financial support for data collection programmes and database

⁸³ FFA Minimum Terms and Conditions of Fishing, para 4(a).

⁸⁴ Ibid., para 4(b).

⁸⁵ FSM Arrangement, Article 3 (4), US Multilateral Treaty on Fisheries, Annex I Part 5(15) and Annex I Schedule 5.

⁸⁶ FSM Arrangement, Article 3(4), US Multilateral Treaty on Fisheries, Annex I, Part 5(15 and 16).

management in SPC member countries and territories. FFA has provided legal assistance to Pacific Island States in legislating at the national level to ensure that Pacific Island States can obtain the required fisheries data on fishing activities within their EEZ and by the vessels flying their flag. Also through regional assistance from FFA and SPC-OFP, and with support of the Tuna Fishery Data Collection Committee, regional standards have been adopted by Pacific Island States for reporting of catch and effort data by fishing vessels, including use of common FFA/SPC logsheet forms by all Pacific Island States fleets and by all fishing vessels operating in Pacific Island States EEZs.

SPC-OFP currently receives raw completed logsheets, port sampling reports and observer programme reports and inputs them into databases on behalf of Pacific Island States. Many Pacific Island States do not have sufficient staff to input the data or to analyse the gaps, although this is improving through the roll-out of the Tuna Fishery Data Management System (TUFMAN) software by SPC-OFP and the associated training.⁸⁷ Most Pacific Island States still send raw logsheets, direct to SPC-OFP, covering the fishing activities of all fishing vessels operating in their EEZ under licence arrangements and the fishing activities of fishing vessels flying their flag and operating in the WCPO. Also logsheet data and observer data received by FFA under the Multilateral Treaty on Fisheries, Palau Arrangement and FSM Arrangement are also provided to SPC-OFP in raw form, under the terms of the FFA/SPC memorandum of understanding. Once these data are received by SPC-OFP, SPC-OFP inputs the data into the regional statistical database. For the purposes of the Multilateral Treaty on Fisheries and the FSM Arrangement, SPC-OFP also analyses the data to provide estimates of catch from within each Pacific Island States EEZs and by fishing vessels flying their flag and operating in the Pacific Islands region. For all data received by SPC-OFP, SPC-OFP will in turn provide each Pacific Island State with an electronic copy of the data via the secure FTP pages and secure national webpages with regular updates hosted by SPC, and may assist in further analysis of the data for conservation and fisheries management purposes.

To demonstrate the success of these Pacific Island State data practices to collect catch and effort data, Table 6-1 summarises the coverage of logsheet data, over the three

⁸⁷ Note the contribution of the Tuna Fishery Data Management System (TUFMAN) software to compilation of fisheries data will be discussed later in this Chapter 6.3 *Analysis of arrangements post-collection of data on tuna fisheries in Pacific Island States.*

year period 2003 – 2005 for all active fleets in the western and central Pacific Ocean tuna fisheries. It can be seen from Table 6-1 that coverage of logsheets for purse-seine fisheries tends to be higher than that for longline for both SPC member fleets and non-SPC fleets. Many fleets have complete or nearly complete coverage of logsheets for purse seine fishing activities. The higher coverage is due to the majority of purse-seine fishery activities being carried out in the tropical areas of the western and central Pacific Ocean and, as was noted in Chapter 5, this region of purse seine catches are mostly comprised of the EEZs Pacific Island States which are members of the PNA and comparatively smaller areas that are beyond national jurisdiction.⁸⁸ Generally coverage by logsheets of Pacific Island States fleets is greater than 50%, and have generally improved since 1998 – 2002.⁸⁹ In fact, for some Pacific Island State fleets logsheet data are provided to SPC-OFP by the coastal States to whom the vessel is licensed rather than the flag State.⁹⁰

Also demonstrating the positive effect of implementation of FFA Minimum Terms and Conditions of Fishing by Pacific Island States, within the regional statistical database the coverage of logsheet catch and effort data for foreign fishing fleets that operate largely within the EEZs of Pacific Island States has been high (see Table 6-1). In comparison the coverage of logsheet data by the foreign fishing fleets, such as distant water longline fleets, that operate largely on the high seas or in areas of national jurisdiction that are not Pacific Island States, the coverage is far lower (see Table 6-1).⁹¹ For most non-SPC fleets,

⁸⁸ See Chapter 5 5.3 *Importance of tuna fisheries to Pacific Island States*, particularly Figure 5-6. Distribution of catches for skipjack tuna, yellowfin tuna and bigeye tuna in the WCPFC Convention Area from 1999-2005.

⁸⁹ T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002), 26-67, *SPC-OFP Data Coverage*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/Coverage/index.asp>.

⁹⁰ T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002), p17. For example, Kiribati, Marshall Islands, the purse-seine fleets of Papua New Guinea and Vanuatu have primarily been obtained by SPC-OFP from the coastal States with which the fleet has access agreements rather than the flag State.

⁹¹ Ibid, *SPC-OFP Data Coverage*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/Coverage/index.asp>.

Table 6-1. Three-year summary (2003 – 2005) of the average coverage of total catches in the western and central Pacific Ocean by logsheet data held by SPC-OFP, by fleet.⁹²

(LL: longline; PS: purse-seine; PL: pole-and-line)

Coverage level	SPC Members (<i>non-Pacific Island States italicised</i>)	Non-SPC Fleets
Complete or nearly complete (90-100%)	<i>Australia: LL, PL, PS(domestic and distant-water)</i> Cook Islands: LL Federated States of Micronesia: PS Fiji: LL Kiribati: PS Marshall Islands: PS Niue: LL Tonga: LL <i>New Zealand: PL, PS</i> Papua New Guinea: PS <i>United States of America: PS</i> Vanuatu: PS	<i>Korea: PS</i> <i>Taiwan: PS</i>
Moderate to high (50-90%)	<i>American Samoa: LL</i> Federated States of Micronesia: LL <i>New Caledonia: LL</i> <i>New Zealand: LL</i> Papua New Guinea: LL Solomon Islands: LL, PL, PS	<i>China: PS</i> <i>Philippine distant-water: PS</i> <i>Spain: PS</i>
Low to moderate (10-50%)	<i>French Polynesia: LL</i> Samoa: LL Vanuatu: LL Kiribati: PL	<i>China: LL</i> <i>Japan: LL</i> <i>Japan distant-water: PS</i> <i>Korea: LL</i> <i>Taiwan offshore: LL</i> <i>Taiwan distant-water: LL</i>
None or near-none (<10%)	Fiji: PL <i>French Polynesia: PL</i> Kiribati: LL Palau: LL	<i>Japan coastal: LL, PS</i> <i>Japan coastal and offshore: PL</i> <i>Japan distant-water: PL</i> <i>Taiwan offshore domestic: LL</i> <i>United States (Hawaii): LL, PL</i> <i>Philippine domestic: LL, PS</i> <i>Indonesia domestic: LL, PS</i>

⁹² Based on tables available on *SPC-OFP Data Coverage*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/Coverage/index.asp>. Note some coverage may be overestimates for some years owing to annual catch estimates that have been under-estimated due to low coverage of logsheet and unloadings data held by the SPC-OFP. At the time of writing more recent coverage information was available, however as will be discussed in later Chapters of the present thesis, these more recent logsheet coverage levels could have been influenced by the by the establishment of the WCPFC. The present discussion is interested in arrangements by Pacific Island States, arrangements that exclude the WCPFC; hence the time period of 1998-2002 is appropriate for the purposes of these discussions.

particularly longline fleets, coverage of logsheet data is less than 50%; this is significant problem because catches by these fleets comprise a significant proportion of tuna catches in the western and central Pacific Ocean, for example distant water longline fleets and domestic fisheries of Indonesia and the Philippines. Most logsheet data held by SPC-OFP in the regional statistical database has been provided for non-SPC fleets by Pacific Island State with which the fleets have access agreements; however coverage also varies among fleets.

It should also be noted that the timeliness of provision of catch and effort logsheets to SPC-OFP varies considerably among the States that provide the logsheets; some members provide logsheets regularly to SPC-OFP while others provide them on an opportunistic basis.⁹³ Delays between the fishing trip of a vessel ending and SPC-OFP receiving them can be in the range of three months to a year. Delays can occur because compiling of data by members varies from several weeks to several months following the end of the fishing trip.⁹⁴

In terms of implementation of FFA/SPC regional standardised logsheets by Pacific Islands States, a recent paper to the 7th Tuna Fishery Data Collection Committee meeting in November 2007, reported that there have been delays in Pacific Islands States implementing the most recent version (2004) of the FFA/SPC regional standard logsheets. As of November 2007, SPC-OFP reported that it had not received catch and effort data recorded on the 2004-version of the FFA/SPC regional standard logsheet. Now whilst the revisions to the FFA/SPC regional standard logsheets are classed as minor revisions by the Tuna Fishery Data Collection Committee, the revisions are intended to ensure that the data collected from the logsheets provides the necessary detail for stock assessments and other scientific analyses. For example, the 2004-version of the FFA/SPC purse seine logsheets requires purse-seine vessels to identify the type of drifting-fishing aggregation device (FAD) sets (drifting log-set, drifting raft or FAD-set, anchored raft, FAD, live whale or live

⁹³ Authors personal experience. For example, some Fisheries Departments may take advantage of a staff member travelling to a Regional Fisheries meeting at SPC headquarters to submit copies of logsheets for the previous year.

⁹⁴ T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002), p22.

whale shark).⁹⁵ The older versions of the FFA/SPC purse seine logsheets were not designed to collect this detail, in part because in the late 1990s the use of drifting FADs was less common. Further details on FAD-type were included in the 2004 version, because more detailed data is required to support scientific analyses to respond to recent concerns about the impact of drifting FADs on increased catches of juvenile bigeye and yellowfin tuna. The older versions of the FFA/SPC logsheets do not provide sufficient detail, so scientific analyses on the impacts of different FAD-setting strategies are problematic.⁹⁶

This analysis has shown that there are significant gaps in the coverage of tuna fishing activities occurring in the western and central Pacific Ocean by operational level catch and effort data held in SPC-OFP regional statistical databases. Also there are delays in the implementation of FFA/SPC regional standard logsheets. In response to the gaps, the next subsection discusses how alternate forms of catch and effort data that are required for scientific analyses of impacts of tuna fishing in the western and central Pacific have been obtained by Pacific Island States.

Voluntary submission of catch and effort data to SPC-OFP for use in stock assessments

SPC-OFP has holdings in the regional statistical database of raised aggregated catch and effort data that covers many of the non-SPC fleets, particularly the distant-water longline. The common format is 5-degree longitude by 5-degree latitude by month by flag for longline fishing activities and 1-degree longitude by 1-degree latitude by month for purse-seine fishing activities. These aggregated catch and effort data have been provided to SPC-OFP so the data could be used to support scientific analyses of impacts of tuna fishing in the western and central Pacific, such as tuna stock assessments. This type of voluntary provision of aggregated catch and effort data by non-SPC countries to SPC-OFP was supported by the positive scientific collaborations arising from the Standing Committee on Tuna and Billfish. Chapter 2 noted that for scientific analyses of impacts of fishing, operational-level catch and effort data (that is logsheet data) is preferable over aggregated catch and effort data because of the greater range of operational detail that are contained in

⁹⁵ SPC-OFP, "An update on the Implementation of the Regional Logsheets Forms in Western and Central Pacific Tuna Fisheries," in *Seventh Meeting of the Tuna Fishery Data Collection Committee (DCC7)*, 12-16 November (Brisbane, Australia: 2007), p1.

⁹⁶ Ibid.

the former.⁹⁷ Nevertheless, aggregated catch and effort data for these fleets can and are used effectively by SPC-OFP for tuna stock assessments and other scientific analyses of impacts of fishing in the western and central Pacific Ocean.⁹⁸

Gaps in ensuring provision of logsheets from vessels to Pacific Island States

The FFA Minimum Terms and Conditions of Fishing provide harmonised minimum terms and conditions of fisheries access that if properly implemented by all Pacific Island States, should ensure the provision of fisheries data for fishing activities within the EEZs of a Pacific Island State by all foreign fishing licensed under either a bilateral or multilateral fishing access agreement. The extra emphasis of these minimum terms and conditions by the Multilateral Treaty on Fisheries, Palau Arrangement and FSM Arrangement, is beneficial but are only relevant to the particular fleets that fall under those arrangements. For example, the US purse-seine fishing vessels licensed under the Multilateral Treaty on Fisheries, or purse-seine fishing vessels licensed under the Palau Arrangement and FSM Arrangement. Therefore, the instruments that Pacific Island States have adopted to assist them in obtaining catch and effort data only cover a portion of the fishing activities occurring in Pacific Island States waters. What about the portion of fishing activities in Pacific Island States waters that are not covered by these instruments ?

In theory, it should be a relatively straightforward matter to require national fishing vessels and locally-based foreign fishing vessels to furnish catch and effort logsheet data, as a condition of their fishing licence. Particularly, if the necessary powers for the Fisheries Department to enforce compliance with this fishing licence requirement, are appropriately provided for in legislation or regulation. However, the Fisheries Departments in some Pacific Island States still have difficulties with having sufficient authority to overcome political influence and to be able to enforce such licence conditions. This is particularly the case for some locally-based foreign fishing vessels which although having business agents

⁹⁷ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), 17-19. Generally for scientific purposes, including *inter alia* stock assessments, operational-level catch and effort data is preferred because such fine-resolution data on fisheries provides more detailed information on trends and variability in the fisheries.

See Chapter 2 2.3 *Catch and effort data to be provided to tuna RFMOs*.

⁹⁸ For example scientific advice on impacts of fishing prior to the establishment of the WCPFC (pre-2000) through the Standing Committee on Tuna and Billfish, were undertaken using both operational-level catch and effort data and aggregated catch and effort data.

in-country have majority of beneficial ownership based offshore.⁹⁹ The evidence for difficulties in obtaining logsheets from national and locally-based vessels is demonstrated in the varying coverage rates of logsheet catch and effort data in SPC-OFP's regional statistical database for Pacific Island States domestic fishing fleets. In general the coverage of logsheets for these fleets can be described as moderate to low (see Table 6-1).¹⁰⁰

The lower coverage levels for domestic fleets in Pacific Island States are a concern. Chapter 5 discussed that many Pacific Island States have sought to seek greater spin-off benefits from tuna fishing operations and many Pacific Island States offer attractive incentives to fishing companies, for example lower licence fees, tax exemptions, fuel and utility discounts.¹⁰¹ These incentives seek to encourage more foreign fishing vessels to establish companies within Pacific Island States and base their operations within Pacific Island States rather than offshore. So as Pacific Island States seek to promote domestic development, more vessels are likely to be licensed as local fishing vessels or locally-based foreign fishing vessels so would not be subject to the FFA Minimum Terms and Conditions of Fishing. Thus the collection of catch and effort data for these fishing activities are further dependent on the ability of Pacific Island States to effectively enforce the requirements of the fishing licence. As was previously noted in Chapter 5, this is a difficulty for some Pacific Island States, as locally-based companies can exert significant political pressure because of the benefits that their operations provide locally.¹⁰² Also the impact of the withdrawal of a fishing license by the Fisheries Department would be felt immediately at the local level, even if justified on the basis of a breach of license conditions. This challenge must be overcome by Pacific Island States, particularly as there will be evolving data and reporting requirements to the *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPFC).¹⁰³ Building positive relationships with fishing industry could be an

⁹⁹ Authors personal experience.

¹⁰⁰ T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002), p17, *SPC-OFP Data Coverage*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/Coverage/index.asp>.

¹⁰¹ See Chapter 5 5.3 *Importance of tuna fisheries to Pacific Island States*.

¹⁰² See Chapter 5 5.4 *Challenges for data practices for western and central Pacific Ocean tuna fisheries*.

¹⁰³ See Chapter 7 7.3 *WCPFC practices to collect catch and effort data*.

option that Pacific Island States could further explore, and which could lead to improved quality of catch and effort reporting by fishing vessels.

Finally, the delay in implementation of the latest versions of FFA/SPC regional standard logsheets by all fleets operating in Pacific Island States waters requires addressing. There is a need for FFA and SPC to better inform Pacific Island States Fisheries Departments of the importance of the prompt implementation of these latest version of forms. Information should be provided by FFA and SPC-OFP to Pacific Island States collectively at the governing body level of regional institutions (Forum Fisheries Committee and SPC Heads of Fisheries) and to individual Pacific Island States. Also future meetings of the Tuna Fishery Data Collection Committee might need to be more participatory, for example the 6th Tuna Fishery Data Collection Committee meeting in 2005 involved as observers representatives from only four Pacific Island States, and based on their job titles these individuals are unlikely to have sufficient authority to implement a change in the version of the logsheets that are used in-country.¹⁰⁴

Alternatively, the relevant outcomes from the Tuna Fishery Data Collection Committee might need to be made more accessible to senior Fisheries Department personnel in Pacific Island States so that appropriate action can be taken at a national level. For example, the outcome document from the 6th Tuna Fishery Data Collection Committee was some 174 pages in length which is not easy to read in one sitting.¹⁰⁵ Also as at March 2008, the outcome document from the most recent meeting of the Tuna Fishery Data Collection Committee (7th Tuna Fishery Data Collection Committee in November 2007) was not yet publicly available, so it is difficult to see how Pacific Island States can respond to outcomes from a meeting to which they are not aware. One option might be to establish a formal report mechanism between the Tuna Fishery Data Collection Committee to Forum Fisheries Committee (FFC) and the SPC Heads of Fisheries.

This section has shown there have been positive benefits from cooperative arrangements amongst Pacific Island States, for improving coverage of logsheet catch and effort data in Pacific Islands States waters. The next section considers the contribution of

¹⁰⁴ *Report of the Sixth Meeting of the Tuna Fishery Data Collection Committee, 16-20 November 2004, Brisbane, Queensland, Australia*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2005).

¹⁰⁵ Ibid.

regional institutions to assisting Pacific Island States to collect other types of data that are needed to support stock assessment.

Collection of fishery data to support stock assessment

As was discussed in Chapter 2, in addition to information on removals from the fishery (catch and effort data), there are other types of data that are necessary for tuna fishery stock assessment analyses.¹⁰⁶ These include information on the basic biology and life history of individual tuna species or stocks, such as *inter alia* age and growth relationships; size composition of catch and discards; stock movement, stock structure and stock abundance; and influence of environmental parameters on abundance of recruits and fish behaviour. Coastal States and flag States are obliged to collect where appropriate three types of biological data and research information that are relevant to support stock assessment. Specifically these three types of data are “(a) composition of the catch according to length, weight and sex; (b) other biological information supporting stock assessments, such as information on age, growth, recruitment, distribution and stock identity; and (c) other relevant research, including surveys of abundance, biomass surveys, hydro-acoustic surveys, research on environmental factors affecting stock abundance, and oceanographic and ecological studies.”¹⁰⁷ Noting that SPC-OFP is also the pre-eminent organisation for western and central Pacific Ocean tuna stock assessments, the analyses that follow will show that Pacific Island States are in a fairly good position with respect to having these three types of data needed to support stock assessment. This section will examine data practices in Pacific Island States to meet these international legal requirements in two parts. First, arrangements for collecting catch composition data in Pacific Island States. Second, arrangements in Pacific Island States to collect other data which are relevant to stock assessment analyses.

Catch composition data

Length and species composition data for stock assessments are currently collected through port sampling programmes in twenty six harbours throughout the region and are an

¹⁰⁶ See Chapter 2 2.4 *Collection of other data and information by tuna RFMOs*.

¹⁰⁷ UN Fish Stocks Agreement, Annex I Article 3(2).

essential input for stock assessment analyses.¹⁰⁸ Currently SPC-OFP funds sampling in the Pacific Island States of Fiji, Kiribati, Samoa and Tonga (as well as in New Caledonia, a French Territory) and continues to provide indirect support in varying levels to most of its other member States often through training. SPC-OFP works closely with national authorities to ensure the proper training of personnel and monitoring of the programmes. SPC-OFP has funded port-sampling programmes throughout the region since the mid-1980s, either through direct contracts with port samplers or through providing funding to fisheries divisions in various member States so that they can employ samplers.¹⁰⁹

Prior to the implementation of port sampling programmes in the region in the early 1990s, the catch composition data held by SPC-OFP consisted primarily of data obtained from tagging experiments and data from observer cruises. Now there is a comprehensive holding of catch composition data in SPC-OFP databases. Currently port-sampled length frequency data is submitted to SPC-OFP by Pacific Island States every three months.¹¹⁰ Also some port sampling data has been provided to SPC-OFP covering the Japanese, Korean and Chinese Taipei longline fleets by USA. Catch composition data is also received by SPC-OFP from the various national and subregional observer programmes in Pacific Island States.¹¹¹

The next section will outline the programmes in Pacific Island States that assist with collecting data relevant to WCPO tuna stock assessments.

Other research programmes to collect data in support of WCPO tuna stock assessment

SPC-OFP has been instrumental in conducting or assisting in the conduct of programmes for Pacific Island States to collect scientific data or research data to support tuna stock

¹⁰⁸ *Report of the Fifth Meeting of the Tuna Fishery Data Collection Committee, 2-6 December 2002, Brisbane, Queensland, Australia*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2003).

¹⁰⁹ T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002), *Report of the Fifth Meeting of the Tuna Fishery Data Collection Committee, 2-6 December 2002, Brisbane, Queensland, Australia*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2003).

¹¹⁰ *SPC-OFP Data Catalogue - Introduction*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/DataCat/intro.htm>. Data are submitted from the following Pacific Island States: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands and Tonga. Data are also submitted to SPC-OFP by the Pacific Territories of American Samoa, French Polynesia, New Caledonia.

¹¹¹ Ibid.

assessment work in the WCPO. First, SPC-OFP also has conducted basic biological research, such as age and growth studies and tuna behavioural studies, which have provided valuable biological parameter information for stock assessments. SPC-OFP also maintains databases for other biological data, such as; morphometric samples, collected during tuna tagging projects; stomach contents data, collected during the tagging programmes and more recently in observer programmes; gonad indices, collected during the tagging programmes; and otolith ring counts from age and growth studies.¹¹²

Second, SPC-OFP has included within its work programmes tuna tagging projects, which have provided valuable information about the movement of tuna within the western and central Pacific Ocean which has been instrumental for regional stock assessments. SPC-OFP has completed two large-scale tagging projects and holds the data in the SPC-OFP databases for use in stock assessments. The first tagging programme was during the Skipjack Survey and Assessment Programme, 1977 – 1981, the second was the Regional Tuna Tagging Project, 1989 – 1992.¹¹³ Additionally there have been a few small-scale tagging programmes, including more recent archival tagging of bigeye in the Coral Sea.¹¹⁴ Japan, New Zealand and United States have also conducted tagging research and have made the data available to SPC-OFP as a contribution to improving regional tuna stock assessments.¹¹⁵

Also a third large-scale tagging project commenced in 2006 in the waters of Papua New Guinea and Solomon Islands: “The Regional Tuna Tagging Programme”. At the time of writing the tagging project, which is being implemented by SPC-OFP, was in the final

¹¹² T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002).

¹¹³ Ibid.

¹¹⁴ Ibid, *SPC-OFP Data Catalogue - Introduction*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/DataCat/intro.htm>. Other tagging projects include Philippines Tuna Research Project (conducted by SPC during 1992-1993), the Albacore Research Project (conducted by SPC during the 1990/91 and 1991/92 seasons) and in-country tagging projects conducted by SPC in Kiribati (1988 and 1991), Fiji (1992), Federated States of Micronesia (1991) and the Solomon Islands (1989 and 1990). More recently the CSIRO bigeye-tagging project in the Coral Sea (Australia).

¹¹⁵ T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002), *SPC-OFP Data Catalogue - Introduction*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/DataCat/intro.htm>. These include tagging data from various cruises on troll vessels, which have been made available from the Albacore Research Project from National Marine Fisheries Service (USA), the New Zealand Ministry of Agriculture and Fisheries.

stages of Phase I.¹¹⁶ A second phase of this tagging project is being proposed, and aims to improve stock assessment and management of skipjack, yellowfin and bigeye tuna in the Pacific Ocean.¹¹⁷ This second phase will include a tagging project covering the equatorial WCPO. Also a series of subregional and national projects in temperate and subtropical waters of the WCPO are also proposed under the umbrella of the second phase of the Regional Tuna Tagging Programme, as well as tagging by the Inter-American Tropical Tuna Commission (IATTC) in the Eastern Pacific Ocean (EPO).¹¹⁸

Third, port sampling and observer programmes provide a valuable means for obtaining catch size composition data, discard information and biological samples that can be used to support stock assessments. For example, these programmes can collect a variety of data, including length frequencies of catches, species composition of catches, non-target species catches, records of discards, vessel and gear attributes and compliance monitoring data. Observers also collect biological samples for use in ecological and biological research (stomachs, gonads, otoliths, tissue). The port sampling coverage varies considerably among fleets though on average it is quite low with an average 2.6% coverage across all fishing gears used to harvest tuna in the western and central Pacific Ocean (see Table 6-2).¹¹⁹ Although, the coverage of fishing activities by port sampling has improved

Table 6-2. Average percent coverage of total catches within western and central Pacific Ocean tuna fisheries by data held by SPC-OFP, for 2003-2005¹²⁰

Please see print copy for Table 6-2.	
--------------------------------------	--

¹¹⁶ SPC-OFP, *Pacific Tuna Tagging Programme -Phase 2: Western and Central Pacific - Executive Summary* November 2007 2007 [cited March 16 2008]]; available from <http://www.spc.int/mrd/doc/tag2-nov2007.pdf>.

¹¹⁷ Ibid.

¹¹⁸ Ibid.

¹¹⁹ T. Lawson, *Status of Data Collection, Compilation and Dissemination* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2003), 67-74.

¹²⁰ Ibid.

from the 0.3% average level of coverage from 1993-2002.¹²¹ Port sampling coverage has been noted to be highest for the United States purse seine fleet and some of the SPC member countries, but lowest for vessels from Korea, Chinese Taipei and Japan.¹²²

Observer programmes have been conducted nationally in Pacific Island States and throughout the Pacific Islands region. For foreign fishing vessels operating in Pacific Island States EEZs, in accordance with the FFA Minimum Terms and Conditions of Fishing foreign fishing vessels should cooperate in national or regional observer programmes. In particular, the operator and each member of the crew of a vessel shall:

allow and assist any person identified by a country as an observer to:

(i) board the vessel for scientific, compliance, monitoring and other functions

(ii) have full access to and use of facilities and equipment on board which the observer may determine is necessary to carry out his or her duties including; (A) full access to the bridge, fish on board, and areas which may be used to hold, process, weigh and store fish; (B) remove samples; (C) full access to the vessel's records, including its logs and documentation for the purpose of inspection and photocopying; (D) reasonable access to navigation equipment, charts and radios; and (E) other information related to fishing;¹²³

Also at a subregional level there are the Multilateral Treaty on Fisheries Observer Programme and FSM Arrangement Observer Programme, both of which are administered by FFA.¹²⁴ Observers operating under these programmes have the authority to board vessels for scientific, compliance, monitoring and other purposes.¹²⁵

¹²¹ Ibid.

¹²² T. Lawson, *Status of Data Collection, Compilation and Dissemination* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2003), *Review of the Oceanic Fisheries Programme - Joint Team Report, September 2001. Report of the findings of an independent review commissioned by the Secretariat of the Pacific Community using terms of reference drafted by the Secretariat of the Pacific Community*, (Noumea, New Caledonia: Secretariat of the Pacific Community, 2001).

¹²³ FFA Minimum Terms and Conditions of Fishing, para 6(a).

¹²⁴ FSM Arrangement, Article 17(1c) and Article 7(2d), US Multilateral Treaty on Fisheries, Annex I Part 7(24).

¹²⁵ The FSM Arrangement Observer Programme objective is to have "a significant level of coverage by observers of the total number of trips by fishing vessels of the Parties", licenced pursuant to the FSM Arrangement (FSM Arrangement, Article 17(1c)). Whereas the objective of the Multilateral Treaty on Fisheries Observer Programme is more specific, although it is subject to review from time to time, and it is to provide an effective observer programme for compliance by targeting twenty percent coverage (US Multilateral Treaty on Fisheries, Annex I Part 7(24c)).

SPC-OFP and FFA work closely with national authorities to ensure the proper training of personnel and monitoring of observer and port sampling programmes.¹²⁶ For both port sampling programmes and observer programmes standard forms are used throughout the region for collecting data.¹²⁷ Also the Tuna Fishery Data Collection Committee designs standard protocols for data collection, and specially designed database programmes are used, so the chance for error is reduced.¹²⁸ SPC-OFP continues to be involved in training and technical support for port sampling and observer programmes through the Pacific Regional Oceanic and Coastal Fisheries Project that commenced in March 2002.¹²⁹

SPC-OFP has funded occasional observer trips since the early 1980s. SPC-OFP holdings of observer data were limited prior to 1994, to trips undertaken in Australia, Federated States of Micronesia, Hawaii and New Zealand as well as the Multilateral Treaty on Fisheries.¹³⁰ Since 1995, as observer programmes have developed in Pacific Island States the coverage of observer data in SPC-OFP database has increased.¹³¹ The average observer coverage of fishing activities in the western and central Pacific Ocean across all gears is 5.8% (see Table 6-2).¹³² This is a marked improvement from overall coverage of fishing activities by observer activities since 1993 – 2002, when it was 2.5% across all gears.¹³³ The improvement is due to doubling of purse seine coverage from 4.9% to 10.8%,

¹²⁶ *Report of the Fifth Meeting of the Tuna Fishery Data Collection Committee, 2-6 December 2002, Brisbane, Queensland, Australia*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2003).

¹²⁷ Note that the FFA/SPC unloadings form is used for both monitoring transshipment at sea activities as well as monitoring unloading activities in port. This form will be referred to in Chapter 8 8.2 *Verifying data on tuna fisheries*.

¹²⁸ T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002).

¹²⁹ *Ibid.*, p2.

¹³⁰ *SPC-OFP Data Catalogue - Introduction*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/DataCat/intro.htm>.

¹³¹ *Ibid.* Data have been provided for observer trips in the Pacific Island States of Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands and Tonga. SPC-OFP also holds data from observer trips in French Polynesia and New Caledonia.

¹³² *SPC-OFP Data Coverage*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/Coverage/index.asp>.

¹³³ See T. Lawson, *Status of Data Collection, Compilation and Dissemination* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2003), 67-74.

and longline coverage from 0.37% to 0.5%.¹³⁴ Accordingly, observer coverage in SPC-OFP databases has been noted to be highest for United States purse-seine vessels operating under the Multilateral Treaty on Fisheries that has a target coverage level of twenty percent of all vessel trips. Similarly coverage for vessels operating under the FSM Arrangement is also high with target for observer coverage of twenty percent: both observer programmes are administered by FFA.¹³⁵

Also as is the case for catch and effort data, there is very little coverage of observer data for fleets of distant water fishing nations fishing on the high seas in SPC-OFP regional databases.¹³⁶ This is probably because these fleets were at the time not required by any regional or subregional arrangement to carry observers when fishing on the high seas. However it is anticipated that the WCPFC Regional Observer Programme, once fully implemented, will lead to a marked improvement in these coverage levels, but this may take some time for this to occur.¹³⁷

Unloadings or landings data are used as a means of verifying logsheet catch and effort data. Unloadings data can also be used together with catch and effort data, observer and port sampling data to estimate annual catch estimates for different fleets. Unloadings data held by SPC-OFP is collected from both SPC members ports and ports outside of SPC members. SPC-OFP compiles unloadings data from Pacific Island States and Pacific Island Territories, and has limited landings data for distant-water fishing nation fleets. In general, the coverage of unloadings data varies considerably and complete coverage is rare (see Table 6-2).

This section has shown that there have been a range of initiatives by SPC-OFP and FFA to assist Pacific Island States in meeting their international obligations with respect to collecting data to support WCPO tuna stock assessment. Similar to what is the case for logsheet data, there is some evidence of successes of these efforts, as well as some evidence

¹³⁴ Ibid, *SPC-OFP Data Coverage*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/Coverage/index.asp>.

¹³⁵ *Report of the Fifth Meeting of the Tuna Fishery Data Collection Committee, 2-6 December 2002, Brisbane, Queensland, Australia*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2003).

¹³⁶ T. Lawson, *Status of Data Collection, Compilation and Dissemination* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2003), 67-74.

¹³⁷ The details of the WCPFC Regional Observer Programme will be examined in Chapter 8 8.2 *Verifying data on tuna fisheries*.

of outstanding challenges for Pacific Island States with respect to ensuring the availability of these fisheries data to support tuna stock assessments in the WCPO. The next section examines the collection of vessel and gear data by Pacific Island States.

Collection of vessel-related data and information

As was discussed in Chapter 2, vessel and gear attributes are required to standardise effort data, which in turn are used in stock assessment analyses.¹³⁸ The maintenance of records of the total annual number of vessels active or the total number of vessels active by size class is a basic way of monitoring the effort in a fishery, and is an international legal requirement.¹³⁹ Vessel and gear information are currently compiled by FFA and SPC.

Vessel and gear data has been compiled on the FFA Vessel Register since its inception. The annual FFA Vessel Register Forms that are to be submitted to the Director General of FFA annually require that information be provided on the physical characteristics of the vessel, its base port, fishing master, vessel master and owner, as well as a photo with identifying characteristics visible.¹⁴⁰ However vessels operating as local fishing vessels or under a charter arrangement are not required to be listed on the FFA Vessel Register. A recent review of the quality of the FFA Vessel Register data has revealed problems such as duplicate vessels, high percentage of missing data, mixture of units for some numeric fields and possible entry errors.¹⁴¹ FFA is currently resolving the problems identified and seeking to obtain historical gear and vessel attribute information.¹⁴²

¹³⁸ See Chapter 2 2.4 *Collection of other data and information by tuna RFMOs*.

¹³⁹ UN Fish Stocks Agreement, Article 18(3c) Measures to be taken by a flag State in respect of vessels flying its flag shall include: “establishment of a national record of fishing vessel authorised to fish on the high seas and provision of access to the information contained in that record on request by directly interested States, taking into account any national laws of the flag State regarding the release of such information.” A similar obligation regarding the establishment of a national record of fishing vessels by flag States can be found in the FAO Compliance Agreement, Article IV: “Each Party shall, for the purposes of this Agreement, maintain a record of fishing vessels entitled to fly its flag and authorized to be used for fishing on the high seas, and shall take such measures as may be necessary to ensure that all such fishing vessels are entered in that record” Also see Code of Conduct for Responsible Fisheries, Article 8.1.2 (all States) and Article 8.21 (flag States), IPOA-IUU, para 24(2). LOS Convention, Article 94(2a) requires flag States to “maintain a register of ships containing the names and particulars of ships flying its flag, except those which are excluded from generally accepted international regulations on account of their small size.”

¹⁴⁰ T. Aqorau, “Illegal Fishing and Fisheries Law Enforcement in Small Island Developing States: The Pacific Islands Experience,” *The International Journal of Marine and Coastal Law* 15, no. 1 (2000): 37-63, 47.

¹⁴¹ T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002), p30.

¹⁴² Ibid.

Vessel and gear data are also compiled by SPC-OFP, and such data are obtained from a number of sources. Data are obtained from logsheets; for longline number of hooks between floats, number of hooks set; for purse seine number of fish aggregate devices and whether tender vessels are used; for pole and line the presence of bait onboard.¹⁴³ Data are also obtained through the observer programme whereby quite specific and objective descriptions of effort can be obtained, however as was discussed above observer coverage has generally been low across the western and central Pacific Ocean for fleets other than purse seine.¹⁴⁴ Because the FFA Vessel Register only covers foreign fishing vessels, SPC-OFP has been working with Pacific Island States and with FFA to obtain better data on gear and vessel attributes for vessels that are not required to be on the FFA Vessel Register (for domestically-based fleets). The next section considers the arrangements in Pacific Island States for data on non-target species.

Collection of data on non-target, dependent and associated species

Chapter 1 noted that ensuring the conservation of species that are affected by the fishery but not targeted, or that are dependent or associated with target fish stocks has become an objective of responsible fisheries conservation and management.¹⁴⁵ To this end States are obliged to take measures to prevent and minimize impacts of fishing for tuna on non-target, dependent and associated species.¹⁴⁶ Chapter 2 showed that international legal

¹⁴³ Logsheets have been under review, and the vessel and gear attributes for purse seine vessels were only included from 2000.

¹⁴⁴ T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002), p30.

¹⁴⁵ United Nations, "Chapter 17: Protection of the Oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources," in *Report of the United Nations Conference on Environment and Development 3-14 June* (Rio de Janeiro: 1992), paras 45 and 70. "Emphasis should also be on multi-species management and other approaches that take into account the relationships among species." Code of Conduct for Responsible Fisheries, 7.2.3 "States should assess the impacts of environmental factors on target stocks and species belonging to the same ecosystem or associated with or dependent upon the target stocks, and assess the relationship among the populations within the ecosystem." Article 12.5 'States should be able to monitor and assess the state of the stocks under their jurisdiction, including the impacts of ecosystem changes resulting from fishing pressure, pollution or habitat alteration. They should also establish the research capacity necessary to assess the effects of climate or environmental change on fish stocks and aquatic ecosystems.'

¹⁴⁶ UN Fish Stocks Agreement, Article 5(d - g) and Article 18(3i), LOS Convention, Article 61(4) and Article 119(1b).

requirements with respect to collection of data on non-target, dependent and associated species come in two forms.¹⁴⁷

First, Pacific Island States are obliged to collect catch and effort fisheries data, and basic biological information on non-target and associated or dependent species so that the impact of fishing can be assessed.¹⁴⁸ The possible sources for such data include those considered previously as sources for catch and effort data and for biological data for target tuna stocks, such as logsheets, landings and observer programmes. Therefore based on findings outlined previously in this Chapter, the situation in Pacific Island States for the availability of data on non-target, dependent and associated species should be similar to the availability of data for target tuna species. As a result it is to be expected that there will be some evidence of the success of efforts by SPC-OFP and FFA through good levels of coverage of data for some tuna fishing activities in the western and central Pacific Ocean and some gaps. A recent study that analysed the available data in SPC-OFP regional statistical database, found that even where logsheet data coverage was good, the reporting rates on logsheets for seabirds, sharks and turtles were relatively low.¹⁴⁹ The reasons identified in the study were that logsheets were primarily designed to record information on the four primary market tunas in the western and central Pacific Ocean.¹⁵⁰ The study further postulated that based on the design of the FFA/SPC logsheets that information on other species is not often recorded or records are underestimates of the true catches.¹⁵¹ These findings suggest that in spite of there being good coverage of logsheet data for some sectors of the western and central Pacific Ocean tuna fisheries, this does not guarantee that

¹⁴⁷ See Chapter 2 2.4 *Collection of other data and information by tuna RFMOs*.

¹⁴⁸ UN Fish Stocks Agreement, Annex I Article 1(1) "Data collected should also include information on non-target and associated or dependent species." and UN Fish Stocks Agreement, Annex I Article 3(1b) States shall collect and make available to the relevant subregional or regional fisheries management organization or arrangement the following types of data in sufficient detail to facilitate effective stock assessment in accordance with agreed procedures "(b) total catch in number, nominal weight or both by species (both target and non-target) as is appropriate to each fishery. IPOA-Sharks, para 21 says that the 'consistent collection of data including inter alia catch and data leading to improved species identification and, ultimately, the establishment of abundance indices.'" IPOA-Seabirds, 4-5 requires collection of data on interactions of seabirds with fisheries for assessment purposes.

¹⁴⁹ B. Molony, "Estimates of the mortality of non-target species with an initial focus on seabirds, turtles and sharks (WCPFC-SC1 Working Paper EB WP-1)," in *1st Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2005), p2.

¹⁵⁰ *Ibid.*, p12.

¹⁵¹ *Ibid.*

there is good coverage of catch and effort data for non-target, dependent and associated species.

Second, Pacific Island States are obliged to establish and implement specific data collection and research programmes to assess impacts of fishing on non-target and associated or dependent species.¹⁵² These programmes could include specific observer programmes, already outlined previously, to address particular fishery impact concerns related to non-target and associated or dependent species. As was discussed in Chapters 2 and 3, independent on-board observers are useful for estimating fishery interactions, including catches, of non-target, associated and dependent species.¹⁵³ Especially those species which are difficult for fishers to identify to species level or which are of little commercial value and that tend not to be accurately reported by fishers on logsheets, for example, shark species.¹⁵⁴ Again the findings previously in this Chapter have shown that observer coverage of tuna fishing activities in the western and central Pacific Ocean varies from good coverage to areas where there is no coverage.

As a general rule, a recent study found that statistically a minimum observer coverage rate of 20% across all gears, areas and flags, achieved most scientific objectives including providing adequate coverage of non-target, dependent and associated species.¹⁵⁵ A different study found that the relatively low coverage rate of observer data in the SPC-OFP database was problematic for properly estimating impacts of fishing on seabirds, sharks and sea turtles.¹⁵⁶ A further finding was that current observer programmes in Pacific

¹⁵² UN Fish Stocks Agreement, Article 6(3d), Code of Conduct for Responsible Fisheries, 7.2.3, 8.4.7, 8.4.8, 12.5 and in respect of fishing gear selectivity 8.5.1 and 12.10.

¹⁵³ See Chapter 2 2.4 *Collection of other data and information by tuna RFMOs* and Chapter 3 3.2 *Verifying data on tuna fisheries*.

¹⁵⁴ B. Molony, "Estimates of the mortality of non-target species with an initial focus on seabirds, turtles and sharks (WCPFC-SC1 Working Paper EB WP-1)," in *1st Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2005), p12.

¹⁵⁵ T. Lawson, *Data related tasks for the WCPFC Scientific Committee* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2005), p20. "In order to accurately and reliably estimate the catches of all species, including species of special interest, 100% coverage by observers is appropriate. If 100% coverage is not possible, then 20% is an appropriate target coverage rate for scientific objectives, given that further increases in coverage result in smaller incremental improvements in the reliability of catch estimates based on observer data."

¹⁵⁶ B. Molony, "Estimates of the mortality of non-target species with an initial focus on seabirds, turtles and sharks (WCPFC-SC1 Working Paper EB WP-1)," in *1st Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2005), p12.

Island States are primarily designed to record information on tuna catches.¹⁵⁷ Furthermore, based on these findings the study recommended the establishment of species observer programmes in Pacific Island States waters that are designed to provide better information on specific catch and bycatch issues in the western and central Pacific Ocean.¹⁵⁸

In addition to the work by SPC-OFP to assist Pacific Island States gather data that can be used to analyse the impacts of tuna fishing on non-target, dependent and associated species, Pacific Island States are undertaking initiatives at a national level. Through assistance from FFA and SPC-OFP, Pacific Island States are undertaking the implementation of an Ecosystem Approach to Fisheries Management (commonly abbreviated to EAFM) at a national level.¹⁵⁹ The FFA Ecosystem Approach to Fisheries Management process uses the best available data and information to individual Pacific Island States and SPC-OFP, and seeks to improve approaches to management of national tuna fisheries in individual Pacific Island States EEZs.¹⁶⁰ Of relevance to minimising impacts of fishing on non-target, dependent and associated species, the FFA Ecosystem Approach to Fisheries Management process incorporates a form of risk assessment for these species. The FFA Ecosystem Approach to Fisheries Management process seeks, through consultation with key stakeholders, to identify individual species or groups of species that could be at risk due to interactions with national sectors of tuna fisheries.¹⁶¹ Consequently the implementation of FFA Ecosystem Approach to Fisheries Management in Pacific Island States, allows for precautionary management actions to be taken at a national level regardless of there being scarce data on non-target, dependent and associated species. The findings would also help to determine and prioritise where further monitoring or research on interactions between Pacific Island States tuna fisheries and non-target, dependent and associated species are required.

These analyses herein have shown that there are limited data in SPC-OFP databases covering non-target, dependent and associated species interactions with western and central

¹⁵⁷ Ibid., p3.

¹⁵⁸ Ibid.

¹⁵⁹ FFA, "Implementation of Ecosystem Approach to Fisheries Management (FFC61/WP 5)" (paper presented at the Officials Forum Fisheries Committee Sixty-First Meeting (15-18 May 2006), Honiara, Solomon Islands, 2006).

¹⁶⁰ Ibid.

¹⁶¹ Ibid.

Pacific Ocean tuna fisheries. Also there are significant areas where Pacific Island States need to improve the coverage of the data across all fisheries, gears and areas. One particular option that has been identified to significantly improve the coverage of data relating to impacts on fishing non-target, dependent and associated species, is to expand the coverage of national and subregional observer programmes to a level of at least twenty percent across all gears, flags and areas. However, this would require a significant outlay of resources from Pacific Island States, including for training of additional observers, so as to expand the existing national and subregional programmes to meet this level of coverage. As a result, noting that Pacific Island States are small-island developing States, this is likely to be something that is not feasible in the short-term.

Another cost-effective option might be for Pacific Island States to focus on the establishment of dedicated observer programmes that focus on particular target and bycatch issues. Alternatively existing national and subregional observer programmes might be coordinated in such a way so as to concentrate higher levels of observer coverage to particular target and bycatch issues. For example, observer coverage rates might be made higher for particular fisheries that have unknown levels of interaction between particular “at-risk” non-target, dependent or associated species. The species or groups of species that may be “at-risk” from western and central Pacific Ocean tuna fisheries would still need to be identified from either national Ecosystem Approach to Fisheries Management consultations or broader subregional ecological risk analyses undertaken by SPC-OFP. However, similar to generally increasing the coverage of observer programmes, creation of specific observer programmes would require significant resources, as well as dedicated assistance from FFA and SPC-OFP, for Pacific Island States to be able to effectively implement this option.

This completes the discussion of arrangements that Pacific Island States have adopted, with the assistance of regional legal and institutional frameworks, to collect data on tuna fisheries that are required to support scientific analyses on the impacts of fishing on western and central Pacific Ocean tuna species and the marine ecosystem. The next section further discusses the data practices of Pacific Island States following the collection of data on tuna fisheries.

6.3 Analysis of arrangements post-collection of data on tuna fisheries in Pacific Island States

This section focuses on arrangements in Pacific Islands States that occur following the collection of data on tuna fisheries. This section will comprise two parts. First, analysis of practices used by Pacific Island States for compiling and verifying fisheries data on tuna fisheries. Second, analysis of frameworks developed in Pacific Island States that assist them to exchange and share data on tuna fisheries.

Practices for Pacific Islands States to compile and verify data on tuna fisheries

The role of SPC-OFP in compiling data at a regional level, on behalf of Pacific Island States, is well recognized and has been discussed previously in this Chapter.¹⁶² This role of SPC-OFP is important for western and central Pacific Ocean tuna fisheries conservation and management, because it ensures that fisheries data which are required to support scientific analyses of impacts of tuna fishing (such as tuna stock assessments) are centralized and accessible for scientific purposes. Noting these arrangements and also that many Pacific Island States still submit raw unprocessed logsheets to SPC-OFP for the data to be input into the databases, this subsection, of the present Chapter, will focus on the assistance that Pacific Islands States have received from SPC-OFP to assist them in compiling and verifying data on tuna fisheries at a national level.

SPC-OFP has developed and is in the process of implementing a software package to assist Pacific Island States with their management of data on tuna fisheries at a national level. The software package is called the “Tuna Fisheries Data Management System” which is commonly abbreviated to “TUFMAN”. Of additional benefit to compilation of data on tuna fisheries at a regional level, is that the file formats used by TUFMAN at the national level are compatible with the SPC-OFP regional statistical database, so updates between the two databases can occur relatively easily through use of SPC-OFPs secure file transfer protocol (FTP) sites. Through use of TUFMAN and the secure national pages on the SPC-OFP FTP site, Pacific Island States can electronically access the data that SPC-OFP has input into the database on their behalf. Note that in accordance with the SPC-OFP data dissemination policy (discussed later) individual Pacific Island States can only access

¹⁶² See 6.1 *Regional institutions and instruments that assist Pacific Island States.*

the data that they themselves have provided to SPC-OFP. Data that SPC-OFP obtains from other sources can only be accessed by another Party if the source of that data specifically authorizes the release of that data to that source. Alternatively, if Pacific Island States have input their own data themselves into their national database the secure SPC-OFP FTP site can be used by Pacific Islands States to provide a copy to SPC-OFP so that the regional statistical database remains up to date.

One important feature of TUFMAN is that it enables most types of fishery data to be integrated into the one database system at a national level. The data that can be compiled include logsheet data, unloadings and vessel activity data, observer and port-sampling programme data, as well as vessel licensing information.¹⁶³ The TUFMAN package enables Pacific Island States to cross-reference or verify different sources of data for the same fishing event, and can identify inconsistencies between these sources. TUFMAN also reconciles licensing data, unloadings and vessel activity data with logsheets to identify gaps in coverage of data. There is a capability in TUFMAN to incorporate summary VMS data into TUFMAN. Also work is ongoing with FFA towards more systematically incorporating operational-level vessel monitoring system (VMS) data into TUFMAN, to support for example the implementation of the PNA vessel days scheme (VDS) at a national level.¹⁶⁴

At the time of writing, TUFMAN had been implemented in at least ten Pacific Island States.¹⁶⁵ In the short-term, SPC-OFP intends to implement TUFMAN in all but one of the remaining Pacific Island States: Papua New Guinea has developed their own customized national database management system.¹⁶⁶ To accompany the implementation of TUFMAN systems, SPC-OFP provides national training when TUFMAN is first

¹⁶³ SPC-OFP, *Ocean Fisheries Programme - Annual Report 2007 and Work Plan 2008* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2008).

¹⁶⁴ J. Hampton, Oceanic Fisheries Programme Manager, SPC, Personal Communication by Email, 22 March 2007, FFA/SPC memorandum of understanding, 6(vii): "SPC and FFA will collaborate in the development of specific additional modules for the TUFMAN database to facilitate the integration and analysis of national fisheries data relating to the FFA work-area. FFA will provide funding and/or human resources for this purpose."

¹⁶⁵ SPC-OFP, *Ocean Fisheries Programme - Annual Report 2007 and Work Plan 2008* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2008), p6. Pacific Island States with TUFMAN are: Cook Islands, Federated States of Micronesia, Fiji, Marshall Islands, Nauru, Palau, Solomon Islands, Tonga, Tuvalu, and Vanuatu.

¹⁶⁶ J. Hampton, Oceanic Fisheries Programme Manager, SPC, Personal Communication by Email, 22 March 2007.

implemented in a Pacific Island State, as well as follow-up training on request.¹⁶⁷ Additionally, through recent Tuna Data Workshops SPC-OFP, with support from FFA, has been providing further training in the development of national procedures to support the collection, management and dissemination of tuna fishery data in Pacific Island States.¹⁶⁸ These national procedures are designed to complement the TUFMAN, and also provide a valuable opportunity for Pacific Island States to share and learn from experiences with data collection and compilation.¹⁶⁹

At a national level most Pacific Island States would be aware of the international legal requirements to ensure the confidentiality of fisheries data is maintained.¹⁷⁰ As was discussed in Chapter 3, individual fishers or the fishing industry are usually concerned that the information that they supply to fisheries management authorities are kept confidential, in particular those information or data that could be used by their competitors to gain an advantage.¹⁷¹ Any perceived or alleged breaches of data confidentiality are likely to lead to difficulties in obtaining future data on tuna fisheries or to falsified or incomplete data.¹⁷² At a national level within Pacific Island States the level of security is usually minimal within the national Fisheries Department. In most, if not all, Pacific Island States there will be a locked room that houses raw datasheets, the computer terminal to access the FFA VMS, the computer terminal for accessing TUFMAN, and computer terminals and databases require password access. It is unlikely that staff would be bound by any formal confidentiality agreement and therefore it is onerous on the responsible fisheries officer/s to ensure the confidentiality of the data held within the Fisheries Department. The secure national webpages hosted on the SPC secure file transfer protocol (FTP) site also greatly

¹⁶⁷ SPC-OFP, *Ocean Fisheries Programme - Annual Report 2007 and Work Plan 2008* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2008).

¹⁶⁸ The first Tuna Data Workshop was held in Noumea, from 23-27 October 2006. The second Tuna Data Workshop will be held in Noumea, from 7-11 April 2008. These workshops also involve SPC Pacific Island Territories. Another aim of these workshops is to assist Pacific Island States and Pacific Island Territories, in meeting their reporting obligations to the WCPFC.

¹⁶⁹ Authors personal experience from participating and presenting to the First Tuna Data Workshop, Noumea, 23-27 October 2006.

¹⁷⁰ UN Fish Stocks Agreement, Article 5(j), Article 10(f) and Article 14(1a).

¹⁷¹ FAO Fishery Resources Division and Fishery Policy and Planning Division, *Fisheries Management*, vol. 4, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 1997), 2.1.5 (i) p29. See Chapter 3 3.3 *Maintaining confidentiality of data on tuna fisheries and sharing data*.

¹⁷² *Ibid.*, 29-30 section 2.1.5

assist Pacific Island States with ensuring the confidentiality of national data hosted by SPC-OFP.¹⁷³

The next subsection discusses other reasons why verification of fisheries data, particularly catch and effort data provided by fishing vessels is important to Pacific Island States.

Additional considerations for verification of catch and effort data

The previous section focussed on the arrangements used by Pacific Island States to ensure the quality of the catch and effort data, mainly because this data is used as the basis of tuna stock assessments in the western and central Pacific Ocean. However recalling the findings of Chapter 5, which found that WCP tuna fisheries are significant source of income to many Pacific Islands States, it is important to consider that there is a very real possibility that the catch and effort data that are reported to Pacific Island States may be biased.¹⁷⁴ The main reason for possible bias is that current or future access fee payment under some access agreements are often directly linked to the quantity of catch.

Catch and effort data, reported to Pacific Island States, are used for calculations of fees that are payable to Pacific Islands States from fishing access to Pacific Island States EEZs. For example, catch and effort data collected under the Multilateral Treaty on Fisheries and FSM Arrangement, are used to apportion access fee payments amongst the Pacific Island States based on reported catches in that Pacific Island States EEZ.¹⁷⁵ The access fee that is paid by vessels licensed under the FSM Arrangement is determined on the basis of reported data on the actual catch performance of vessels operating under this arrangement in the preceding year and data on the average price for tuna in the preceding year.¹⁷⁶ There are often similar arrangements for fees payable to Pacific Island States under bilateral access agreements.

¹⁷³ The SPC-OFP data dissemination policy ensures that Parties can only access the non-public domain data held by SPC-OFP in the regional statistical database, which they themselves have provided to SPC-OFP. Proper authorization from the source of the data is required to vary access to non-public domain data.

¹⁷⁴ See Chapter 5 5.3 *Importance of tuna fisheries to Pacific Island States*.

¹⁷⁵ Multilateral Treaty on Fisheries Internal Agreement, Schedule 1 – FFA distributes 85% of payments received under the Multilateral Treaty on Fisheries to Pacific Island States on the basis of the proportion of catches in their EEZ during the period in question.

¹⁷⁶ FSM Arrangement, Annex IV Schedule 1.

Therefore Pacific Island States have further incentive to have in place measures to ensure the accuracy of the data received from vessels operating under foreign access arrangements as well as domestic licensing arrangements. It is important for Pacific Island States to have means to verify such data through obtaining data from multiple sources, such as through observer programmes and port sampling programmes that have been developed with the support and assistance of SPC-OFP and FFA. Port sampling programmes provide a valuable means for obtaining additional data and scientific information and biological samples that can be used to support stock assessments. Observer programmes can provide data to verify catch and effort reports provided by fishing vessels and the programmes provide an opportunity to collect extra data and information on fishing operations, including catches/interactions with non-target, associated and dependent species. Unfortunately as was discussed previously the current coverage of fishing activities by observer programmes and port sampling programmes in Pacific Island States waters has been less than satisfactory for most fleets and ports.

The next subsection analyses the legal and policy frameworks for Pacific Island States to exchange and share data on tuna fisheries.

Arrangements for Pacific Island States to exchange data and share data on tuna fisheries

In fulfilling the duty to cooperate Pacific Island States are obliged to share with other States, in a timely manner, complete and accurate data on tuna fisheries as well as information from research programmes.¹⁷⁷ It will be shown that SPC-OFP and FFA have assisted Pacific Island States in fulfilling their obligations to share data on western and central Pacific Ocean tuna fisheries, whilst maintaining confidentiality as appropriate. This section will comprise four subparts. First, arrangements facilitated primarily by SPC-OFP to ensure that the best data is available to support scientific analyses of impacts of tuna fishing, including western and central Pacific Ocean tuna stock assessments. Second, arrangements facilitated by SPC-OFP and FFA for the dissemination of data and

¹⁷⁷ UN Fish Stocks Agreement, Article 5(j): “In order to conserve and manage straddling fish stocks and highly migratory fish stocks, coastal States and States fishing on the high seas shall, in giving effect to their duty to cooperate in accordance with the Convention: collect and share, in a timely manner, complete and accurate data concerning fishing activities on, inter alia, vessel position, catch of target and non-target species and fishing effort, as set out in Annex I, as well as information from national and international research programmes;” Also UN Fish Stocks Agreement, Article 10(f) and Article 14(1a).

information on western and central Pacific Ocean tuna fisheries. Third, arrangements facilitated mainly by FFA for exchange of data among Pacific Island States. The final subsection discusses arrangements for sharing of data between two regional institutions, FFA and SPC-OFP.

Arrangements to facilitate data sharing to support scientific analyses of impacts of tuna fishing

The SPC-OFP continues to play a significant role in facilitating the sharing of tuna fisheries data in the western and central Pacific Ocean. As has been discussed previously, SPC-OFP houses and manages a comprehensive regional statistical database for tuna fisheries data that is used as the basis for WCPO tuna stock assessments and other scientific analyses. The scientific analyses that underpin scientific advice for tuna fisheries conservation and management are also largely undertaken by SPC-OFP. SPC-OFP also assists Pacific Islands States by facilitating the sharing of fisheries data so that the best data is available to support scientific analyses of impacts of tuna fishing, including western and central Pacific Ocean tuna stock assessments.

As was discussed in Chapter 2, it is preferable that the data on tuna fisheries for tuna conservation and management covers the full range of the fisheries and the tuna stocks.¹⁷⁸ This fact was recognised by participants to the Standing Committee on Tuna and Billfish.¹⁷⁹ The Standing Committee on Tuna and Billfish provided a forum where in the spirit of cooperation for tuna conservation and management, States involved in western and central Pacific Ocean tuna fisheries collaborated to share catch and effort data so that better stock assessments could be completed for tuna stocks of the western and central Pacific Ocean.¹⁸⁰ This was particularly important because fisheries data from Pacific Island States would not be sufficient to cover the range of western and central Pacific Ocean tuna fisheries, because, as was discussed in Chapter 5, a sizable amount of tuna fishing is still

¹⁷⁸ See Chapter 2 2.2 *Analysis of international legal framework for data on tuna fisheries*.

¹⁷⁹ Japan has described the current arrangement where it provides data to SPC-OFP, not as one of obligation but of one of a “gentleman’s agreement”. *Report of the Technical Consultation on the Collection and Exchange of Fisheries Data, Tuna Research and Stock Assessment, 15-19 July 1996, Noumea New Caledonia*, (Noumea, New Caledonia: Oceanic Fisheries Programme, South Pacific Commission, 1996), p11 (para 55).

¹⁸⁰ P. Ward, N. Tsirbas, and R. Kearney, *Getting Science into Regional Fisheries Management - A Global View* (Canberra, Australia: Bureau of Research Sciences, 1998), p38. SCTB: “facilitates data sharing and research coordination, streamlines existing arrangements for regional science cooperation and encourages greater participation by distant-water fishing nations.”

conducted in the western and central Pacific Ocean by foreign fishing vessels operating largely or exclusively on the high seas.¹⁸¹

In practice SPC-OFP was recognised as the premier expert organisation to undertake stock assessments for tuna in the western and central Pacific Ocean as well as the host for the combined database.¹⁸² So although States were collaborating through Standing Committee on Tuna and Billfish, the data flows were directly to the SPC-OFP. Previously in this Chapter, it was noted that Pacific Island States submit operational-level catch and effort data to SPC-OFP, and that many fishing States provide aggregated catch and effort data to SPC-OFP for use in scientific analyses.¹⁸³ The understanding between SPC-OFP and fishing States that provide data to SPC-OFP, is that the data is to be managed by SPC-OFP in accordance with an agreed dissemination policy¹⁸⁴

It is desirable for the purposes of tuna conservation and management to have fisheries data covering the full range of the stocks and the fisheries that target them. Chapter 5 pointed out that the Pacific Ocean is divided in two halves: the eastern Pacific Ocean (EPO) and the western and central Pacific Ocean (WCPO). As was discussed in Chapter 1 (*1.4 Achieving long-term conservation and sustainable use of tuna fisheries through fisheries management*), the *Inter-American Tropical Tuna Commission* (IATTC) is the tuna regional fisheries management organisation (RFMO) that is responsible for conservation and management of tuna stocks in the eastern Pacific Ocean.¹⁸⁵ Prior to the establishment of the *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPFC), the SPC-OFP was the principal organisation that compiled data on tuna fisheries and undertook tuna stock assessments for the western and central Pacific Ocean. Recognising the need for IATTC and SPC-OFP to cooperate so as to ensure that data for tuna conservation and

¹⁸¹ See Chapter 5 5.2 *The tuna fisheries of the western and central Pacific Ocean* also see Table 6-1. Three-year summary (2003 – 2005) of the average coverage of total catches in the western and central Pacific Ocean by logsheet data held by SPC-OFP, by fleet.

¹⁸² SPC-OFP, on occasion invites certain scientific experts to collaborate in WCPO tuna stock assessments.

¹⁸³ See 6.2 *Collection of data on tuna fisheries by Pacific Island States*.

¹⁸⁴ The details of the SPC-OFP data dissemination policy are examined in the next subpart.

¹⁸⁵ Also see *Figure 5-1 Map of the Pacific Islands region*.

management is complete, since 2003 SPC-OFP and IATTC have had an “Agreement on the Exchange of Tuna Fisheries Data between IATTC and SPC.”¹⁸⁶

One of the key features of the IATTC and SPC Exchange Agreement is that it facilitates the exchange of operational-level catch and effort data between the two institutions when either holds data relating to the others half of the ocean. For example, SPC-OFP will receive operational level catch and effort data from IATTC that relates to fishing activities in the WCPO, and IATTC will receive operational level catch and effort data from SPC-OFP covering fishing activities that occur in the eastern Pacific Ocean. Also each institution is to provide to the other institution aggregated catch and effort data for their respective halves of the Pacific Ocean, so that each organisation has a complete set of aggregated catch and effort data for the whole Pacific Ocean.¹⁸⁷ To ensure confidentiality of data that are exchanged between SPC and IATTC, the Exchange Agreement stipulates that any release of data, exchanged pursuant to the Agreement, is subject to approval by other Party.

The next subsection analyses the arrangements that Pacific Island States have used to disseminate data on tuna fisheries in the WCPO.

Arrangements for disseminating data on tuna fisheries

As was discussed in Chapter 3, Pacific Island States have a general responsibility to make objective, reliable and credible information available to the international community relating to trends in the fisheries as well as on impacts of the fisheries on the stocks and ecosystem.¹⁸⁸ However this responsibility must be balanced with the obligation to ensure the confidentiality of data, particularly non-aggregated data, is maintained.¹⁸⁹ A large

¹⁸⁶ T. Lawson, Principal Fisheries Scientist (Statistics), SPC, Personal Communication by Email, 16 February 2004. A copy of the ‘Agreement on the Exchange of Tuna Fisheries Data between IATTC and SPC’ was obtained by email from SPC-OFP. It is reproduced herein as Appendix 5.

¹⁸⁷ The IATTC, through the Agreement on the Exchange of Tuna Fisheries Data between IATTC and SPC is the source of eastern Pacific Ocean data on tuna fisheries that SPC-OFP publishes in the Tuna Fishery Yearbook.

¹⁸⁸ FAO Strategy on Improving Information in Fisheries, adopted at the FAO Conference in 2003.

¹⁸⁹ UN Fish Stocks Agreement, Annex I Article 7(1): “Data collected by flag States must be shared with other flag States and relevant coastal States through appropriate [tuna RFMOs]. Such [tuna RFMOs] shall compile data and make them available in a timely manner and in an agreed format to all interested States under the terms and conditions established by the [tuna RFMO], while maintaining confidentiality of non-aggregated data, and should to the extent feasible, develop database systems which provide efficient access to data.” UN Fish Stocks Agreement, Annex I Article 1(1) also states that “Confidentiality of non-aggregated data shall be maintained.” The Code of Conduct also requires both States and subregional or regional fisheries

proportion of the fisheries data collated by SPC-OFP in the regional statistical database is commercially sensitive data. Therefore the release of data and information, outside of SPC-OFP regular publications, regardless of whether it is public domain data or non-public domain data, is monitored and recorded by the SPC-OFP. Such a practice is important for the accountability of SPC-OFP to the sources of data.

For data held in the SPC-OFP regional statistical database, SPC-OFP has a data dissemination policy. This policy recognises that data on tuna fisheries have been voluntarily submitted to SPC-OFP by Pacific Island States as well as by other States involved in western and central Pacific Ocean tuna fisheries. The data has been provided to SPC-OFP for the purposes of ensuring that the best scientific information is available to support scientific analyses of the impacts of fishing by western and central Pacific Ocean tuna fisheries, and under the understanding that data will be maintained in accordance with an “agreed” data dissemination policy. The SPC-OFP dissemination policy considers that catch and effort data grouped by five-degree-square by month for longline fisheries, and one-degree-square by month for surface fisheries, for all fishing nations combined, are in the public domain.¹⁹⁰

Note that practice of not identifying the flag is a point of difference with general practices in other tuna regional fisheries management organisations (RFMOs), which were outlined in Chapter 3.¹⁹¹ In other tuna RFMOs, catch and effort data grouped by five-degree-square by month for longline fisheries, and one-degree-square by month for surface fisheries, *by flag* are considered to be in the public domain.¹⁹² The difference is probably because SPC-OFP is a centre of technical expertise that receives fisheries data from States

management organisations and arrangements to maintain confidentiality of fisheries data (Article 7.4.4 in respect of States, and Article 7.4.7 in respect of subregional or regional fisheries management organisations or arrangements).

¹⁹⁰ T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002), p31.

¹⁹¹ See Chapter 3 3.4 *Arrangements required at the global level for data on tuna fisheries*.

¹⁹² CCSBT, *Report of the Tenth Annual Meeting of the Commission, 7-10 October 2003* (Christchurch, New Zealand: Commission for the Conservation of Southern Bluefin Tuna, 2006), Attachment 13-Revised Confidentiality Policy of the CCSBT Central Database and the CCSBT Statistical Document Program, *ICCAT - Assessments - Access to ICCAT Statistical databases*, [website] (ICCAT, [cited 29 January 2008]); available from <http://www.iccat.int/accessingdb.htm>, P. Ward, N. Tsirbas, and R. Kearney, *Getting Science into Regional Fisheries Management - A Global View* (Canberra, Australia: Bureau of Research Sciences, 1998), p54.

voluntarily. In contrast, tuna RFMOs are formally recognised as institutions to facilitate cooperation between States to effectively conserve and manage tuna fisheries. So, sensibly SPC-OFP has been particularly cautious to maintain the cooperation of source/s of data that provide data voluntarily. Whereas, as was discussed in Chapter 2 and 3, the arrangements between tuna RFMOs and their members, is one of an obligation for those States to provide catch and effort data in fulfilment of their obligation to cooperate for the conservation and management of tuna stocks.

In fulfilling the responsibility for making reliable information available on western and central Pacific Ocean tuna fisheries available SPC-OFP and FFA both produce regular publications. SPC-OFP publishes public domain data in the Western Central Pacific Tuna Bulletin (formerly the Regional Tuna Bulletin) that contains monthly catch and effort data and the Tuna Fishery Yearbook that contains annual catch estimates by country and flag.¹⁹³ Public domain data are also available for download from the SPC-OFP website, and have been available on the SPC-OFP website since May 1999.¹⁹⁴ FFA also compiles some catch data, economic information and tuna market price information. FFA publishes the Tuna Market News each month on its website, as well as quarterly and annual summaries.¹⁹⁵ FFA also recently published on its website indicative estimates of the values of catches in

¹⁹³ These two SPC-OFP publications, are now published by SPC-OFP on behalf of the WCPFC and form part of the contractual obligations of SPC-OFP to WCPFC. The Western Central Pacific Tuna Bulletin (formerly the Regional Tuna Bulletin) contains monthly catch rates that are determined from catch and effort logsheet data provided to the SPC-OFP. The coverage of this Bulletin is limited covering only certain fleets. The Bulletin is available in print quarterly from the first quarter of 1988 to the first quarter of 2008, it is available semi-annually from the SPC-OFP website <http://www.spc.int>. The Tuna Fishery Yearbook contains estimates of annual catches in the WCPO area (prior to 1999, estimates were produced for the SPC Statistical Area), and includes estimates of annual catches for the EPO area. The most recent edition of the yearbook covers the time period 1950-2006, and covers 53 fleets, plus the domestic fisheries of Indonesia and the Philippines and several small-scale fisheries. Copies of the Tuna Fisheries Yearbook are available both in print and on the SPC-OFP website.

¹⁹⁴ T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002), 31-33.

¹⁹⁵ Tuna Market News is available on the FFA website <http://www.ffa.int> and covers price and volume trends in world and regional tuna markets. Market prices are strongly affected by the volume of tuna available from the WCPO, which in turn depends on weather and oceanic conditions, and the economic conditions of consumer countries.

individual Pacific Island State national waters and by national fleets.¹⁹⁶ All Standing Committee on Tuna and Billfish papers and reports were made publicly available.¹⁹⁷

In accordance with ensuring the confidentiality on non-aggregated data is maintained, data that does not fit the SPC-OFP definition of public domain data (as was defined above) are all considered by SPC-OFP to be non-public domain data. Releases of non-public domain data by SPC-OFP are possible upon request and are considered on a case-by-case basis. All releases of non-public domain data by SPC-OFP require prior permission from the source/s before SPC-OFP will release the data.¹⁹⁸ As a general rule, catch and effort data are released for research purposes only, and a description of the research project is normally required at the time of the request. Normally the data must be destroyed upon completion of the research project, although with the permission of the source exceptions may be granted for long-term use of data. Also a copy of the results of the research is requested by SPC-OFP so that the source/s of the data can be informed of the findings.¹⁹⁹

The SPC-OFP policy for dissemination of length data is similar to that for catch and effort data. There is no specific policy concerning the dissemination of other types of data held by SPC-OFP. Observer data is generally released by SPC-OFP in summary form for research purposes. However observer reports are often provided to the agency that arranged the placement of an observer, and upon request to the captain and owner of the vessel.²⁰⁰

The next subsection analyses the framework for exchange of data on tuna fisheries between Pacific Island States.

¹⁹⁶ FFA, *Value of WCPFC Tuna Fisheries - March 2007* [website and Microsoft Excel spreadsheet file] (2007 [cited 24 December 2007]); available from <http://www.ffa.int/node/862>.

¹⁹⁷ All Standing Committee on Tuna and Billfish papers and reports are available on SPC-OFP website <http://www.spc.int>.

¹⁹⁸ T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002), 31-33. Non-public domain catch and effort data are released for research purposes only and “to individuals who can be trusted to use the data responsibly”.

¹⁹⁹ Ibid., p31.

²⁰⁰ Ibid., 31-33.

Framework for the exchange of data on tuna fisheries between Pacific Island States

The previous analyses discussed how Pacific Island States compile their data on tuna fisheries with the assistance of SPC-OFP. Also discussed were the Standing Committee on Tuna and Billfish arrangements that enabled data to be compiled at a regional level by SPC-OFP so that tuna stock assessments and other scientific analyses on impacts of tuna fishing could be undertaken. Noting that data on tuna fisheries held by SPC-OFP are managed under a data dissemination policy that enables access to data only for scientific purposes, this section will discuss the framework Pacific Island States have to facilitate the exchange of data on tuna fisheries among themselves. There are many reasons why Pacific Island States might want to exchange data on tuna fisheries among themselves. Most reasons relate to the fact that western central Pacific Ocean tuna stocks are shared resources. For example, adjacent Pacific Island States might want to exchange data on tuna fisheries so that each State can check on the completeness and accuracy of reporting by vessels fishing in their EEZs or unloading in their ports.

As was discussed previously, Pacific Island States are obliged to maintain the confidentiality of data. Pacific Island States also recognise that any perceived or alleged breaches of data confidentiality are likely to lead to difficulties in obtaining future data on tuna fisheries or to falsified or incomplete data. As a result it is unlikely that in the absence of a formal agreement between two Pacific Island States that their national laws would permit the national Fisheries Departments of one Pacific Island State to directly provide copies of any data on tuna fisheries to the national Fisheries Department of another Pacific Island State.

There are at least two ways that two Pacific Islands States could exchange data on tuna fisheries between each other. First, Pacific Island States could exchange data pursuant to the SPC-OFP data dissemination policy that was discussed previously. The conditions on this mechanism for Pacific Island States to exchange of data include first, that the data should be held by SPC-OFP in the regional statistical database. Second, the exchange of data is solely for scientific research purposes and relates to data that is not in the public domain.²⁰¹ Third, Pacific Island States can only authorise SPC-OFP to release data to another State that they themselves have provided to SPC-OFP.

²⁰¹ Of course public domain data would be by definition publicly available and not relevant to this discussion.

The second way is for two Pacific Island States as Parties to the Niue Treaty on Cooperation in Fisheries Surveillance and Law Enforcement in the South Pacific Region (Niue Treaty), to conclude a Niue Treaty Subsidiary Agreement.²⁰² As was noted earlier in the present Chapter, at the time of writing, seven subsidiary agreements have been concluded under the Niue Treaty.²⁰³ Many of these subsidiary agreements authorise the sharing of vessel monitoring system (VMS) data between Pacific Island States, however the specific form of the authorisation between States for the sharing of VMS data does vary. The authorisation may either be indefinitely for the duration of the subsidiary agreement.²⁰⁴ Alternatively the authorisation is only applicable during the period of a planned fisheries surveillance and enforcement activity.²⁰⁵ The conclusion of a Niue Treaty subsidiary agreement also enables Pacific Island States to share information on the vessels they have licensed to fish in their waters.

Although the benefits for data exchange between Pacific Island States through Niue Treaty subsidiary agreements are recognised, the process of negotiating these subsidiary agreements has been noted as being quite slow and cumbersome.²⁰⁶ For this reason, at the time of writing the concept of a multilateral type agreement was being considered by the Parties to the Niue Treaty. It is anticipated that such a multilateral type agreement could *inter alia* facilitate exchange of data on tuna fisheries, particularly VMS data, more readily between Pacific Island States and other Parties to the Niue Treaty.²⁰⁷

Also relevant to data exchange between Pacific Island States, are the arrangements that FFA facilitates on a short-term basis for purposes of multilateral fisheries surveillance and enforcement operations. These short-term data exchange arrangements are

²⁰² Niue Treaty, Article II(2): "A Subsidiary Agreement may expand upon rights and obligations under this Treaty in their application between the Parties to the Subsidiary Agreement."

²⁰³ The subsidiary agreements under the Niue Treaty are between Tonga and Tuvalu; Australia and Papua New Guinea; Samoa and Cook Islands; and Federated States of Micronesia, Republic of Marshall Islands and Palau; Federated States of Micronesia and Nauru; Kiribati and Nauru; Samoa and Tokelau. At the time of writing two draft subsidiary agreements were being discussed amongst Fiji, Tuvalu, Tonga, Samoa and Vanuatu; and between Papua New Guinea, Solomon Islands, Vanuatu, Fiji and New Caledonia.

²⁰⁴ J. Gordon, Acting Legal Counsel, FFA, Personal Communication by Email, 2 March 2008. This is the case for the 2005 Niue Treaty Subsidiary Agreement between the Governments of the Republic of Nauru and the Republic of Kiribati.

²⁰⁵ Ibid. This is the case for the 2005 Niue Treaty Subsidiary Agreement between the Governments of the Cook Islands and the Independent State of Samoa.

²⁰⁶ FFA, "Niue Treaty" (paper presented at the 20th Annual Treaty Consultation Meeting: Internal Meeting of the Pacific Island Parties 3-4 March, Rarotonga, Cook Islands, 2008).

²⁰⁷ Ibid.

implemented pursuant to the Niue Treaty, and often though not necessarily through the conclusion of Niue Treaty Subsidiary Agreements. To simplify the data sharing approval process for VMS data, the FFA Secretariat has created a template that allows Pacific Island States to specify the data sharing arrangements that they wish to authorise easily and quickly, but which ensures Pacific Island States retain full control of national VMS data at all times.²⁰⁸ Also to improve the utility of available data sources during surveillance operations, FFA has been developing and trialling computer software that, for the purposes of these fisheries surveillance and enforcement operations, enables multiple sources of data to be merged through a secure web-based Geographical Information System. These data sources that can be merged include VMS, aerial and surface surveillance reports, licensing information and Patrol Vessel positions.²⁰⁹

The next subsection considers the arrangements between SPC and FFA to formalise the exchange of data on tuna fisheries between the two institutions.

Framework for sharing of data between FFA and SPC-OFP

As was discussed previously, SPC-OFP and FFA both have roles in assisting Pacific Island States in tuna fisheries development, conservation and management. To this end, the FFA/SPC memorandum of understanding provides a formal mechanism for the two institutions to exchange data on tuna fisheries, whilst also maintaining the confidentiality of any non-public domain data. Article 3 of the FFA/SPC memorandum of understanding states the following:

FFA and SPC hereby agree to freely exchange information and documentation on, and to keep each other fully informed of, their activities and programmes of work on oceanic resources, subject always to such arrangements as may be necessary for safeguarding information of a sensitive or confidential nature as agreed by the owners of that information, including the member countries and territories of both organizations. Protocols on the exchange of quantitative data are attached as Annex A.²¹⁰

²⁰⁸ FFA, "Status of VMS Data Sharing and Non-FFA Member Nations Participation" (paper presented at the 10th FFA MCS Working Group Meeting, 26-30 March, Honiara, Solomon Islands, 2007). This VMS sharing data template can be used for Pacific Island States to authorise the sharing of VMS data with aerial surveillance providers such as New Zealand, France and the United States.

²⁰⁹ FFA, "FFA E-Ops Room" (paper presented at the 10th FFA MCS Working Group Meeting, 26-30 March, Honiara, Solomon Islands, 2007).

²¹⁰ FFA/SPC memorandum of understanding, para 3.

Annex A to the FFA/SPC memorandum of understanding is attached herein as Appendix 4 and is comprised of two tables. The first table sets out the data on tuna fisheries that FFA are to provide to SPC-OFP, and the second, sets out the data on tuna fisheries that SPC-OFP are to provide to FFA. The preamble to Annex A of FFA/SPC memorandum of understanding stipulates that any exchanges of data on tuna fisheries pursuant to the MOU are subject to either organizations internal requirements for maintaining confidentiality. So while the FFA/SPC memorandum of understanding enables provision of certain data on tuna fisheries by one organization to the other, depending on the type of data in question and its confidentiality status, the receiving organization could in fact be constrained from further disseminating that data.²¹¹

The majority of data that FFA is to provide to SPC-OFP are catch and effort data and observer programme data for the Multilateral Treaty on Fisheries and the FSM Arrangement. These two subregional treaties are administered by the FFA Secretariat on behalf of Pacific Island States, and the FFA Secretariat receives catch and effort logsheets from fishing vessels and observer reports covering these vessels.²¹² FFA is to provide these data to the Parties to those treaties.²¹³ For the Multilateral Treaty on Fisheries some data on tuna fisheries (catch and effort data, port sampling data and unloadings data) are collected by the National Marine Fisheries Service of the United States, and these are provided to FFA as administrator of the treaty. SPC-OFP inputs and compiles these data into the SPC-OFP regional statistical database, and a copy is sent back to FFA by SPC-OFP.

There are three other groups of data that FFA has agreed to provide to SPC-OFP. First, data and information pertaining to vessels on the FFA Vessel Register and second, any information available to FFA on vessels licensed in Pacific Island States waters.²¹⁴ Both of these data are probably used by SPC-OFP, as appropriate, to supplement data in the regional statistical database and has some use in fishing effort standardization. The third

²¹¹ For example the Multilateral Treaty on Fisheries states that FFA and Pacific Island State Parties must maintain the confidentiality of all data received pursuant to the Multilateral Treaty on Fisheries and its subsidiary Agreements, unless agreed to and provided for otherwise (US Multilateral Treaty on Fisheries, Implementing Agreement, Article 4). Therefore although pursuant to the FFA/SPC MOU SPC-OFP receives catch and effort data and observer reports for compiling and input on behalf of FFA, SPC-OFP would not be able to release that data to third Parties.

²¹² FSM Arrangement, Article 9, US Multilateral Treaty on Fisheries, Article 14(1).

²¹³ FSM Arrangement, Article 9, US Multilateral Treaty on Fisheries, Article 14(1).

²¹⁴ FFA/SPC memorandum of understanding, Annex A Table 1. It is noted in Annex A that coverage of this data held by FFA is incomplete.

type of data FFA is to provide to SPC-OFP is Regional vessel monitoring system (VMS) data. The provision of these data by FFA to SPC-OFP is subject to certain confidentiality conditions.²¹⁵

In accordance with the FFA/SPC memorandum of understanding, there are three groups of data on tuna fisheries that SPC-OFP is to provide to FFA. First, FFA is given access to relevant parts of the SPC-OFP regional statistical database relating to operational-level catch and effort data collected by FFA members. The data are updated three to four times per year, and the data is provided in formats that are of most use for FFA purposes (tabular as well as in a format that enables maps and graphics to be generated). Also provided by SPC-OFP to FFA are annual catch estimates by fleet and EEZ for the WCPFC Convention Area.²¹⁶ Second, estimates of annual effort by fleet and EEZ are also provided with the regional tuna fishery database access. Third, is access by FFA to SPC-OFP holdings of SPC/FFA national observer data collected by FFA members.²¹⁷

Conclusion

This Chapter has shown that many international legal requirements for data on tuna fisheries are being fulfilled by the data practices of Pacific Island States. Pacific Island States, with the support of Secretariat of the Pacific Community Oceanic Fisheries Programme (SPC-OFP) and Pacific Islands Forum Fisheries Agency (FFA) have effectively established data practices to ensure the collection of fisheries data that are necessary to support scientific analyses of impacts of tuna fishing. The data practices ensure that catch and effort data are collected covering tuna fisheries that are licensed in their EEZs, as well as other data and information that are needed to support stock assessment (biological and research information, vessel and gear information; and data on non-target species). Pacific Island States have been able to ensure that fisheries data that covers the majority of western and central Pacific Ocean tuna fisheries can support

²¹⁵ Ibid., . It is noted in Annex A that the conditions were those specified by certain FFA members, and were attached to a fax sent by Director of FFA to Director of Marine Resources – SPC.

²¹⁶ These data are used and referenced in the catch and value estimate tables for Pacific Island States: FFA, *Value of WCPFC Tuna Fisheries - March 2007* [website and Microsoft Excel spreadsheet file] (2007 [cited 24 December 2007]); available from <http://www.ffa.int/node/862>.

²¹⁷ FFA/SPC memorandum of understanding, Annex A Table 1. According to Annex A, this exchange of data is yet to be implemented, and awaits a formal request from FFA to initiate the process.

scientific analyses of the impacts of tuna fishing in the western and central Pacific Ocean. Pacific Island States have achieved this through the arrangements established under Standing Committee on Tuna and Billfish, and the support of SPC-OFP. There remains scope to improve the data coverage of western and central Pacific tuna fisheries, particularly for fishing activities that occur beyond Pacific Island States EEZs.

The Chapter has shown that Pacific Island States also have adequate arrangements at national and regional levels for compilation, as well as sharing and exchange of data on tuna fisheries. These were established and are supported by the SPC-OFP and FFA. With the support of SPC-OFP and FFA, data verification arrangements, such as observer programmes, vessel-monitoring systems, port sampling programmes and unloadings monitoring are established in the Pacific Islands region and necessary data are being collected and verified. There is scope for improved coverage of data verification activities within areas under national jurisdiction of Pacific Island States, but particularly in areas beyond the national jurisdiction of Pacific Island States.

As was discussed in Chapter 5, Pacific Island States have a vested interest in the long-term sustainability of the tuna stocks on which they depend. It is for these reasons that Pacific Island States have been open to pursuing arrangements to ensure that the best scientific information is available for scientific analyses of impacts of tuna fishing in the western and central Pacific Ocean. Only through cooperation will the best scientific advice and information be available to underpin fisheries management actions to achieve long-term conservation and sustainable use of western and central Pacific Ocean tuna fisheries. Improving cooperation amongst all States involved in western and central Pacific Ocean tuna fisheries, is one reason that necessitated Pacific Island States entering into negotiation of a treaty that lead to the eventual establishment of the tuna regional fisheries management organisation for the region: the *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPFC). It is the fisheries data practices under the WCPFC that will be the subject of the next two Chapters of this thesis, and implications to Pacific Island States of these arrangements will also be analysed.

Chapter 7. Analysis of WCPFC practices for collection of data on tuna fisheries

Cooperation among all States involved in western and central Pacific tuna fisheries is essential to ensure that the long-term conservation and sustainable use of these fisheries is achieved for the benefit of all, including Pacific Island States.¹ The *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the western and central Pacific Ocean* (WCPFC or Commission)² is the mechanism to facilitate this cooperation. The Commission requires quality scientific advice to ensure the effectiveness of conservation and management measures that are adopted for the long-term conservation and sustainable use of these tuna fisheries. Fisheries data is a key input that underpins scientific advice to the Commission. Effective fisheries data practices must be established in the WCPFC to ensure the collection and compilation of the fisheries data that are necessary to support scientific analyses of impacts of tuna fisheries in the western and central Pacific Ocean.

This Chapter is the first of a two-part analysis of the fisheries data practices established in the WCPFC. The framework for the analyses was outlined in the introduction to the present thesis. The purpose of this Chapter is to analyse the fisheries data practices that have been established by the WCPFC to collect the fisheries data required to support scientific analyses of the impacts of western and central Pacific tuna fisheries. This Chapter will comprise four parts. First, the background to the WCPFC and WCPFC practices for data on tuna fisheries will be examined, and the WCPFC legal framework for fisheries data will be overviewed. This first section provides the necessary

¹ Pacific Island States refers to the fourteen independent island countries: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu.

² Note that within this thesis two abbreviations will be used to refer to the *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean*. The “WCPFC” is the commonly used abbreviation that is used to distinguish this tuna RFMO from the other tuna RFMOs. The phrase “Commission” is used herein to refer specifically to the decision-making body of the WCPFC as distinct from the other bodies that together comprise the WCPFC. These other bodies of the WCPFC include *inter alia* the WCPFC Secretariat and the subsidiary bodies such as the Scientific Committee or Technical and Compliance Committee.

context to analyses and assessment of WCPFC fisheries data practices that subsequently follow, in the present and subsequent Chapters. The second part, will introduce the WCPFC decisions to collect data on tuna fisheries from WCPFC members. Third, the practices to collect catch and effort data that are required by the WCPFC for scientific analyses of impacts of fishing, including tuna stock assessments. Fourth, practices to ensure the collection of other data and information that are required by the WCPFC for scientific analyses of impacts of fishing, including on the marine ecosystem. These “other data and information” comprise four groups: biological data and research information to support stock assessment; vessel-related information to standardise fishing effort; and data on impacts of western and central Pacific tuna fishing on non-target, dependent or associated species.

7.1 Background to WCPFC and practices for data on tuna fisheries

As was noted in Chapter 1 there are five tuna regional fisheries management organisations (RFMOs) that together cover the global range of the four principal market tuna species.³ The tuna RFMOs are the *Inter-American Tropical Tuna Commission* (IATTC), covering the eastern Pacific Ocean (EPO); the *International Commission for the Conservation of Atlantic Tunas* (ICCAT) covering the Atlantic Ocean; the *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT) covering the global range of southern bluefin tuna; the *Indian Ocean Tuna Commission* (IOTC) covering the Indian Ocean; and the WCPFC covering the western and central Pacific Ocean.⁴ The WCPFC is the youngest of the five tuna RFMOs with its constituting treaty, the *Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean*

³ See Chapter 1 1.4 *Achieving long-term conservation and sustainable use of fisheries through fisheries management*, particularly Figure 1-7. Map to illustrate the approximate mandated area for the five tuna RFMOs.

⁴ IATTC was established in 1949 through adoption of the *Convention for the Establishment of an Inter-American Tropical Tuna Commission*, of 31 May 1949 80 UNTS 4; ICCAT was established in 1966 through adoption of the *International Convention for the Conservation of Atlantic Tuna*, of 14 May 1966 UN/LEG/SER.B/16, 483-491; IOTC was established in 1993 through adoption of the *Agreement for the Establishment of the Indian Ocean Tuna Commission*, of 25 November 1993, Accessed from <http://www.iotc.org/about/>; CCSBT was established in 1993 through adoption of the *Convention for the Conservation of Southern Bluefin Tuna*, of 10 May 1993, Accessed from http://www.ccsbt.org/docs/pdf/about_the_commission/convention.pdf.

(WCPF Convention), having been adopted in 2000.⁵ The WCPF Convention reflects principles of responsible fisheries management and seeks to implement the relevant provisions of the *Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks* (UN Fish Stocks Agreement).⁶ Whereas the other tuna RFMOs, particularly IATTC and ICCAT that were established before the *United Nations Convention on the Law of the Sea* (LOS Convention),⁷ have had to face the challenge of adapting their constituting treaties to reflect the principles of the modern international legal framework for tuna fisheries conservation and management. The present section will overview the developments that led to the establishment of the WCPFC and the WCPFC practices for data on tuna fisheries.

Background

From at least the seventies, Pacific Island States had recognised that they shared, with other countries that had an interest in tuna fisheries, common concerns for ensuring the sustainability of tuna stocks in the western and central Pacific Ocean . For example, as was mentioned in Chapter 6 the constituting treaty for the Pacific Islands Forum Fisheries Agency (FFA), which was adopted in 1979, specified that at some point in the future that some additional international machinery would be required between all coastal States in the region and all States involved in the harvesting of such resources.⁸ However, at that time Pacific Island States were not yet ready to enter into multilateral negotiations for a tuna fisheries treaty. Certain developments in international law, particularly the recognition of the special requirements of small-island developing States, improved the readiness of

⁵ Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, of 5 September 2000, 5 September 2000, in force 19 June 2004, [2000] *ATNIF No.11* (WCPF Convention,).

⁶ Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, of 4 December 1995, entered into force from 11 December 2001 (1995) 34 *ILM* 1542 (UN Fish Stocks Agreement,).

⁷ United Nations Convention on the Law of the Sea of 10 December 1982, entered into force from 16 November 1994 (1982) 21 *ILM* 1261.

⁸ South Pacific Forum Fisheries Agency Convention, of 10 July 1979, 1579 *UNTS* 307, in force 9 August 1979 (FFA Convention, Article III) Current FFA members are: Australia, Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, and Vanuatu.

Pacific Island States to seek, through cooperative efforts with other countries, to formally establish a treaty arrangement for cooperation amongst all States, coastal States and flag States, for tuna conservation and management in the western and central Pacific Ocean.⁹

There were two rounds of conferences that lead to the establishment of the WCPFC. The first round was the *Multilateral High-Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western Central Pacific* (MHLC). The MHLC were a series of negotiations between States with an interest in the conservation and management of tuna stocks in the western and central Pacific Ocean .

Multilateral High Level Conference

The MHLC comprised seven sessions and four technical consultations over the period December 1994 to September 2000.¹⁰ MHLC1 was convened shortly following the entry into force of the LOS Convention, at the invitation of FFA members, as a session of talks of an exploratory nature with some distant water fishing States on South Pacific tuna

⁹ Following the adoption of the LOS Convention, further pressure was placed on Pacific Island States to expand the membership of the FFA consistent with Article 64 of the LOS Convention (so that FFA included all States involved in the fisheries). However consensus among the FFA membership on being comfortable to partake in negotiations with fishing States for a conservation and management arrangement for the western and central Pacific Ocean tuna stocks was not reached until towards the end of negotiations on the UN Fish Stocks Agreement. Many Pacific Islands States participated actively at the negotiations of the UN Fish Stocks Agreement and were reassured by their collective ability to negotiate a favourable outcome. At the 1995 and 1996 Pacific Islands Forum, the decision was taken by Forum Leaders to proceed to develop comprehensive arrangements for management and conservation of tuna consistent with the UN Fish Stocks Agreement. S. Tarte, "Negotiating a Tuna Management Regime for the Western and Central Pacific: the MHLC Process 1994-1999," *The Journal of Pacific History* 34, no. 3 (1999): 273-280, S. Tarte, *'Small Islands; Big Fish': The International Politics of Tuna Management in the Western and Central Pacific* (Suva, Fiji: The University of the South Pacific, 2001).

¹⁰ Participation in MHLC1 was by invitation of FFA members as convenor of the Conference. Subsequently other States, territories and fishing entities were invited to participate in other session of the MHLC either as full participants or observers. The 14 Pacific Island States and Tokelau participated throughout the MHLC process. Other participants in the MHLC were: Australia, Canada, China, France, French Polynesia, Indonesia, Japan, New Caledonia, New Zealand, Philippines, Republic of Korea, Chinese Taipei, United States of America, United Kingdom of Great Britain and Northern Ireland on behalf of Pitcairn, Henderson, Ducie and Oeno Islands, Wallis and Futuna. Other observers to the MHLC included European Commission, Mexico and Ecuador.

The MHLC were held as follows: MHLC1 Honiara, Solomon Islands 1-5 December 1994; MHLC2 Majuro, Marshall Islands 10-13 June 1997; MHLC3 Tokyo, Japan 22-26 June 1998; MHLC4 Honolulu, Hawaii 10-19 February 1999; MHLC5 Honolulu, Hawaii 6-15 September 1999; MHLC6 Honolulu, Hawaii 11-19 April 2000; MHLC7 Honolulu, Hawaii 30 August-5 September 2000.

The technical consultations were held as follows: Technical consultation on the collection and exchange of fisheries data, tuna research and stock assessment, Noumea, New Caledonia 15-19 July 1996; Technical consultation on fishing vessel monitoring systems, Suva, Fiji 13-15 November 1996; Intersessional technical consultation on issues relating to fisheries management, Honiara, Solomon Islands 1-5 December 1997; Intersessional technical consultation on issues related to monitoring, control and surveillance, Suva, Fiji 10-13 March 1998.

fisheries.¹¹ MHLC2 was not held until after the UN Fish Stocks Agreement had been adopted, and following the decision by Pacific Island Forum Leaders, in 1995 and 1996, to partake in negotiations on the development of an arrangement for conservation and management of western and central Pacific Ocean tuna stocks that was consistent with UN Fish Stocks Agreement.¹² During the MHLC process, Pacific Islands saw the establishment of the WCPFC as necessary to secure the long-term sustainability of tuna stocks whilst also providing opportunities for Pacific Island States to achieve their aspirations for greater returns and development of tuna fisheries.¹³

The aim of MHLC2 was to consider issues relating to the adoption of a regional mechanism for the conservation and management of highly migratory fish stocks.¹⁴ The Majuro Declaration, which was adopted by the participants to the MHLC2, stated *inter alia* the commitment of participants to establish a mechanism for the conservation and management of highly migratory fish stocks in the Western and Central Pacific Ocean in accordance with the LOS Convention and UN Fish Stocks Agreement, by June 2000.¹⁵ The subsequent sessions of MHLCs considered draft convention texts prepared and revised by the Chairman Satya N. Nandan. In September 2000, only a few months short of the Majuro Declaration deadline, the final version of the WCPF Convention was adopted by vote during MHLC7.¹⁶

¹¹ S. Tarte, *'Small Islands; Big Fish': The International Politics of Tuna Management in the Western and Central Pacific* (Suva, Fiji: The University of the South Pacific, 2001). The talks in Honiara, Solomon Islands during MHLC1 were more of an exchange of views and there was some wariness of pre-empting the outcomes of the process of negotiation for the UN Fish Stocks Agreement.

¹² S. Tarte, "Negotiating a Tuna Management Regime for the Western and Central Pacific: the MHLC Process 1994-1999," *The Journal of Pacific History* 34, no. 3 (1999): 273-280, p274, S. Tarte, *'Small Islands; Big Fish': The International Politics of Tuna Management in the Western and Central Pacific* (Suva, Fiji: The University of the South Pacific, 2001), p8.

¹³ FFA, *Record of Forum Fisheries Committee - Twenty-sixth Meeting, Port Moresby, Papua New Guinea, 1 - 5 May 1995* (Honiara: Pacific Islands Forum Fisheries Agency, 1995), para 121. There were five principles that FFA members agreed to pursue when the decision was taken to enter negotiations on a treaty for western and central Pacific Ocean tuna conservation and management: "To secure and protect the rights and interests of FFA countries; To secure maximum long-term benefits for FFA member countries; To ensure conservation of the resource; To promote full involvement of all FFA countries in a transparent and binding decision-making process; and To ensure consistency with international obligations."

¹⁴ S. Tarte, "Negotiating a Tuna Management Regime for the Western and Central Pacific: the MHLC Process 1994-1999," *The Journal of Pacific History* 34, no. 3 (1999): 273-280, p281.

¹⁵ Majuro Declaration, adopted at second Multilateral High-Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific; accessed from 'Internet Guide to International Fisheries Law' <http://www.oceanlaw.net/texts/majuro.htm> on 11 March 2006.

¹⁶ The result of the vote was 19 in favour, 2 against (Japan and Republic of Korea), with three abstentions (China, France and Tonga). Tonga subsequently signed and has ratified the WCPF Convention. The WCPF

Also adopted at MHLC7 by vote was the resolution titled “Establishing a Preparatory Conference for the Establishment of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean.” The *Preparatory Conference for the Establishment of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (PrepCon) was the second round of conferences that lead to the establishment of the WCPFC. Also comprising seven sessions, the PrepCon aimed to facilitate “the necessary arrangements for the commencement of the functions of the Commission without undue delay and to take all possible measures to ensure its effective operation.”¹⁷

Preparatory Conference for the Establishment of the WCPFC

The PrepCon was a series of meetings for likely members to make preparations relating to how the WCPFC would operate. These included *inter alia* rules of procedure for operation of meetings, financial regulations and procedures for the WCPFC, scientific structures and arrangements for the provision of advice to the Commission.¹⁸ Of relevance to the development of the WCPFC framework for data on tuna fisheries, the PrepCon intended to *endeavour to* formulate recommendations for consideration by the WCPFC concerning:¹⁹

Convention has been acceded to by Japan, Republic of Korea, China and France. For further information see WCPFC, *Status of the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean as at 18th November 2005*, WCPFC/Comm.2/07 Rev.1 (Pohnpei, Federated States of Micronesia: 2005).

¹⁷ The Preparatory Conference was established through Final Act of the Multilateral High-Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific, Adopted at seventh Multilateral High-Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific; accessed from 'WCPFC' <http://www.wcpfc.int/pdf/FinalAct.pdf> on 7 March 2008 (Final Act of MHLC, Preamble). The Preparatory Conferences were held as follows: PrepCon1, Christchurch, New Zealand 23-28 April 2001; PrepCon2, Madang, Papua New Guinea 25 February - 1 March 2002; PrepCon3 Manila, Philippines 18-22 November 2002; PrepCon4, Nadi, Fiji 5-9 May 2003. PrepCon5 Rarotonga, Cook Islands 29 September - 3 October 2003; PrepCon6 Bali, Indonesia 19-23 April 2004; PrepCon7 Pohnpei, Federated States of Micronesia 6-7 December 2004.

¹⁸ Ibid., paras 5-10. Participants in the PrepCon were those that participated in the MHLC process (see note 10). The European Community and Russia participated as observers to PrepCon, but in practice the European Community was granted greater participatory rights than was Russia.

¹⁹ Not “The Preparatory Conference will” as was used in Ibid., para 6. The phrase is “The Preparatory Conference will endeavour to” – which weakens the requirement for the PrepCon to have formulated recommendations in relation to the items that follow, instead the PrepCon was required to make their best efforts to formulate recommendations for the items that follow.

“the collection of data and information in accordance with Article 23, paragraph 2 (a) and (b), of the Convention.”²⁰

Key to the work of the PrepCon on the fulfilment of the data and information task, as well as in respect of other science-based tasks, was *Working Group II on the scientific structure of the Commission and the provision of interim scientific advice* (PrepCon Science Working Group). The PrepCon Science Working Group was established during PrepCon1 as an open-ended working group to address issues associated with the provision of scientific advice to the Commission both in the interim period and in the long-term.²¹ Of particular relevance to WCPFC arrangements for data on tuna fisheries, the PrepCon Science Working Group made recommendations to PrepCon on transitional arrangements in the WCPFC to utilise pre-existing standards and arrangements in the western and central Pacific Ocean: for data to be provided by WCPFC members; for database services; and for stock assessment and scientific research.²² Another important function of the PrepCon Science Working Group was to provide the PrepCon with provisional scientific advice on the status of tuna stocks in the western and central Pacific Ocean.²³ Later analyses in this and Chapter 8 will show that the PrepCon recommendations on scientific and fisheries data matters shaped the form of WCPFC practices for data on tuna fisheries.²⁴ The PrepCon and its subsidiary bodies remained in existence until the conclusion of the inaugural meeting of the WCPFC held in Pohnpei, Federated States of Micronesia, during 8 – 9 December 2004.

²⁰ Ibid., Resolution I (7a(ii)).

²¹ The terms of reference for PrepCon Science Working Group are described in "Working Group II: Scientific Structure and Provision of Interim Scientific Advice - Terms of Reference: WCPFC/PrepCon/4", (paper presented at the Preparatory Conference for the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: First Session 23-28 April 2001, Christchurch, New Zealand, 2001). The terms of reference relate primarily to the needs of the Commission in relation to WCPFC Convention Article 12 (Functions of the Scientific Committee) and WCPFC Convention Article 13 (Scientific Services) and paragraph 10 of MHLC Final Act - Resolution I (which relate to the need for provisional scientific advice on the status of tuna stocks).

Additionally, a subgroup of the PrepCon Science Working Group was established to bring further scientific and technical expertise into the work of the PrepCon Science Working Group. This subgroup was called the Scientific Coordinating Group and the terms of reference are described in *Working Group II: Scientific Structure and Provision of Interim Scientific Advice - Summary Report by the Chairman of Working Group: WCPFC/PrepCon/15*, (Madang, Papua New Guinea: 2002), Annex V.

²² See summary of discussions and recommendations of WGII in *Final Report of Working Group II: WCPFC/PrepCon/45, WCPFC/PrepCon/41* (Pohnpei, Federated States of Micronesia: 2004).

²³ Ibid.

²⁴ See 7.3 WCPFC practices to collect catch and effort data and 7.4 WCPFC practices to collect other data and information also see Chapter 8.

Overview of WCPFC

The objective of the WCPF Convention is to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the western and central Pacific Ocean, in accordance with the LOS Convention and UN Fish Stocks Agreement.²⁵ The WCPF Convention is the first implementation of the UN Fish Stocks Agreement and *inter alia* sought to strike a balance between the diverse, and at times competing, interests of all participants in tuna fisheries in the western and central Pacific Ocean.²⁶ All fourteen Pacific Island States are members of the WCPFC, as well as other coastal States in the western and central Pacific Ocean, and flag States whose tuna fishing vessels fish in the western and central Pacific Ocean and most market States.²⁷ The WCPFC, with twenty-five members, has a membership size that is placed in the mid-range of other tuna RFMOs.²⁸ Pursuant to WCPF Convention Article 43, seven “territories” also participate in the work of the WCPFC.²⁹ Also, at the time of writing, the Commission had granted to Belize and Indonesia the status of Cooperating Non-Member, which entitles them to participate in the work of the WCPFC.³⁰ It is a condition of Cooperating Non-

²⁵ WCPF Convention, Article 2.

²⁶ For a thorough analysis see T. Aqorau, "Tuna Fisheries Management in the Western and Central Pacific Ocean: A Critical Analysis of the Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean and Its Implications for the Pacific Islands States," *The International Journal of Marine and Coastal Law* 16, no. 3 (2001): 379-431. Also see M. Tsamenyi and L. Manarangi-Trott, "Chapter 10: The Implications of the WCPFC for Australia's maritime regulation and enforcement," in *Protecting Maritime Resources: Boundary Delimitation, Resource Conflicts and Constabulary Responsibilities*, ed. R. Heath and B. Snushall, *Papers in Australian Maritime Affairs* (Canberra: Royal Australian Navy, Sea Power Centre, 2003).

²⁷ As at January 2008 the members of the WCPFC were: Australia; Canada; China; Cook Islands; European Community; Federated States of Micronesia; Fiji; France; Japan; Kiribati; Korea; Marshall Islands; Nauru; New Zealand; Niue; Palau; Papua New Guinea; Philippines; Samoa; Solomon Islands; Tonga; Tuvalu; United States of America, and Vanuatu. Also, Chinese Taipei, pursuant to the *WCPF Convention, Annex I. Fishing Entities*, participates in the work of the WCPFC as a WCPFC member.

²⁸ The ICCAT has the highest number of members at forty-six. The IOTC has twenty-seven members, which is slightly higher than the WCPFC with twenty-five members. Next, are the IATTC and CCSBT with fifteen and five members, respectively. The members of each tuna RFMOs are listed in Table 1-6 Membership of tuna RFMOs and cooperating non-parties (See Chapter 1 *1.4 Achieving long-term conservation and sustainable use of fisheries through fisheries management*).

²⁹ Pursuant to WCPF Convention Article 43 the following are “Participating Territories” (the relevant Contracting Party with responsibility for its internal affairs): Tokelau (New Zealand); French Polynesia; New Caledonia; Wallis and Futuna (France); and American Samoa; Commonwealth of Northern Marianas; Guam (United States).

³⁰ At the time of writing, Belize and Indonesia had been granted CNM status in the WCPFC for the duration of 2008. CNM status is conferred by the Commission annually pursuant to WCPFC, *Conservation and Management Measure on Cooperating Non-Member (CMM 2004-02)* (As adopted at First Regular Session of the Commission, Pohnpei, Federated States of Micronesia, 9-10 December 2004).

Member status, that like WCPFC Members and Participating Territories, Cooperating Non-Members are expected to comply with decisions of the Commission, including relevant requirements to submit data on tuna fisheries to the Commission.³¹

The WCPF Convention establishes the Commission and the mandate of the Commission for ensuring the effective long-term conservation and sustainable use of highly migratory fish stocks within the Western and Central Pacific Ocean.³² Two subsidiary bodies, a Scientific Committee (SC) and Technical and Compliance Committee (TCC) were established pursuant to Article 11 of the WCPF Convention to provide recommendations and advice to the Commission.³³ Other Subsidiary Bodies include the Northern Committee, established pursuant to WCPF Convention Article 11(7) which provides advice and recommendations for the part of the Convention Area north of 20N; the Standing Committee on Finance and Administration which was established by the Commission at WCPFC3 and had its inaugural meeting in December 2007 in association with WCPFC4. Other subsidiary bodies have been established on a more ad-hoc basis for specific tasks, such as the Ad Hoc Task Group [Data] and Intersessional Working Group on the Regional Observer Programme. Since the inaugural meeting of WCPFC Commission, three regular sessions of the Scientific Committee and Technical and Compliance Committee have been convened.³⁴

The area of competence of the WCPFC is defined in the WCPF Convention. The WCPFC Convention Area, as specified in Article 3 of the WCPF Convention, is the waters

³¹ Ibid., para 3.: “Cooperating non members shall: (a) Comply with all conservation and management measures in force in the Convention Area; (b) Provide all the data members of the Commission are required to submit, in accordance with the recommendations adopted by the Commission; (c) Inform the Commission annually of the measures it takes to ensure compliance by its vessels with the Commission’s conservation and management measures;”

³² WCPF Convention, Part III (Articles 9-22) Note that the “Commission” will be used specifically to refer to the decision-making body of a relevant tuna RFMO. The “WCPFC” will be used in a more general sense to refer to the broader elements of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean.

³³ Ibid., Article 11 Functions of the SC are set out in Article 12 and Article 13, and functions of the TCC Are set out in Article 14.

³⁴ In 2005, the Scientific Committee (SC) met in Noumea, New Caledonia 8-19 August; the Technical and Compliance Committee (TCC) met in Pohnpei, Federated States of Micronesia 5-9 December. In 2006, the Second Regular Session of the SC (SC2) was held in Manila, Philippines, 7-18 August; the Second Regular Session of the TCC (TCC2) was held in Brisbane, Australia 28 September-3 October. In 2007, the Third Regular Session of the SC (SC3) was held in Honolulu, Hawaii, 13-24 August; the Third Regular Session of the TCC (TCC3) was held in Pohnpei, Federated States of Micronesia, 27 September -3 October.

Please see print copy for Figure 7-1.

Figure 7-1. Illustration of the WCPFC Convention Area (the area to the west and north of the black line) and the WCPFC Statistical Area (bounded by the yellow line). The boundary of the WCPFC Statistical Area has the boundary of the WCPFC Convention Area (black) as well as the additional boundary north of Australia (yellow). The Area of the IATTC is shown (portion of the Eastern Pacific Ocean lightly shaded in red). Also shown is the overlap area of the WCPFC Convention Area with the Area of IATTC (black shaded area).

Source: Insert map adapted from P. Williams and C. Reid, Overview of the tuna fisheries in the Western and Central Pacific Ocean (WCPO), including economic conditions - 2007, WCPFC-SC3 GN WP-1 (Kolonias, Federated States of Micronesia: WCPFC, 2007), p1 figure 1.

bounded to the south and east of a specified boundary illustrated as black line in Figure 7-1.³⁵ The WCPFC Convention Area includes all waters: that is waters beyond national jurisdiction and waters under national jurisdiction of coastal States.³⁶ In spite of this, the relevant rights, jurisdictions and duties of States under the LOS Convention and UN Fish Stocks Agreement still are applicable within the WCPFC Convention Area.³⁷ Also paragraph 3 of Article 3 specifies that the WCPF Convention applies throughout the range of “highly migratory fish stocks” within the WCPFC Convention Area, with the exception of sauries.³⁸ Therefore, the WCPFC Convention Area is ideal from a scientific perspective because it encompasses the theoretical range of the principal market tuna stocks to which the WCPF Convention applies.³⁹ However, owing to the undefined northern and western boundaries, the definition of the WCPFC Convention Area is less than ideal from a regulatory perspective.⁴⁰ For these reasons, a definition for the WCPFC Statistical Area

³⁵ WCPF Convention, Article 3(1) “from the south coast of Australia due south along the 141° meridian of east longitude to its intersection with the 55° parallel of south latitude; thence due east along the 55° parallel of south latitude to its intersection with the 150° meridian of east longitude; thence due south along the 150° meridian of east longitude to its intersection with the 60° parallel of south latitude; thence due east along the 60° parallel of south latitude to its intersection with the 130° meridian of west longitude; thence due north along the 130° meridian of west longitude to its intersection with the 4° parallel of south latitude; thence due west along the 4° parallel of south latitude to its intersection with the 150° meridian of west longitude; thence due north along the 150° meridian of west longitude”.

³⁶ Ibid.,

³⁷ Ibid., Article 4: “Nothing in this Convention shall prejudice the rights, jurisdiction and duties of States under the 1982 Convention and the Agreement. This Convention shall be interpreted and applied in the context of and in a manner consistent with the 1982 Convention and the Agreement.”

³⁸ Ibid., Article 3(3) “highly migratory fish stocks” is defined in Article 1 as “all fish stocks of the species listed in Annex I of the [LOS] Convention occurring in the Convention Area and such other species of fish as the Commission may determine”. For reference Annex I of the LOS Convention is attached herein as Appendix 1.

³⁹ Skipjack tuna, *Katsuwonus pelamis*; yellowfin tuna, *Thunnus albacares*; albacore tuna, *Thunnus alalunga*; bigeye tuna, *Thunnus obesus*. For bigeye there is evidence to support separate eastern and western stocks of bigeye in the Pacific, as well as a single stock of bigeye tuna throughout the Pacific Ocean, in any case the former is preferred by scientists because a more conservative stock assessment result is produced when no mixing is presumed between the eastern and western halves of the stock. For albacore, tuna stock assessments tend to assume separate northern and southern stocks of albacore with no distinction of east and west.

⁴⁰ This is an issue that is beyond the scope of this thesis. The lack of a northern and western boundary arose in part because of territorial disputes between countries within the north western corner of the Pacific particularly areas such as the South China Sea (some countries in the north western region did not want the WCPF Convention to apply to their areas under national jurisdiction). The lack of a northern and western boundary is a pertinent issue that the Commission will have to grapple with at some stage in order for it to be able to determine when violations of WCPFC conservation and management measures are occurring and when they are not. The implementation of the WCPFC conservation and management measures for monitoring, control and surveillance, including the WCPFC Boarding and Inspection Scheme and Commission Vessel Monitoring System (VMS) will also have to deal with this ambiguity as well. Also the

has been adopted by the WCPFC.⁴¹ There was a need to define a WCPFC Statistical Area, because while the southern and eastern boundaries of the WCPFC Convention Area are specified in Article 3 of the WCPF Convention, the northern and western boundaries are not completely defined. The difference between the WCPFC Convention Area and the WCPFC Statistical Area is that the WCPFC Statistical Area has a defined boundary for the division of the Indian Ocean and the western and central Pacific Ocean (yellow line in Figure 7-1).⁴² The area of overlap between the eastern Pacific Ocean, the area of the Inter-American Tropical Tuna Commission and the WCPFC Statistical Area can also be seen in Figure 7-1.

Decision-making in the WCPFC as a general rule is by consensus, which refers to no formal objection being made at the time the decision was taken.⁴³ However, if all efforts to reach consensus have been exhausted, a voting procedure may be used that is elaborated in the WCPF Convention.⁴⁴ There are a few specific circumstances where

lack of a western boundary has left some uncertainty as to whether Vietnam and Thailand, both of which have significant tuna fisheries, are located within the WCPFC Convention Area.

⁴¹ WCPFC, *Decision on Scientific Data to be Provided to the Commission* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 8: “The WCPFC Statistical Area is defined as follows: from the south coast of Australia due south along the 141° meridian of east longitude to its intersection with the 55° parallel of south latitude; thence due east along the 55° parallel of south latitude to its intersection with the 150° meridian of east longitude; thence due south along the 150° meridian of east longitude to its intersection with the 60° parallel of south latitude; thence due east along the 60° parallel of south latitude to its intersection with the 130° meridian of west longitude; thence due north along the 130° meridian of west longitude to its intersection with the 4° parallel of south latitude; thence due west along the 4° parallel of south latitude to its intersection with the 150° meridian of west longitude; thence due north along the 150° meridian of west longitude; and from the north coast of Australia due north along the 129° meridian of east longitude to its intersection with the 8° parallel of south latitude, thence due west along the 8° parallel of south latitude to the Indonesian peninsula; and from the Indonesian peninsula due east along the 2°30’ parallel of north latitude to the Malaysian peninsula.”

⁴² During the formulation of the recommendation on a definition for the WCPFC Statistical Area remained contentious. Many of the asian countries with areas under national jurisdiction in the region of the northern and western limits of the WCPFC Convention Area, were particularly concerned to ensure that the definition of the WCPFC Statistical Area did not preclude any definition of the WCPFC Convention Area, and such additional boundaries were solely for statistical purposes. (Authors personal observation during Statistical Specialist Working Group – SC1, August 2005).

⁴³ WCPF Convention, Article 20(1).

⁴⁴ Ibid., Article 20(2). Except where the Convention expressly provides that a decision shall be made by consensus, if all efforts to reach consensus have been exhausted, the Chairman shall fix a time during that session of the Commission for taking the decision by vote. There are two types of decisions for the purposes of a vote. First, questions of procedure shall be taken by a majority of those present and voting. Second, questions of substance shall be taken by a ¾ majority of those present and voting provided that such a majority includes a ¾ majority of FFA members and a ¾ majority of non-FFA members present and voting.

decisions must be made by consensus.⁴⁵ Decision-making in the WCPFC can be complex. The complexity stems from the large number of Commission members, their differing perspectives and the different jurisdictional areas to which the WCPF Convention applies.

The WCPFC has adopted nomenclature to distinguish between three types of decisions that are made by the Commission.⁴⁶ First, are administrative decisions that are taken by the Commission on a regular basis or that are procedural matters. Examples of administrative matters include budget and staffing issues, rules and procedures for operation of the Commission, or decisions for WCPFC members to report information to the Commission. Second, are *Conservation and Management Measures* (or CMM) which are binding decisions that are made by the Commission, in accordance with Article 10 which relate to target stocks, and non-target, associated and dependent species. Conservation and Management Measures are the form of decision that is used for the adoption of Monitoring, Control and Surveillance related measures that are adopted by the Commission. Third, are *Resolutions* that are non-binding statements or recommendations.

Each year at its regular annual session, the Commission receives scientific advice from the subsidiary body charged with providing the Commission with the best scientific information available: the Scientific Committee or SC.⁴⁷ It is data on tuna fisheries which

⁴⁵ There are five specific areas where decision-making shall only be taken by consensus. These are: Adoption, and amendment, of rules of procedure (Ibid., Article 9(8)); Decisions relating to allocation of total allowable catch or the total level of fishing effort (WCPF Convention, Article 10(4)); Adoption of financial regulations (WCPF Convention, Article 17(2)); Adoption of the budget and a scheme for assessment of contributions to the budget (WCPF Convention, Article 18(1 and 2)); and amendments to the Convention (WCPF Convention, Article 40).

⁴⁶ The nomenclature for decision-making in the WCPFC was adopted by the Commission at WCPFC2 (2005). It is attached as WCPFC, *Summary Record of the Second Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 12-16 December* (Pohnpei, Federated States of Micronesia: 2005), Attachment M Nomenclature for Commission Decisions.

⁴⁷ WCPF Convention, Articles 12 and 13. The functions of the Scientific Committee are set out in paragraph 2 of Article 12: "(a) recommend to the Commission a research plan, including specific issues and items to be addressed by the scientific experts or by other organizations or individuals, as appropriate, and identify data needs and coordinate activities that meet those needs; (b) review the assessments, analyses, other work and recommendations prepared for the Commission by the scientific experts prior to consideration of such recommendations by the Commission and provide information, advice and comments thereon, as necessary; (c) encourage and promote cooperation in scientific research, taking into account the provisions of article 246 of the 1982 Convention, in order to improve information on highly migratory fish stocks, non-target species, and species belonging to the same ecosystem or associated with or dependent upon such stocks in the Convention Area; (d) review the results of research and analyses of target stocks or non-target or associated or dependent species in the Convention Area; (e) report to the Commission its findings or conclusions on the status of target stocks or non-target or associated or dependent species in the Convention Area; (f) in consultation with the Technical and Compliance Committee, recommend to the Commission the priorities and objectives of the regional observer programme and assess the results of that programme; (g) make reports and

is available to the WCPFC that underpins the scientific advice. Chapter 1 noted that scientific advice on the status of tuna stocks is inherently uncertain.⁴⁸ The uncertainty arises in part from the quality of data on tuna fisheries, but also because of the complexity of the fisheries that target them.⁴⁹ Accordingly, efforts that improve the quality of fisheries data that is available to the WCPFC will reduce some of the uncertainty in scientific advice to the Commission regarding impacts of tuna fishing.

The most recent scientific advice on the current status of stocks of the principal market tuna species in the western and central Pacific Ocean is as follows.⁵⁰ Two of the four principal market tuna stocks have associated sustainability concerns, namely bigeye tuna and yellowfin tuna, and albacore may have economic concerns. As has been discussed previously in this thesis,⁵¹ bigeye tuna and yellowfin tuna are caught in the western and central Pacific Ocean using a range of gear types: small-sized bigeye tuna and yellowfin tuna are caught as bycatch, in surface fisheries by purse seine and pole-and-line gear generally targeting skipjack; and larger/older bigeye tuna and yellowfin tuna are caught in deeper waters using longline gear.⁵²

recommendations to the Commission as directed, or on its own initiative, on matters concerning the conservation and management of and research on target stocks or non-target or associated or dependent species in the Convention Area; and (h) perform such other functions and tasks as may be requested by or assigned to it by the Commission.”

⁴⁸ See Chapter 1 1.3 *Impacts of fishing for tuna and billfish*.

⁴⁹ See Chapter 1 1.3 *Impacts of fishing for tuna and billfish*.

⁵⁰ This advice was previously presented in Chapter 5 5.2 *The tuna fisheries of the western and central Pacific Ocean* and also See Table 5-3. Summary of the main characteristics of the Principal Market Tuna Species in the WCPO tuna fisheries.

⁵¹ See Chapter 1 1.2 *The fisheries for tuna and billfishes since 1950*, Chapter 5 5.2 *The tuna fisheries of the western and central Pacific Ocean* (Table 5-3. Summary of the main characteristics of the Principal Market Tuna Species in the WCPO tuna fisheries).

⁵² See Chapter 1 1.2 *The fisheries for tuna and billfishes since 1950*, Chapter 5 5.2 *The tuna fisheries of the western and central Pacific Ocean* (Table 5-3. Summary of the main characteristics of the Principal Market Tuna Species in the WCPO tuna fisheries) R. Gillett and A. Langley, *Tuna for Tomorrow? Some of the Science Behind an Important Fishery in the Pacific Islands* (Noumea: Asian Development Bank and Secretariat of the Pacific Community, 2007), A. Langley, P. Williams, and J. Hampton, *The Western and Central Pacific Tuna Fishery: 2005 overview and status of stocks*, *Tuna Fisheries Assessment Report No.7* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2006), WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2007).

At the time of completing this thesis, the Commission has had four regular annual Sessions.⁵³ In response to scientific advice of sustainability concerns for bigeye tuna and yellowfin tuna, and economic concerns for south Pacific albacore, the Commission has taken decisions with respect to the conservation and management of these stocks. These decisions, in the form of binding conservation and management measures are intended to have the effect of capping or limiting catch and/or fishing effort to either 2004 levels or the average of 2001-2004 levels.⁵⁴ Importantly for Pacific Island States, exemptions are provided in the decisions so the limits do not constrain the development of domestic fisheries in Pacific Island States.⁵⁵ The WCPFC has been criticised for not adopting

⁵³ In 2004, WCPFC1 was in Pohnpei, Federated States of Micronesia, 9-10 December. In 2005, WCPFC2 was in Pohnpei, Federated States of Micronesia, 12-16 December. In 2006, WCPFC3 was held in Apia, Samoa, 11-15 December. In 2007, WCPFC4 was held in Tumon, Guam, 3-7 December.

⁵⁴ WCPFC, *Conservation and Management Measure for south Pacific Albacore (CMM 2005-02)* (As adopted at Second Regular Session of the Commission, Pohnpei, Federated States of Micronesia, 12-16 December 2005). states that each Commission Member is limited to the highest number of vessels that actively fished for South Pacific albacore during the period 2001 - 2004, except that Pacific Island States fleets are exempt from this limit in order to develop domestic fisheries.

For bigeye and yellowfin, pursuant to WCPFC, *Conservation and Management Measure for Bigeye and Yellowfin (CMM 2005-01)* (As adopted at Second Regular Session of the Commission, Pohnpei, Federated States of Micronesia, 12-16 December 2005).and WCPFC, *Conservation and Management Measure for Bigeye and Yellowfin (CMM 2006-01)* (As adopted at Third Regular Session of the Commission, Apia Samoa, 11-15 December 2006)., each Commission Members is to ensure that the longline catch of bigeye by their vessels shall not exceed either the average 2001 – 2004 or 2004 levels until end of 2008. Effort in the purse seine fishery is to be limited to average of 2001 – 2004 levels through the Vessels Days Scheme in Parties to the Nauru Agreement waters (PNA – Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Papua New Guinea, Palau, Solomon Islands and Tuvalu). Compatible measures are to be taken on the high seas to limit fishing effort to average of 2001 – 2004 levels or 2004 levels. Other commercial fishing methods (which are defined as fisheries other than longline and tropical (20°N – 20°S) purse seine, and these include: hand-line, pole and line, purse seine fisheries north of 20°N or south of 20°S, ring-net, troll and unclassified fisheries) are to limit total capacity to levels no greater than average of 2001 – 2004 levels or 2004 levels.

⁵⁵ Conservation and Management Measure for south Pacific Albacore CMM 2005-02: paragraph 2. “The provisions of paragraph 1 shall not prejudice the legitimate rights and obligations under international law of small island developing State and Territory CCMs in the Convention Area for whom South Pacific albacore is an important component of the domestic tuna fishery in waters under their national jurisdiction, and who may wish to pursue a responsible level of development of their fisheries for South Pacific albacore.”

Conservation and Management Measure for Bigeye and Yellowfin CMM 2005-01: paragraph 5. “For the purposes of these measures, vessels operated under charter, lease or other similar mechanisms by developing islands States and participating territories, as an integral part of their domestic fleet, shall be considered to be vessels of the host island state or territory. Such charter, lease or other similar mechanism shall be conducted in a manner so as not to invite IUU vessels. The Commission shall develop a Charter Arrangements Scheme, which will include notification provisions, at its third Session in 2006.” Paragraph 6. “Nothing in this decision shall prejudice the legitimate rights and obligations of those small island state Members and participating territories in the Convention Area seeking to develop their own domestic fisheries.”

Conservation and Management Measure for Bigeye and Yellowfin CMM 2006-01 is to be read in accordance with Conservation and Management Measure for Bigeye and Yellowfin CMM 2005-01, therefore paragraph 5 and 6 of CMM 2005-01 apply therein.

conservation and management measures that fully respond to Scientific Committee recommendations for reductions in fishing mortality on bigeye and yellowfin tuna.⁵⁶ For example, at the 2007 Regular Session of the Commission (WCPFC4), consensus could not be reached on the form of a new conservation and management measure for bigeye and yellowfin tuna. Consequently, the adoption of a decision was deferred to WCPFC5 in 2008.⁵⁷

The Commission has also adopted decisions for the conservation and management of some billfish species such as swordfish and striped marlin, and north Pacific albacore.⁵⁸ A range of conservation and management measures and non-binding resolutions have also been adopted by the Commission to mitigate the impacts of fishing on non-target species such as sharks, sea turtles, seabirds and non-target fish species.⁵⁹ Also to respond to scientific advice that there should be no further increase in fishing mortality for Pacific

⁵⁶ For example, see P. Cleary, "Overfishing woe set to be repeated around the Pacific," *The Age*, November 4 2007, Greenpeace International, "Another tuna commission fails to protect the world's favourite fish - Greenpeace calls for retailer responsibility," (2007), Greenpeace International, "Greenpeace calls for Pacific tuna catch to be cut by half," (2007), M. Lack, *With an eye to the future: addressing failures in the global management of bigeye tuna* (Sydney, Australia: Traffic International and WWF Australia, 2007), "Tuna in trouble - major problems for the world's tuna fisheries," in *Joint Tuna RFMO meeting, January 22-26 2007* (Kobe, Japan WWF International, 2007).

⁵⁷ WCPFC, *Summary Record of the Fourth Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 3-7 December 2007* (Tumon, Guam, USA: 2007).

⁵⁸ These conservation and management measures are: WCPFC, *Conservation and Management Measure for swordfish in the south-west Pacific (CMM 2006-03)* (As adopted at Third Regular Session of the Commission, Apia Samoa, 11-15 December 2006).; WCPFC, *Conservation and Management Measure for striped marlin in the southwest Pacific (CMM 2006-04)* (As adopted at Third Regular Session of the Commission, Apia Samoa, 11-15 December 2006).; and WCPFC, *Conservation and Management Measure for north Pacific albacore (CMM 2005-03)* (As adopted at Second Regular Session of the Commission, Pohnpei, Federated States of Micronesia, 12-16 December 2005).

⁵⁹ Conservation and Management Measures and some non-binding Resolutions have also been adopted for non-target species such as:

Sharks (WCPFC, *Conservation and Management Measure for Sharks in the Western and Central Pacific Ocean (CMM 2006-05)* (As adopted at Third Regular Session of the Commission, Apia Samoa, 11-15 December 2006).);

Seabirds in the subtropical and temperate regions (WCPFC, *Conservation and Management Measure to mitigate impacts of fishing for highly migratory fish stocks on seabirds (CMM 2006-02)* (As adopted at Third Regular Session of the Commission, Apia Samoa, 11-15 December 2006).);

Other fish species (WCPFC, *Resolution on non-target fish species (Resolution 2005-03)* (As adopted at Second Regular Session of the Commission, Pohnpei, Federated States of Micronesia, 12-16 December 2005).); and

Sea-turtles (WCPFC, *Resolution to Mitigate the Impact of Fishing For Highly Migratory Fish Species on Sea Turtles (Resolution 2005-04)* (As adopted at Second Regular Session of the Commission, Pohnpei, Federated States of Micronesia, 12-16 December 2005).).

bluefin, in 2008 the Commission may adopt a conservation and management measure for Pacific bluefin tuna.⁶⁰

The next section overviews the WCPF Convention framework for data on tuna fisheries. This framework aims to ensure that the WCPFC receives the fisheries data that are needed to underpin the scientific advice on impacts of tuna fishing to the Commission.

Overview of WCPFC legal framework for data on tuna fisheries

The principal substantive provision of the WCPF Convention for data on tuna fisheries is Article 5(i). It states:

In order to conserve and manage highly migratory fish stocks in the Convention Area in their entirety, the members of the Commission shall, in giving effect to their duty to cooperate in accordance with the [*LOS Convention*], the [*UN FISH Stock Agreement*] and this Convention: ...collect and share, in a timely manner, complete and accurate data concerning fishing activities on, inter alia, vessel position, catch of target and non-target species and fishing effort, as well as information from national and international research programmes;⁶¹

By way of brief overview, the WCPFC legal framework for fisheries data can be thought to comprise two parts. First, the legal requirements specifying the fisheries data which WCPFC members are to provide to the WCPFC.⁶² Second, the legal requirements for WCPFC data practices for compilation, verification and maintaining confidentiality which are required for these fisheries data, once they are collected from WCPFC members.⁶³ The

⁶⁰ The WCPFC Northern Committee will consider, at the fourth regular session of the Northern Committee in 2008, the formulation of a conservation and management measure for Pacific bluefin tuna to respond to scientific advice that there should be no further increase in fishing mortality on that species.

⁶¹ WCPF Convention, Article 5(i).

⁶² The main WCPF Convention provisions are Ibid., Article 23(2): “Each member of the Commission shall (a) provide annually to the Commission statistical, biological and other data and information in accordance with Annex I of the [UN Fish Stocks] Agreement and, in addition, such data and information as the Commission may require; (b) provide to the Commission in the manner and at such intervals as may be required by the Commission, information concerning its fishing activities in the Convention Area, including fishing areas and fishing vessels in order to facilitate the compilation of reliable catch and effort statistics; (c) provide to the Commission at such intervals as may be required information on steps taken to implement the conservation and management measures adopted by the Commission.”

⁶³ The principal WCPF Convention provisions are Ibid., Article 10(1): “Without prejudice to the sovereign rights of coastal States for the purpose of exploring and exploiting, conserving and managing highly migratory fish stocks within areas under national jurisdiction, the functions of the Commission shall be to: (d) adopt standards for collection, verification and for the timely exchange and reporting of data on fisheries for highly migratory fish stocks in the Convention Area in accordance with Annex I of the [UN Fish Stocks] Agreement, which shall form an integral part of this Convention; (e) compile and disseminate accurate and complete statistical data to ensure that the best scientific information is available, while maintaining confidentiality, where appropriate; (f) obtain and evaluate scientific advice, review the status of stocks,

two parts together ensure that the most complete and accurate data on tuna fisheries underpins scientific advice on the impacts of tuna fishing to the Commission. These two parts correspond to the two parts of the analytical framework for this thesis that was presented in the introduction.

A key feature of the WCPF Convention is that the provisions are to “be interpreted and applied in the context of and in a manner consistent with” the LOS Convention and the UN Fish Stocks Agreement.⁶⁴ Additionally the fisheries data provisions of the WCPF Convention refer to the requirements for consistency of data practices with UN Fish Stocks Agreement Annex I *Standard requirements for the collection and sharing of data* (reproduced herein as Appendix 2).⁶⁵ Accordingly, the international legal requirements for fisheries data that were documented previously in Chapters 2 and 3 of the present thesis are applicable to WCPFC members and the WCPFC.⁶⁶ The findings of those Chapters will be briefly reviewed here, and the link highlighted to the framework for the analyses of WCPFC data practices by this thesis.

The analyses in Chapter 2 showed first, that tuna RFMOs require data on the characteristics of tunas as well as the surrounding ecosystem, the catch and effort of the fisheries and the characteristics of the fisheries themselves. Consistent with a sustainable and responsible approach to fisheries management, data should not only over target tuna species but also those species that are not targeted but may be impacted on by the fisheries, or that are dependent or found in association with tuna species. These four groups of fisheries data are required by tuna RFMOs to support scientific analyses of impacts of tuna fishing on target tuna stocks and the marine ecosystem. Second, to ensure that tuna RFMOs receive the best available scientific advice, tuna RFMOs have adopted decisions to require all States involved in tuna fisheries to provide to the tuna RFMO, in a timely manner, complete and accurate data on tuna fisheries. These findings are relevant to the analyses that follow in the present Chapter.

promote the conduct of relevant scientific research and disseminate the results thereof; (g) obtain and evaluate economic and other fisheries-related data and information relevant to the work of the Commission.”

⁶⁴ Ibid., Article 4.

⁶⁵ Ibid., Article 10(1d), Article 23(2a), Annex III Article 5.

⁶⁶ The findings from Chapter 2 correspond to the data collection aspects of the WCPFC fisheries data legal framework, and the findings from Chapter 3 correspond to the compilation, verification, exchange and dissemination practices of the WCPFC fisheries data legal framework.

The analyses in Chapter 3 focussed on international legal requirements and practices in tuna RFMOs post-collection of data on tuna fisheries. The Chapter 3 analyses showed first, to ensure efficient access to data held by the tuna RFMO for scientific analyses of impacts of fishing, that arrangements for compilation of data are required in the tuna RFMO. Second, to ensure that data on tuna fisheries available to a tuna RFMO are complete and accurate, that arrangements for verification of data are required in the tuna RFMO. Third, so as to ensure that the confidentiality of data on tuna fisheries is maintained, rules and procedures for dissemination and exchange of data on tuna fisheries are required in the tuna RFMO. These findings are relevant to the analyses that are in Chapter 8.

Area of Application of WCPFC data standards

As was noted previously, the WCPFC has adopted a definition for a WCPFC Statistical Area (see Figure 7-1). WCPF Convention Article 10(1d) specifies that the Commission is to adopt standards for *inter alia* collection of data on tuna fisheries, and that these WCPFC data standards are to cover the entire Convention Area.⁶⁷ Also the data standards are to be adopted “without prejudice to the sovereign rights of coastal States for the purpose of exploring, exploiting, conserving and managing highly migratory fish stocks within areas under national jurisdiction”.⁶⁸ Hence, one way to implement such standards might be that the Commissions data standards will be adopted by the Commission for the parts of the Convention Area that are beyond areas under national jurisdiction, and coastal States would then apply compatible measures within areas under national jurisdiction.⁶⁹ However, in practice given that coastal States, as members of the Commission are obliged, as discussed above, to provide data and information to the Commission “in the manner and at such intervals as may be required by the Commission” the data standards are probably best applied across the whole Convention Area.⁷⁰ Nevertheless, consistent with Article 8 of the

⁶⁷ L. Manarangi-Trott, "Legal Aspects Governing Fisheries Data (SCTB17 Working Paper SWG-8)," in *17th Meeting of the Standing Committee on Tuna and Billfish (SCTB17) 8-18 August* (Majuro, Marshall Islands: 2004). Although it is clear that the data standards adopted by the Commission pursuant to Article 10(1d) will apply to the Convention Area, the lack of a specific northern and western boundary for the area of application of the Convention (as set out in WCPF Convention, Article 3) means that some ambiguity remains for the use of the WCPFC Convention area for statistical purposes.

⁶⁸ WCPF Convention, Article 10(1d).

⁶⁹ Ibid., Article 8.

⁷⁰ Ibid., Article 23(2b).

WCPF Convention, the without prejudice overarching statement, does imply that the formulation of these data collection standards must take into account “conservation and management measures adopted and applied with Article 61” of the LOS Convention.⁷¹ For example, such considerations in the development of WCPFC data standards might include the existing arrangements for data on tuna fisheries that Pacific Island States have applied to their exclusive economic zones (EEZs) which were examined in Chapter 6.

Article 8 also enables the previously agreed measures that have been established and applied to the high seas in accordance with the LOS Convention and UN Fish Stocks Agreement, to be taken into account in the formulation of data collection and verification standards by the Commission.⁷² So, essentially the data standards for the WCPFC shall cover the entire Convention Area and should take into account any previously applied data standards for waters under the national jurisdiction of coastal States and high seas of western and central Pacific Ocean. However, as will be shown later in the present Chapter the coverage by fisheries data for the entire WCPFC Convention Area has not been easy to implement in practice.

So to conclude, analyses of the WCPFC practices in the present thesis, will involve comparison with the relevant obligations of the WCPF Convention, as well as approaches and experiences of other tuna RFMOs.⁷³ Noting the need to take into account previously applied practices and standards, the analyses of WCPFC data practices will compare to pre-existing standards and practices for data on tuna fisheries in the western and central Pacific Ocean.⁷⁴ Following the two part structure to the WCPFC fisheries data legal framework,⁷⁵ the present Chapter will analyse the WCPFC data practices to collect data on tuna fisheries. Subsequently, Chapter 8 will analyse the WCPFC data practices to establish arrangements for data on tuna fisheries that occur post-collection, these are arrangements for compilation, verification and to maintain confidentiality of fisheries data.

⁷¹ Ibid., Article 8(2a).

⁷² Ibid., Article 8(2b).

⁷³ These were examined in Chapters 2 and 3.

⁷⁴ These were examined in Chapter 6.

⁷⁵ This two part structure to the analyses is consistent with the Analytical framework that was discussed in the Introduction to the present thesis (See Figure A. A schematic diagram illustrating the role of data in tuna RFMOs, based on Annex I of the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement, Annex I).

7.2 Overview of WCPFC decisions for collection of data on tuna fisheries

The need for members of the Commission to provide, in a timely manner, complete and accurate data on tuna fisheries to the Commission is recognised in the WCPF Convention, specifically Article 5(i).⁷⁶ Complementary to this general obligation, WCPFC members are obliged under WCPF Convention Article 23(2) to provide certain fisheries data and information to the Commission. Article 23(2) is comprised of three parts; each part describes a different set of data or information that WCPFC members are to provide to the Commission. The provisions of Article 23(2) are that members shall:

- (a) provide annually to the Commission statistical, biological and other data and information in accordance with Annex I of the [UN Fish Stocks] Agreement and, in addition, such data and information as the Commission may require;
- (b) provide to the Commission in the manner and at such intervals as may be required by the Commission, information concerning its fishing activities in the Convention Area, including fishing areas and fishing vessels in order to facilitate the compilation of reliable catch and effort statistics;
- (c) provide to the Commission at such intervals as may be required information on steps taken to implement the conservation and management measures adopted by the Commission.⁷⁷

It should be noted that WCPF Convention Article 23(2a) refers to the need for consistency in data practices with the standards of UN Fish Stocks Agreement Annex I.⁷⁸ It was shown in Chapter 2 that tuna RFMOs require four groups of data to support scientific analyses of impacts of tuna fishing. These are set out in UN Fish Stocks Agreement Annex I, and they are catch and effort data; biological data; vessel and gear data and data relating to non-target, dependent and associated species (see Appendix 2). Shortly the analysis will

⁷⁶ WCPF Convention, Article 5(i): “In order to conserve and manage highly migratory fish stocks in the Convention Area in their entirety, the members of the Commission shall, in giving effect to their duty to cooperate in accordance with the [LOS Convention], the [UN FISH Stock Agreement] and this Convention: ...collect and share, in a timely manner, complete and accurate data concerning fishing activities on, inter alia, vessel position, catch of target and non-target species and fishing effort, as well as information from national and international research programmes;”

⁷⁷ Ibid., Article 23(2).

⁷⁸ Additionally the fisheries data provisions of the WCPF Convention (Article 10(1d), Article 23(2a) and Annex III Article 5) refer to the requirements for consistency of data practices with UN Fish Stocks Agreement Annex I *Standard requirements for the collection and sharing of data* (reproduced herein as Appendix 2).

examine the WCPFC response to each of these groups of data in turn. But first, the forms of decisions that the WCPFC has adopted will be overviewed.

The WCPFC response to the requirements of WCPF Convention Article 23(2) has been in three ways. These three ways will be briefly overviewed here before being analysed in subsequent sections of this Chapter. First, specifically to meet the requirements of the provisions of Article 23(2) paragraph a), and also noting that the Commission is required pursuant to Article 10(1d) to adopt standards for *inter alia* collection of data on tuna fisheries, the WCPFC has taken a decision that sets out the types and format for the annual provision of data on tuna fisheries by WCPFC members to the Commission.⁷⁹ The decision is titled *Scientific Data to be provided to the Commission* by WCPFC members, and the text of this decision is reproduced herein as Appendix 6.⁸⁰ There are five types of scientific data that WCPFC members are to provide to the Commission in accordance with

⁷⁹ WCPF Convention, Article 10(1d): “Without prejudice to the sovereign rights of coastal States for the purpose of exploring and exploiting, conserving and managing highly migratory fish stocks within areas under national jurisdiction, the functions of the Commission shall be to: adopt standards for collection, verification and for the timely exchange and reporting of data on fisheries for highly migratory fish stocks in the Convention Area in accordance with Annex I of the [UN Fish Stocks] Agreement, which shall form an integral part of this Convention;”

⁸⁰ WCPFC, *Decision on Scientific Data to be Provided to the Commission* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007). This decision originated as two proposals to the Scientific Committee, from the Statistics Specialist Working Group, a subsidiary body of the Scientific Committee. These two proposals were adopted by the Scientific Committee as recommendations to the Commission for consideration at the WCPFC2. (WCPFC, *Report of the First Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 8-19 August 2005*, WCPFC/Comm.2/22 (Noumea, New Caledonia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2005), p 39 paras 6.1-6.3.) At WCPFC2, the Commission adopted the Report of SC1 and its recommendations, subject to budgetary considerations (WCPFC, *Summary Record of the Second Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 12-16 December 2005*, ? (Pohnpei, Federated States of Micronesia: 2005), para 26.) The *Scientific Data to be provided to the Commission* decision had a minor amendment adopted at WCPFC4. The amendment encourages those flag States that fish east of the eastern boundary of the WCPFC Convention Area to also provide catch and effort data for those fishing activities to the Commission (WCPFC, *Summary Record of the Fourth Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 3-7 December 2007* (Tumon, Guam, USA: 2007).).

Note the use of the phrase “scientific data” in the title of the decision was intentional, based on the historical progresses made in seeking agreement among WCPFC members on the provision of operational level catch and effort data. Some participants were still uncomfortable for logsheet data being used for purposes other than “scientific analyses” to estimate stock status and impact of fishing. The “Ad Hoc task group to identify types of data that must be treated as confidential and to develop draft rules and procedures to govern the security and confidentiality of data collected and held by the Commission” is intended to allay some of the concerns of WCPFC members particularly with regard to the provision of operational level catch and effort data to the Commission.

the decision *Scientific Data to be provided to the Commission*: annual catch estimates, the number of vessels active, operational-level catch and effort data, catch and effort data aggregated by time period and geographic area, and size composition data.⁸¹ The data specified must be provided by members before April 30 of each year, covering data for the previous calendar year, unless otherwise specified.⁸² As was noted in Chapter 2, it is common for tuna RFMOs to adopt formal decisions which specify the types and format of data on tuna fisheries that States are to annually submit to the Commission, the deadlines for these data range from the end of April to end of July.⁸³ In other tuna RFMOs, these decisions have been revised from time to time, and the decisions often contain minimum statistical requirements as well as voluntary statistical requirements.

Second, specifically to meet the requirements of the provisions of Article 23(2) paragraphs b) and c), the WCPFC has adopted an *Annual Report to the Commission* template, for members to report these information to the Commission on an annual basis.⁸⁴ The Annual Report to the Commission is reproduced herein as Appendix 7. The template

⁸¹ See Appendix 6.

⁸² Except for fisheries data from the troll fishing method. Trolling, has a fishing season in the Pacific Ocean south of the Equator from July to June. Fisheries data is to be provided by members to the Commission on April 30 of each year covering the most recently complete fishing season (eg data covering the season from July of year 'x' to June of 'x+1' should be provided to the Commission by April 30 of year 'x+2').

⁸³ Chapter 2 (2.2 *Analysis of international legal framework for data on tuna fisheries* and 2.3 *Catch and effort data to be provided to tuna RFMOs*) noted that the Inter-American Tropical Tuna Commission (IATTC), International Commission for the Conservation of Atlantic Tuna (ICCAT) and Indian Ocean Tuna Commission (IOTC) have each adopted decisions to specify data provision by their members (IATTC, *Resolution on Data Provision (Resolution C-03-05)*, ICCAT, *Recommendation by ICCAT on Compliance with Statistical Declaration Obligations (Recommendation 05-09)*, IOTC, *Resolution on Mandatory Statistical Requirements for IOTC Members (Resolution 01/05)*). CCSBT is the exception which specifies data provision based on requirements and identified gaps on a biennial or annual basis.

⁸⁴ The Annual Report to the Commission template arose as a recommendation from the Technical and Compliance Committee (TCC) at its inaugural meeting to the Commission (WCPFC, *Report of the First Meeting of the Technical and Compliance Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 5-9 December 2005* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 2005), para 13 and Attachment D. WCPFC, *Summary Record of the Second Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 12-16 December 2005*, ? (Pohnpei, Federated States of Micronesia: 2005), para 54.) This recommendation was subsequently adopted by the Commission at its second regular session: "The Commission adopted the recommendations that had been agreed by consensus by the TCC." This would include the recommendation of the Technical and Compliance Committee "that Part I become the template for the National Fishery Reports for the SC and that Part II become the template for Management and Compliance Reports to the TCC." (WCPFC, *Report of the First Meeting of the Technical and Compliance Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 5-9 December 2005* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 2005), para 13.)

for the Annual Report to the Commission is comprised of two parts;⁸⁵ Part I *Information on Fisheries Research and Statistics* provides information that is relevant to the work of the Scientific Committee; Part II *Management and Compliance* covers information that is relevant to the work of the Technical and Compliance Committee.⁸⁶ A standardised template for Annual Reports enables the information provided by all WCPFC members to be more easily compared and collated, because the headings within the Reports are the same. Additionally a standardised template simplifies the completion by members of their Annual Reports to the Commission, because the template clearly establishes the range of information fields that members are required to complete.

Third, the WCPFC has specified *ad hoc* reporting requirements for WCPFC members in the adopted text of conservation and management measures and voluntary resolution decisions. These reporting requirements may specify data that are to be provided by members to the Commission, which are in addition to the requirements of the principal WCPFC decision on data (*Scientific Data to be provided to the Commission*). Also, often these additional data are to be provided to the Commission with a different deadline.⁸⁷ Alternatively, they may be supplementary inclusions in each WCPFC member's Annual Report to the Commission.

Noting the three responses of the WCPFC to require WCPFC members to provide certain data and information to the Commission, the next section will commence the analysis of how these three responses meet WCPF Convention obligations. Ultimately the WCPFC is seeking to collect fisheries data that are required to underpin scientific analyses

⁸⁵ WCPFC, *Decision on Template for Annual Report to the Commission - Part 1 Information on Fisheries, Research and Statistics* (As refined and adopted at Second Regular Session of the Commission, Pohnpei, Federated States of Micronesia, 12-16 December 2005), WCPFC, *Decision on Template for Annual Report to the Commission - Part 2 Management and Compliance* (As refined and adopted at Third Regular Session of the Commission, Apia, Samoa, 11-15 December 2006).

⁸⁶ The Functions of the Scientific Committee can be found at WCPF Convention, Article 12, while the Functions of the Technical and Compliance Committee can be found at WCPF Convention, Article 14.

⁸⁷ The range of deadlines for reporting requirements to the Commission has been cause for concern, because of the potential for confusion and unnecessary complication to WCPFC members reporting. For example, the Technical and Compliance Committee noted that the reporting requirements for WCPFC members should be streamlined as much as possible so that current reporting is not duplicated or missed. WCPFC, *Summary Report of the Second Regular Session of the Technical and Compliance Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 28 September -3 October 2005, Brisbane Australia, WCPFC3-2006/13* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean,, 2006), para 20.

of impacts of tuna fishing. The next section analyses WCPFC decisions for WCPFC members to provide catch and effort data.

7.3 Catch and effort data to be provided to WCPFC

Chapter 1 and 2 clearly established that catch and effort data are the baseline data to be collected for any fishery. Catch represents the removals from the fishery due to fishing. Catch and effort data together can be used to estimate rate of removal from a fish stock due to fishing. Recalling that WCPFC members are obliged in accordance with WCPF Convention Article 23(2a) to “provide annually to the Commission statistical, biological and other data and information in accordance with Annex I of the [UN Fish Stocks] Agreement and, in addition, such data and information as the Commission may require.” Also that the standards for data on tuna fisheries in the WCPFC shall be adopted by the Commission in accordance with Annex I of the UN Fish Stocks Agreement.⁸⁸ UN Fish Stocks Agreement Annex I Article 3(1) sets out five types of catch and effort data that all WCPFC members are obliged to collect and make available to WCPFC. The five types of catch and effort data are:

(a) time series of catch and effort statistics by fishery and fleet; (b) total catch in number, nominal weight, or both, by species (both target and non-target) as is appropriate to each fishery; (c) discard statistics, including estimates where necessary, reported as number or nominal weight by species, as is appropriate to each fishery; (d) effort statistics appropriate to each fishing method; and (e) fishing location, date and time fished and other statistics on fishing operations as appropriate.⁸⁹

The WCPFC decisions to require Commission members to provide these five types of catch and effort data should ensure that the data received by the WCPFC is “in sufficient detail to facilitate effective stock assessment in accordance with agreed procedures.”⁹⁰

The possible sources for and utility of each of these five types of catch and effort data were analysed in some detail in Chapter 2.⁹¹ Logbooks are a key source for all

⁸⁸ UN Fish Stocks Agreement, Article 10(1d).

⁸⁹ Ibid., Annex I Article 3 (1) “States shall collect and make available to the relevant subregional or regional fisheries management organization or arrangement the [listed] types of data in sufficient detail to facilitate effective stock assessment in accordance with agreed procedures” Also the list is repeated in IPOA-IUU, para 47(2).

⁹⁰ Ibid.,

relevant catch and effort data that are required for stock assessments, because the catch and effort data are recorded on a per-trip or per-set basis. Flag States are obliged to ensure that fishing vessels flying their flag provide the flag State with logbooks in a timely manner, so that the flag State can meet their regional and international obligations.⁹² Furthermore, pursuant to WCPF Convention Article 24(2b) the provision of catch and effort logsheets to the flag State is a general obligation of all vessels operating in the WCPFC Convention Area.⁹³ Coastal States in the exercise of their sovereign rights in the EEZ, can require as a term and condition of a fishing licence, that all fishing vessels provide the coastal State with copies of logbooks covering fishing activities in the EEZ.⁹⁴

Chapter 2 also noted that catch and effort data can be sourced from alternative sources. These additional sources include: tagging studies as a semi-independent source of fishery data, providing independent assessment of movement, mortality, growth and stock structure;⁹⁵ observer programme reports for better monitoring of discards and fishery interactions with non-target species;⁹⁶ sales slips and port sampling data to assist in estimating total annual catches and raising catch and effort data;⁹⁷ and port inspections and

⁹¹ See Chapter 2 2.3 *Catch and effort data to be provided to tuna RFMOs*.

⁹² UN Fish Stocks Agreement, Article 14(1) and Annex I Article 5, FAO Compliance Agreement, Article III(7), Code of Conduct, 6.11.

⁹³ WCPF Convention, Article 24(3) "It shall be a condition of every authorisation issued by a member of the Commission that the fishing vessel in respect of which the authorisation is issued: (b) is operated on the high seas in accordance with the requirements of Annex III, the requirements of which shall also be established as general obligations of all vessels operating pursuant to this Convention." Furthermore, WCPF Convention, Annex III Article 5 states: "The operator shall record and report vessel position, catch of target and non-target species, fishing effort and other relevant fisheries data in accordance with the standards for collection of such data set out in Annex I of the [UN Fish Stocks] Agreement."

⁹⁴ LOS Convention, Article 62(4(a, c and e)).

⁹⁵ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), 19-21.

⁹⁶ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics*. La Jolla, California, USA, 13-16 December 1993, FAO Fisheries Report 500 (Rome: FAO, 1994), p8, T. Lawson, "Observer Coverage Rates and Reliability of CPUE Estimates for Offshore Longliners in Tropical Waters of the Western and Central Pacific Ocean (SCTB17 WP SWG-4)," in *17th Standing Committee on Tuna and Billfish, Marshall Islands* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2004), B. Molony, "Estimates of the mortality of non-target species with an initial focus on seabirds, turtles and sharks (WCPFC-SC1 Working Paper EB WP-1)," in *1st Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2005).

⁹⁷ FAO, *Guidelines for the routine collection of capture fishery data*. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382 (Rome: FAO, 1999), p16.

vessel monitoring systems (VMS) for information on fishing operations.⁹⁸ The progress of the WCPFC in developing many of these programmes will be discussed elsewhere in the present thesis.⁹⁹

Analysis of WCPFC decisions to require Commission members to provide catch and effort data

The WCPFC decision titled *Scientific data to be provided to the Commission*, and the requirement for WCPFC members to submit Part I of the Annual Report to the Commission both seek to meet the WCPFC needs for catch and effort data.¹⁰⁰ The two decisions are reproduced herein as Appendix 6 and 7, respectively. Both decisions require that WCPFC members submit data and information annually, however the deadlines for each differ: Part I of the Annual Report to the Commission is due 30 June covering the previous year, and the *Scientific data to be provided to the Commission* is due by 30 April covering the previous calendar year. These deadlines are consistent to those currently being implemented in other tuna RFMOs.¹⁰¹ So the WCPFC decisions ensure that catch and effort data are received by the WCPFC “in a timely manner”.¹⁰²

These two WCPFC decisions will now be analysed. Each of the five types of catch and effort data that are required by the WCPFC, as set out in UN Fish Stocks Agreement Annex I Article 3(1), will be considered in turn. A summary of the relevant WCPFC

⁹⁸ Ibid., p18.

⁹⁹ See Chapter 2 2.3 *Catch and effort data to be provided to tuna RFMOs*, also Chapter 8 8.2 *Verifying data on tuna fisheries* will discuss the progress made by the WCPFC in implementing the WCPFC Regional Observer and Commission VMS programmes and developing a WCPFC port monitoring scheme. Also as was noted in Chapter 6, the WCPFC is a partner in a comprehensive regional tuna tagging programme for the western and central Pacific Ocean that is being led by SPC-OFP.

¹⁰⁰ WCPFC, *Decision on Template for Annual Report to the Commission - Part 1 Information on Fisheries, Research and Statistics* (As refined and adopted at Second Regular Session of the Commission, Pohnpei, Federated States of Micronesia, 12-16 December 2005), WCPFC, *Decision on Scientific Data to be Provided to the Commission* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007).

¹⁰¹ Sources: CCSBT, *Report of the Twelfth Meeting of the Scientific Committee, 10-14 September 2007* (Hobart, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2007), Attachment 11, general deadline of 30 April, but alternative deadlines may be set for specific data sets, IATTC, *Resolution on Data Provision (Resolution C-03-05)*, deadline of 30 June, ICCAT, *Recommendation by ICCAT on Compliance with Statistical Declaration Obligations (Recommendation 05-09)*, deadline of 31 July, IOTC, *Resolution on Mandatory Statistical Requirements for IOTC Members (Resolution 01/05)*, deadline for fisheries data for surface fisheries is 30 June and high seas longline data is 30 June (provisional) and 30 December (Final)

¹⁰² UN Fish Stocks Agreement, Article 5(j), Article 14(1b), Annex I Article 1(1), Annex I Article 2(c), WCPFC Convention, Article 5(i).

decision requirements and how they match up with the UN Fish Stocks Agreement Annex I Article 3(1) provisions is included in Appendix 8.

Time series of catch and effort statistics by fishery and fleet

This section analyses how the requirements of UN Fish Stocks Agreement Annex I Article 3(1) paragraphs a) and d) have been implemented in the WCPFC. Paragraph a) *time series of catch and effort statistics by fishery and fleet*, are frequently the most useful data for monitoring the impact of fishing. Catch data and effort data can be used to produce the Catch per Unit of Effort (CPUE), or catch rate.¹⁰³ Examples of commonly expressed CPUE units for tuna fisheries include catch per number of hooks for longline vessels, or catch per set or catch per trip for purse seine vessels. Time series of catch and effort statistics can be submitted to tuna RFMOs as logbook data, as is the case for the *Inter-American Tropical Tuna Commission* (IATTC) purse-seine fishery.¹⁰⁴ However, time series of catch and effort data are commonly submitted to the tuna RFMO as aggregated catch and effort data. For instance, Chapter 2 noted that the common form that aggregated catch and effort data are submitted to tuna RFMOs generally is: for surface fisheries (purse seine and pole-and-line) data are aggregated by 1-degree latitude by 1-degree longitude by month by the flag State; and for longline fisheries data are aggregated by 5-degree latitude by 5-degree longitude by month by the flag State.¹⁰⁵

Paragraph d) *effort statistics appropriate to each fishing method*, is a subset from the time series of catch and effort statistics. For fishing effort statistics to be used in stock assessment will require fishing effort measures to be related very closely to specific gear use. For example, in longline fisheries the number of hooks set, date, times, position of start set, end set, hook size, bait used and number of hooks between floats.¹⁰⁶ In purse seine fisheries the date, times positions of start set, end set type of fish aggregation devices

¹⁰³ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), p19.

¹⁰⁴ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p44, p48, *IATTC_Data*, [website] (IATTC, 05 September 2007 [cited 29 January 2008]); available from <http://www.iattc.org/DataENG.htm>.

¹⁰⁵ See Chapter 2 2.3 *Catch and effort data to be provided to tuna RFMOs*.

¹⁰⁶ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), p19.

(FADs) used, if any.¹⁰⁷ The standard form that aggregated catch and effort data are submitted to tuna RFMOs does not provide this level of detail in fishing effort statistics. Effort data that are used in stock assessment analyses are commonly sourced directly from logbooks.

The WCPFC approach to these two requirements, as set out in UN Fish Stocks Agreement Annex I Article 3(1) paragraphs a) and d), has had a long history of development. There were two divergent points of view. First, that the WCPFC should adopt the approach of most other tuna RFMOs to require as a minimum that WCPFC members submit aggregated catch and effort data. Second, that the WCPFC should recognise the pre-existing arrangements in the western and central Pacific Ocean of Pacific Island States submitting operational-level catch and effort data to SPC-OFP. The outcome of the negotiations is reflected in the WCPFC decision: *Scientific data to be provided to the Commission*.¹⁰⁸ The WCPFC decision provides for some flexibility in the form that WCPFC members can provide time series of catch and effort statistics to the WCPFC, whilst also ensuring that the data has the appropriate level of detail required for scientific analyses. However, before looking at the detail of the WCPFC decision, some of the background to the decision will first be outlined.

The bumpy path to agreement that operational-level catch and effort data should be provided to the WCPFC

It was recognised from at least the time of the negotiation of the WCPF Convention (Multilateral High Level Conference or MHLC process) that it was desirable from a scientific point of view that WCPFC members should provide complete logbook catch and effort data to the WCPFC. For instance, the participants of the *1996 Technical Consultation on the Collection and Exchange of Fisheries Data* considered the data requirements for the various stock assessment methods that were used for stock assessments of tuna species in the western and central Pacific Ocean. The participants recognised that “complete operational level (or logbook) data would provide the best and

¹⁰⁷ Ibid.

¹⁰⁸ WCPFC, *Decision on Scientific Data to be Provided to the Commission* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 3-4, Annex 1 (also see Appendix 6 herein).

most flexible data resource to support stock assessments using these methods.”¹⁰⁹ This statement was probably based on the positive experiences from Pacific Island States submitting operational-level catch and effort data, covering licensed fishing activities in their EEZ, directly to SPC-OFP for use in scientific analyses of impacts of fishing.¹¹⁰ However, some participants had always expressed strong concerns that there were practical constraints, including commercial confidentiality concerns, which should constrain the sharing of operational-level catch and effort data between States, whether through the Commission or through some alternative body or arrangement.¹¹¹ Consequently, the recommendation of the *1996 Technical Consultation on the Collection and Exchange of Fisheries Data* was first, that flag States should collect from their vessels, catch and effort data at a vessel operational-level (logbooks).¹¹² Second, was that the degree of detail and level of resolution for the provision of operational-level catch and effort data to the Commission, was still to be agreed upon.¹¹³

During the Preparatory Conference (PrepCon) process, which occurred following the adoption of the WCPF Convention to make preparations for the establishment of the Commission, support grew for the provision of operational-level catch and effort data by WCPFC members to the Commission. Similarly, it was “recognized that accurate stock assessment depends on accurate data collected at an operational level i.e. longline and purse-seine sets, and pole and line and troll by day fished. Such data are a long-term data

¹⁰⁹ *Report of the Technical Consultation on the Collection and Exchange of Fisheries Data, Tuna Research and Stock Assessment, 15-19 July 1996, Noumea New Caledonia*, (Noumea, New Caledonia: Oceanic Fisheries Programme, South Pacific Commission, 1996), para 15. The stock assessment methods can be categorised as indices of abundance based on catch per unit effort (CPUE), surplus production models, tag-recapture models and length-based age-structured models.

¹¹⁰ These were outlined in Chapter 6: 6.2 *Collection of data on tuna fisheries by Pacific Island States*

¹¹¹ *Report of the Technical Consultation on the Collection and Exchange of Fisheries Data, Tuna Research and Stock Assessment, 15-19 July 1996, Noumea New Caledonia*, (Noumea, New Caledonia: Oceanic Fisheries Programme, South Pacific Commission, 1996), para 21. “The representative of Japan, while acknowledging the desirability from a scientific point of view of providing complete logbook data, noted that there were several difficulties in doing so. These included commercial sensitivity of operational level data, the need for national scientists to have first rights to analyse such data, and the need for such data provision to be covered by international agreement. The logistical difficulties and cost of implementing scientific observer programmes was also noted.”

¹¹² *Ibid.*, para 66: Specification of Agreed Minimum Requirements for Routine Data in Support of Stock Assessment’.

¹¹³ *Ibid.*

requirement of the Commission.”¹¹⁴ However it was “recommended that operational level data be collected by all fleets and be made available to the Commission for stock assessment and other scientific analyses, with appropriate arrangements for data security and confidentiality.”¹¹⁵ Thus, there was a shift in the comfort of PrepCon participants towards having WCPFC members provide operational-level catch and effort data to the Commission, so as to improve stock assessment outputs in the long-term. In fact, there seemed to be wider acceptance among PrepCon participants that adequate arrangements could be made within the WCPFC framework to ensure the confidentiality of “commercially sensitive data”.¹¹⁶ In spite of this, as will be discussed in Chapter 8 (8.3 *Maintaining confidentiality of data on tuna fisheries and sharing data*), the formal provision of operational-level catch and effort data to the WCPFC awaits the finalisation and implementation of adequate arrangements to maintain confidentiality of data held by the WCPFC.

Additionally the PrepCon recognised the pre-existing contribution that Pacific Island States have made to existing availability of data on tuna fisheries held and used by SPC-OFP in stock assessments. For instance, the regional arrangements such as the FFA Harmonised Minimum Terms and Conditions for Foreign Fishing Vessel Fishing Access, that ensured collection of time series of operational-level catch and effort data covering fishing activities occurring in their EEZ.¹¹⁷ In particular it was recognised that the characteristics of western and central Pacific Ocean tuna fisheries were unique, “that the pathways for data communication may be complex, and that coastal states play a critical role in regional data collection.”¹¹⁸ Furthermore, the PrepCon recommended that “flexibility be maintained in establishing data reporting requirements for the Commission and that coastal states and flag states cooperate in ensuring that the Commission receive

¹¹⁴ *Report of the Second Meeting of the Scientific Coordinating Group (SCG2): WCPFC/PrepCon/28*, (Rarotonga, Cook Islands: 2003), para 20.

¹¹⁵ *Ibid.* This recommendation was subsequently adopted as a final recommendations by the PrepCon to the Commission: *Final Report of Working Group II: WCPFC/PrepCon/45, WCPFC/PrepCon/41* (Pohnpei, Federated States of Micronesia: 2004), para 25.

¹¹⁶ Authors personal observations, PrepCon5(2003) – PrepCon7 (2004).

¹¹⁷ For further detail see Chapter 6 6.2 *Collection of data on tuna fisheries by Pacific Island States*.

¹¹⁸ *Report of the Second Meeting of the Scientific Coordinating Group (SCG2): WCPFC/PrepCon/28*, (Rarotonga, Cook Islands: 2003), para 24.

data in a timely fashion.”¹¹⁹ For Pacific Island States, the in-principle agreement that operational-level catch and effort data should be provided by WCPFC members to the Commission, also ensured that their aspirations for allocation of quotas in the WCPFC by EEZs remained a possibility.¹²⁰

Following the inaugural meeting of the Commission in 2004, the Scientific Committee was the forum where the debate on the standards for the provision of data to the Commission was finalised. In 2005, at the first Regular session of Scientific Committee, a recommendation titled *Scientific data to be provided to the Commission (SC1-ST-1)* was adopted as a recommendation to the Commission. This recommendation was adopted by the Commission at the second Regular Session of the WCPFC in 2005.¹²¹ However, the WCPFC Secretariat identified that there was some ambiguity in the way the WCPFC decision *Scientific data to be provided to the Commission* was initially adopted by the Commission.¹²² Consequently, in 2007 the Commission, in making a small amendment for relating to the area of overlap between the IATTC and WCPFC, formally adopted the WCPFC decision *Scientific data to be provided to the Commission*.¹²³

¹¹⁹ Ibid. This recommendation was subsequently adopted as a final recommendations by the PrepCon to the Commission: *Final Report of Working Group II: WCPFC/PrepCon/45, WCPFC/PrepCon/41* (Pohnpei, Federated States of Micronesia: 2004), para 28.

¹²⁰ The rationale being that the provision of aggregated catch and effort fisheries data by members to the WCPFC, even if to 1° x 1° squares, will not provide a resolution that would enable reliable estimates of catches within individual EEZs, nor to differentiate catches on adjacent high seas with those in EEZ areas. Without operational-level catch and effort fisheries data, the WCPFC would be pushed towards allocation by flag. Flag allocations are more likely to be apportioned based on the catch history of a nation, rather than by the catch history within an EEZ area and its future potential. Flag allocations based on catch history would tend to be to the disadvantage of Pacific Island States, most of whose fisheries that have only been developing in the last two decades and which have allowed access to their EEZs by foreign-flagged fishing vessels. Allocations by EEZ area would be to the advantage of Pacific Island States, particularly those with large EEZs within the more productive areas of the WCPFC Convention area.

¹²¹ WCPFC, *Report of the First Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 8-19 August 2005, WCPFC/Comm.2/22* (Noumea, New Caledonia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2005), p39 (6.1 and 6.2) and Annex VIII. The WCPFC adopted the SC1 Report and its recommendations, subject to budgetary recommendations(WCPFC, *Summary Record of the Second Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 12-16 December* (Pohnpei, Federated States of Micronesia: 2005), para 26.)

¹²² The ambiguity arose because the Commission adopted the Inaugural Scientific Committee Report and its recommendations, which included the Recommendation *Scientific data to be provided to the Commission*, subject to budgetary recommendations. The view of the WCPFC Secretariat was that there was not a clear standalone decision on this matter.

¹²³ WCPFC, *Decision on Scientific Data to be Provided to the Commission* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 3-4, Annex 1 (also see 292

Analysis of the form of the WCPFC decision for provision of operational-level catch and effort data

There are multiple-levels in the WCPFC decision *Scientific data to be provided to the Commission* that relate to how WCPFC members should provide time series of catch and effort data to the Commission. A schematic diagram that represents the three levels of the WCPFC decision is illustrated in Figure 7-2 (over page). At the first level, pursuant to paragraph 3 of the decision, all WCPFC members are obliged to provide to the Commission, by April 30 of each year, operational-level catch and effort data for the previous calendar year in respect of the fishing activities of each fishing vessel flying their flag within the WCPFC Statistical Area.¹²⁴ Operational-level catch and effort data is described in the decision as “individual sets by longliners and purse seiners, and individual days fished by pole and line vessels and trollers.”¹²⁵ Such data is required to be provided by members to the Commission in accordance with the standards of Annex I to the WCPFC decision.¹²⁶

However, it was recognised that during the early years following the establishment of the WCPFC that some members of the Commission would not be able to provide complete (or 100%) coverage of catch and effort logsheets to the Commission. This is the second level in the WCPFC decision *Scientific data to be provided to the Commission* in the schematic illustration in Figure 7-2 (over page). For instance, as was discussed in Chapter 6, in 2003 – 2005 SPC-OFP had less than 50% coverage of catches by logsheets of fleets that do not operate in Pacific Island States waters.¹²⁷ For example, all of the Asian States longline fleets had less than 50% coverage of catches by logsheets.¹²⁸ Also it was shown that the domestic fisheries of Indonesia and the Philippines, had less than 10% coverage of tuna fishing activities by operational-level catch and effort data. Consequently, the WCPFC decision *Scientific data to be provided to the Commission*, provides the

Appendix 6 herein). The area of overlap between the EPO and the WCPFC Convention Area is shown in Figure 7-1. Illustration of the WCPFC Convention Area and the WCPFC Statistical Area.

¹²⁴ Ibid., para 3.

¹²⁵ Ibid.

¹²⁶ WCPFC, *Decision on Scientific Data to be Provided to the Commission* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007). Also see Appendix 6.

¹²⁷ See Chapter 6 6.2 *Collection of data on tuna fisheries by Pacific Island States* and Table 6-2. Average percent coverage of total catches within western and central Pacific Ocean tuna fisheries by data held by SPC-OFP (2003-2005).

¹²⁸ *SPC-OFP Data Coverage*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/Coverage/index.asp>.

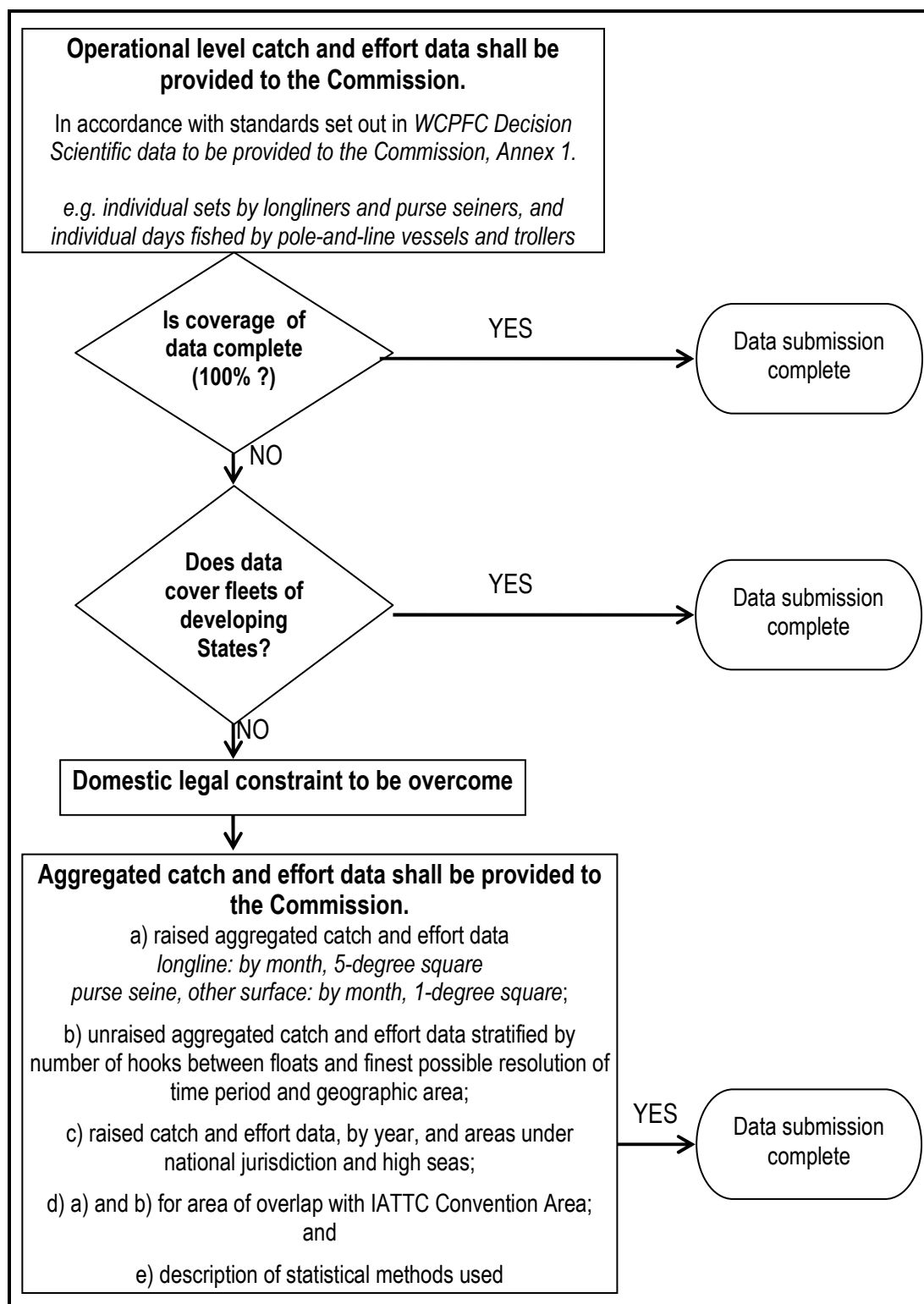


Figure 7-2. Schematic to illustrate the WCPFC decision *Scientific data to be provided to the Commission*. Operational level catch and effort data is to be provided by WCPFC members. However if coverage of this data is incomplete (not 100% coverage), five types of aggregated catch and effort data are also to be provided to the Commission.

alternative option for WCPFC members to report aggregated catch and effort data.¹²⁹ To this end the decision specifies two particular circumstances that are noted in the WCPFC decision as reasons for not providing complete operational-level catch and effort data.

The first exemption related to the domestic legal constraints that currently prevent members from providing operational level catch and effort data to the Commission:

It is recognised that certain members and cooperating non-members of the Commission may be subject to domestic legal constraints, such that they may not be able to provide operational data to the Commission until such constraints are overcome. Until such constraints are overcome, aggregated catch and effort data and size composition data ...shall be provided. Unraised longline catch and effort data stratified by the number of hooks between floats and the finest possible resolution of time period and geographic area shall also be provided.¹³⁰

The United States of America was one such State that indicated at the time they would be so constrained, particularly by the terms of the Multilateral Treaty on Fisheries.¹³¹ The second exemption recognised the special requirements of developing States, in that practically there are challenges for certain fleets of developing States, including in Pacific Island States and Territories, to complete and/or compile operational level catch and effort data by the deadline:

It is recognised that certain members and cooperating non-members of the Commission may have practical difficulties in compiling operational data for fleets comprised of small vessels, such as certain sectors of the fisheries of Indonesia and the Philippines and small island developing States.¹³²

This provision, unlike the first exemption, does not specify that instead aggregated catch and effort data are to be provided. Consequently, in accordance with WCPF Convention Article 30, this provision takes into account the special requirements of developing States, such as Pacific Island States, Indonesia and the Philippines, which have limited national

¹²⁹ WCPFC, *Decision on Scientific Data to be Provided to the Commission* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 4.

¹³⁰ WCPFC, *Decision on Scientific Data to be Provided to the Commission* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 3.

¹³¹ *Ibid.*, para 6. states “It is recognised that the ability of flag States or entities to provide scientific data to the Commission may be constrained by the terms of bilateral or regional arrangements, such as the Treaty on Fisheries Between the Governments of Certain Pacific Island States and the Government of the United States of America.” As was discussed in Chapter 6, the data on fishing activities pursuant to the Multilateral Treaty on Fisheries are provided to FFA as Administrator of the Treaty, who facilitates dissemination to the relevant contracting parties of the Treaty. Pursuant to the Multilateral Treaty on Fisheries, the United States can only access this data if all the contracting Parties to the Treaty agree to release this data to the United States.

¹³² *Ibid.*, para 3.

data-analytical capabilities and/or face significant practical constraints in collecting fisheries data from multiple fishing vessels of varying scales at multiple landing points.¹³³ However, developing States are not exempt from the requirements to provide catch and effort data to the Commission, but instead afforded the option of providing to the Commission the best data that they have available. For instance, a developing State could submit raw logbook data directly to the WCPFC, instead of having to undertake in-house analyses to verify, collate and process the aggregated data themselves.¹³⁴

It is possible that other WCPFC members, who are yet to provide operational-level catch and effort data, may use the first exemption of “domestic legal constraints” to justify their lack of provision of operational-level catch and effort data. However a process of assessing compliance by WCPFC members to meet their data reporting obligations is still being developed in the WCPFC. As a result, at the time of writing, there was no information of formal justifications by the relevant WCPFC members for their inability to provide operational-level catch and effort data.

In instances where a WCPFC member is unable to provide to the Commission complete coverage of operational-level catch and effort data, instead aggregated catch and effort data shall be provided. This is the third and final level shown in the schematic illustration in Figure 7-2. The aggregation level for the catch and effort data is equivalent to the common standard in other tuna RFMOs “Longline catch and effort data shall be aggregated by periods of month and areas of 5° longitude and 5° latitude. Catch and effort data for surface fisheries shall be aggregated by periods of month and areas of 1° longitude and 1° latitude.”¹³⁵ However, in addition to the provision of these aggregated catch and effort data there are a further four types of aggregated catch and effort data that are also to be provided by WCPFC members to the Commission. First, WCPFC members are required to provide unraised aggregated catch and effort data stratified by number of hooks between floats and finest possible resolution of time period and geographic area.¹³⁶ As was

¹³³ For further detail see Chapter 5 *5.4 Challenges for data practices for western and central Pacific Ocean tuna fisheries*.

¹³⁴ This is by reading the paragraph 3 exemption together with the provision paragraph 6 provision that states “Scientific data compiled by coastal States shall also be provided to the Commission.”

¹³⁵ WCPFC, *Decision on Scientific Data to be Provided to the Commission* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 4.

¹³⁶ *Ibid.*

discussed earlier in the present section, this provides the additional detail of fishing effort statistics, which are required for use in stock assessment analyses and which would otherwise not be available from aggregated catch and effort data.

Second, members are required to provide catch and effort data that have been raised to represent the total catch and effort shall also be aggregated by periods of year and areas of national jurisdiction and high seas within the WCPFC Statistical Area. Third, data are to be provided for the overlap part of the Convention Area with the Inter American Tropical Tuna Commission (IATTC) Convention Area (eastern Pacific Ocean) (see Figure 7-1). These are raised aggregated catch and effort data, and unraised catch and effort data stratified by number of hooks between floats or finest possible resolution.¹³⁷ Fourth, similar to what was the case for the methods to calculate annual catch estimates, members are required to report on the statistical methods used to derive aggregated catch and effort data.¹³⁸ For instance, information should be provided by WCPFC members of the coverage rates of operational-level catch and effort data on which the estimates were based, and the method used to raise the data.

The WCPFC decision *Scientific data to be provided to the Commission* makes mention of the relative responsibilities of flag States and coastal States to provide data to the WCPFC.¹³⁹ The WCPFC decision clearly states that it is the Flag State which is responsible for the provision of data on tuna fisheries, covering the activities of their flag vessels to the Commission.¹⁴⁰ Additionally the WCPFC decision states that “scientific data compiled by coastal States shall also be provided to the Commission.”¹⁴¹ This provision recognizes the significant contribution that coastal States, particularly Pacific Island States, have made to the availability of operational-level catch and effort data on western and central Pacific Ocean tuna fisheries to the WCPFC. For instance, as was discussed in Chapter 6, since the early 1990s, many Pacific Island States have required as a minimum terms and condition of access to their EEZs that foreign fishing vessels conducting fishing

¹³⁷ Ibid.

¹³⁸ Ibid.

¹³⁹ Ibid., para 6.

¹⁴⁰ Ibid. Except in the case of joint-venture or charter arrangements with another State such that the vessels operate, for all intents and purposes, as local vessels of the other State, in which case the other State shall be responsible for the provision of data to the Commission.

¹⁴¹ Ibid.

activities in their EEZs provide copies of their logsheets to the Pacific Island State.¹⁴² Also, for 2003 – 2005 the coverage of purse seine catches by logsheets in holdings of SPC-OFP, for Asian States fleets tended to be above 50% percent, because these fleets operate largely within the EEZs of Pacific Island States under access agreement or licence.¹⁴³

In terms of how these provisions of the WCPFC decision *Scientific data to be provided to the Commission* are being implemented in practice, in late 2007 the WCPFC commenced the publishing of summary information on data submissions by WCPFC members on its website (www.wcpfc.int).¹⁴⁴ It should be noted that the analysis of the information on implementation will be brief herein, more detailed tables and analyses are included in Appendix 8. As at November 2007, only four WCPFC members and one participating territory had provided operational-level catch and effort data to the Commission.¹⁴⁵ Some of these WCPFC members data provision was incomplete, because the data only covered a few of the recent years in the time series. This number of WCPFC members is marked lower than the number of WCPFC members that have complete or nearly complete (90 – 100%) logsheet coverage of annual catches held by SPC-OFP, over the same period through pre-existing data arrangements.¹⁴⁶ For instance, in Chapter 6 (6.2 *Collection of data on tuna fisheries by Pacific Island States*) it was shown that regardless of the flag, the majority of the purse seine fishing activities that occur in Pacific Island States EEZs have complete or nearly complete coverage of logsheet data that is held by SPC-

¹⁴² See Chapter 6: 6.2 *Collection of data on tuna fisheries by Pacific Island States*.

¹⁴³ *SPC-OFP Data Coverage*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/Coverage/index.asp>. and see *Table 6-2. Average percent coverage of total catches within western and central Pacific Ocean tuna fisheries by data held by SPC-OFP (2003-2005)*.

¹⁴⁴ This followed the recommendation by the Scientific Committee in 2007, that “the Secretariat deploys on the WCPFC website (within the next 12 months) a prototype computer program that allows data gaps to be easily identified;” (WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2007), para 279.)

¹⁴⁵ *WCPFC-Statistics and Data - Status of the Provision of Data to the Commission*, [website] (WCPFC, 23 November 2007 [cited 9 March 2008]); available from <http://www.spc.int/oceanfish/html/wcpfc/statistics/StatProv.asp>.: Provision of Operational data for 2003-2006. WCPFC website reports having received operational level data from the following fleets only 2003-2006: Australia: longline, pole-and-line, purse seine, troll, longline; French Polynesia: longline; New Zealand: longline, pole-and-line, purse seine, troll; Solomon Islands: longline 2003-2004, pole-and-line and purse seine 2003-2005; Spain: purse seine only for 2005. (See Appendix 8).

¹⁴⁶ See Appendix 8 for further details.

OFF.¹⁴⁷ Similarly, some of the longline fishing activities that occur in Pacific Island States EEZs tend to also have moderate to nearly complete coverage of logsheet data that is held by SPC-OFP.¹⁴⁸ Nevertheless, because of the transitional arrangement for the contracting of SPC-OFP by the WCPFC for scientific services, the lack of formal data provision to the WCPFC has not negatively impacted on the availability of data on tuna fisheries for scientific analyses of impacts of fishing in the western and central Pacific Ocean.¹⁴⁹ This is because the pre-existing arrangements for provision of data to SPC-OFP have been maintained, and SPC-OFP can, for example, undertake western and central Pacific Ocean tuna stock assessments that are required by the WCPFC using the full range of data that are available to SPC-OFP.

There are a few reasons for the difference between the reported coverage levels on the WCPFC website and the reported coverage levels available to SPC-OFP. First, as will be discussed in Chapter 8, there have been some discussions underway to negotiate arrangements for WCPFC member access to WCPFC-held data, and arrangements for maintaining confidentiality.¹⁵⁰ These arrangements were partially concluded in 2007, with the WCPFC decision *Rules and Procedures for the Protection of, Access to, and Dissemination of, Data Compiled by the Commission*.¹⁵¹ There are some gaps in these rules and procedures, and the rules and procedures are still to be implemented. Therefore, noting that the background to the agreement for the provision of operational-level catch and effort data was contingent on appropriate arrangements for maintaining confidentiality to be established in the Commission, it is possible that some WCPFC members have been awaiting the finalisation of the WCPFC Data Rules and Procedures before providing

¹⁴⁷ See Table 6-2 Average percent coverage of total catches within western and central Pacific Ocean tuna fisheries by data held by SPC-OFP (2003-2005) and *SPC-OFP Data Coverage*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/Coverage/index.asp>.

¹⁴⁸ See Table 6-2 Average percent coverage of total catches within western and central Pacific Ocean tuna fisheries by data held by SPC-OFP (2003-2005) and *Ibid*.

¹⁴⁹ The details of the contractual relationship between SPC-OFP and the WCPFC for scientific services and data contracting will be discussed in Chapter 8 8.1 *Compiling data on tuna fisheries*.

¹⁵⁰ These discussions have been undertaken by the subsidiary body of the WCPFC the Ad Hoc Task Group [Data]. For further detail see Chapter 8 8.3 *Arrangements to maintain confidentiality whilst facilitating exchange and sharing of data*.

¹⁵¹ WCPFC, *Decision on Rules and Procedures for the Protection of, Access to, and Dissemination of, Data Compiled by the Commission (WCPFC Data Rules and Procedures)* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007).

operational-level catch and effort data to the WCPFC.¹⁵² Second, although the WCPFC decision *Scientific data to be provided to the Commission* was adopted in 2005, some felt that there was ambiguity around the decision's adoption, so the adoption of this decision to some only occurred in 2007 when it was refined and formally adopted.¹⁵³

Third, some WCPFC members have not provided operational-level data, and have instead provided aggregated catch and effort data. It was noted in Chapter 6 that SPC-OFP has near to none or no coverage of logsheet data covering the fishing activities of many of the distant water longline fleets.¹⁵⁴ In accordance with paragraph 4 of the WCPFC decision *Scientific data to be provided to the Commission*, aggregated catch and effort data have been provided to the WCPFC.¹⁵⁵ Paragraph 4 of the WCPFC decision *Scientific data to be provided to the Commission* states that if the coverage of operational-level catch and effort data is not complete (100%) that four types of aggregated catch and effort data are to be provided to the WCPFC.¹⁵⁶ Many of the Asian WCPFC members have provided raised aggregated catch and effort data to the Commission, particularly for distant-water longline fleets. However, the WCPFC website reports that many of these fleets have not provided the data in accordance with the specifications set out in paragraph 4 to the WCPFC decision *Scientific data to be provided to the Commission*.¹⁵⁷ For instance, unraised catch and effort data stratified by number of hooks between floats and finest resolution of time and geographic area was provided for one fleet only.¹⁵⁸ Additionally, for some fleets it was

¹⁵² Authors personal observations in 2007 at SC3, TCC3 and WCPFC4. Some Pacific Island States expressed this view during discussions at these WCPFC meetings.

¹⁵³ Authors personal observations in 2007 at SC3 and WCPFC4. The WCPFC Secretariat held this view and indicated that it would be easier if the decision was clearly adopted by the Commission rather than being adopted by the Commission embedded in the body of a subsidiary body report.

¹⁵⁴ SPC-OFP, *Scientific Data Available to the Western and Central Pacific Fisheries Commission, WCPFC-SC3-2007/ST-Information Paper 3* (Noumea, New Caledonia: 2007). Noted gaps in operational level catch and effort data available to SPC-OFP as data-contractor to WCPFC are: Japanese fleets outside Pacific Island States EEZs, Korean distant-water longline fleet, Chinese and Chinese Taipei distant-water water longline fleets targeting bigeye and yellowfin. Also See Table 6-2 Average percent coverage of total catches within western and central Pacific Ocean tuna fisheries by data held by SPC-OFP (2003-2005) and *SPC-OFP Data Coverage*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/Coverage/index.asp>.

¹⁵⁵ For further detail see Appendix 8.

¹⁵⁶ WCPFC, *Decision on Scientific Data to be Provided to the Commission* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 4.

¹⁵⁷ For further detail see Appendix 8 (*WCPFC-Statistics and Data - Status of the Provision of Data to the Commission*, [website] (WCPFC, 23 November 2007 [cited 9 March 2008]); available from <http://www.spc.int/oceanfish/html/wcpfc/statistics/StatProv.asp>); Provision of Aggregate data for 2003-2006)

¹⁵⁸ *Ibid.*: Provision of Aggregate data for 2003-2006. This was Japanese longline fleet for 2003-2005.

noted that the purse-seine data was not appropriately stratified by set type or that the resolution for the stratification was incorrect (5-degree instead of 1-degree square).¹⁵⁹ Also the longline catch and effort data for some fleets had omitted the weights of fish, and only provided the numbers of fish when both should be provided.¹⁶⁰

Based on the findings on implementation of paragraphs 3 and 4 of the WCPFC decision *Scientific data to be provided to the Commission*, it is apparent that there is a need for some follow-up on WCPFC member implementation of the WCPFC decision. The commencement in 2007 of providing information on the WCPFC website relating to compliance with the data reporting obligations is a step in the right direction. Additionally, further information could be available because in 2008 a study will be undertaken by the WCPFC Secretariat “to identify the causes of data gaps.”¹⁶¹ It remains for the Scientific Committee and the Technical and Compliance Committee to take steps to check that WCPFC members are providing data on tuna fisheries to the WCPFC in accordance with WCPFC decisions. Additionally, to improve the coverage of operational-level catch and effort data in the future, the Technical and Compliance Committee must ensure that those WCPFC members who are not providing operational-level catch and effort data must be required to provide regular reports on their efforts to overcome the national legal constraints that prevent the provision of operational-level catch and effort data.¹⁶² This is an approach that is becoming common in other tuna RFMOs. For instance, as was discussed in Chapter 2 it was noted that *International Commission on Conservation of Atlantic Tunas* (ICCAT) requires its contracting Parties to provide explanations on reporting deficiencies including the reasons underlying identified gaps, any capacity challenges and plans for corrective action.¹⁶³

¹⁵⁹ Ibid.:Provision of Aggregate data for 2003-2006.

¹⁶⁰ Ibid.:Provision of Aggregate data for 2003-2006.

¹⁶¹ WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2007), para 279.

¹⁶² As was discussed earlier in this section, in accordance with paragraph 3 of the WCPFC decision *Scientific data to be provided to the Commission*, WCPFC members are obliged to provide operational-level catch and effort data to the WCPFC, unless they are a developing State where best efforts are to be made. Alternatively, unless they have domestic legal constraints that must first be overcome.

¹⁶³ ICCAT, *Recommendation by ICCAT on Compliance with Statistical Declaration Obligations* (Recommendation 05-09).

The WCPFC decision *Scientific data to be provided to the Commission* meets the obligations of UN Fish Stocks Agreement Annex I Article 3(1) paragraphs a) and d), including the requirement that data be collected in sufficient detail to facilitate effective stock assessment. The WCPFC decision took into account, and did not undermine, pre-existing standards for provision of catch and effort data in the western and central Pacific Ocean. The special requirements of Pacific Island States, as developing States, have also been given consideration in the formulation of the WCPFC decision. Also considered has been the proven ability of Pacific Island States to effectively contribute to the collection of data on tuna fisheries in the western and central Pacific Ocean. The WCPFC decision seeks to match the higher international standard in other tuna RFMOs by requiring the provision of operational-level catch and effort data. Nevertheless, where exceptions to the requirement to provide complete operational-level catch and effort data are being applied, the WCPFC decision seeks to ensure that catch and effort data of sufficient detail for stock assessment are still provided to the WCPFC. However, at the time of writing, significant gaps remain in implementation of this WCPFC decision and considerable efforts are required by the WCPFC and individual WCPFC members to comply with the WCPFC decision requirements. Consequently the availability of catch and effort data to the WCPFC for scientific analyses of impacts of fishing is largely because of pre-existing arrangements established by Pacific Island States with the support of SPC-OFP and FFA.

Data practices in the WCPFC to collect the other catch and effort data that are listed in UN Fish Stocks Agreement Annex I Article 3(1) will now be analysed.

Total annual catches by species

UN Fish Stocks Agreement Annex I Article 3(1b) states that the WCPFC should receive, from each WCPFC member, *estimates of total annual catch in number, or nominal weight, by species for each fishery*. The WCPFC template for the Annual Report to the Commission sets out general requirements for submission of annual catches by species of target species and non-target species.¹⁶⁴ However, the species to be submitted are not

¹⁶⁴ WCPFC, *Decision on Template for Annual Report to the Commission - Part 1 Information on Fisheries, Research and Statistics* (As refined and adopted at Second Regular Session of the Commission, Pohnpei, Federated States of Micronesia, 12-16 December 2005), 1.1 Annual Fisheries Information - Essential Information.

specified therein, so it is for each WCPFC member to determine the species they report annual catch estimates.¹⁶⁵

More specific requirements for annual catch estimates are set out in the WCPFC decision on *Scientific data to be provided to the Commission*. This decision requires that WCPFC members provide to the Commission annual estimates of catch by weight (in metric tonnes) for each gear type, for each of the species that are listed therein for the WCPFC Statistical Area. These species include the principal market tunas (bigeye tuna, yellowfin tuna, skipjack tuna and albacore tuna), Pacific bluefin tuna and some of the billfishes (striped marlin, blue marlin, black marlin and swordfish). As there is a small area of overlap between the WCPFC Statistical Area and the IATTC Convention Area (eastern Pacific Ocean or EPO), members are also required to provide annual estimates of catches for these species for that part of the WCPFC Statistical Area that is east of 150°W (the overlap area can be seen in Figure 7-1). Additionally for albacore tuna, striped marlin, and swordfish and Pacific bluefin tuna, which have more varied stock distributions across the Pacific Ocean, estimates are required of annual catches of each species by gear type for the southern part of the Pacific Ocean (south of the equator), the northern part of the Pacific Ocean, and for the southern part of the WCPFC Statistical Area, and for the northern part of the WCPFC Statistical Area, as well as for the overlap area with the IATTC Convention Area.¹⁶⁶ Additionally, to assist scientists in better understanding the annual catch estimates, members are also required to report on the statistical methods that are used to estimate the annual catches, including data coverage rates and conversion factors for whole to processed weight.¹⁶⁷

Therefore, on paper the WCPFC decisions adequately meet the requirements of UN Fish Stocks Agreement Annex I Article 3(1b) to ensure that the WCPFC receives from

¹⁶⁵ As will be discussed later in this Chapter under a subsection on data related to non-target, dependent and associated species (7.4 *WCPFC practices to collect other data and information*), WCPFC members are required by *ad hoc* data requirements specified in conservation and management measure decisions to include annual catch estimates and other available data for sharks, seabirds and sea turtles in their Annual Reports to the Commission.

¹⁶⁶ WCPFC, *Decision on Scientific Data to be Provided to the Commission* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 1.

¹⁶⁷ *Ibid.*

WCPFC members estimates of total catches (by number or weight) by species.¹⁶⁸ However, in practice compliance by WCPFC members with this requirement has not been perfect.¹⁶⁹ For instance, in 2007 only four members had reported 2006 annual catch estimates by the 30 June deadline for Annual Reports to the Commission, and only one member had reported by the 30 April deadline for *Scientific data to be provided to the Commission*.¹⁷⁰ In spite of the delays in meeting the deadlines WCPFC members, including Pacific Island States, are meeting the requirement to provide annual catch estimates to the Commission.¹⁷¹

Initially, Pacific Island States required direct assistance from SPC-OFP with the estimation of annual catch estimates. However, in 2007 it was reported that all Pacific Island States produced 2006 estimates of annual catches by species without need for direct assistance from SPC-OFP.¹⁷² As was noted in Chapter 6 (6.3 *Analysis of arrangements post-collection of data on tuna fisheries in Pacific Island States*), Pacific Island States have been receiving assistance in the form of implementation of the national “Tuna Fishery Data Management System” (TUFMAN) database software, developed by SPC-OFP to assist Pacific Island States in compiling and verifying data on tuna fisheries at a national level.¹⁷³ Pacific Island States have also received training and workshop assistance to assist them in being able to meet their reporting requirements to the WCPFC.¹⁷⁴

¹⁶⁸ See Appendix 8 for a table that summarises the WCPFC decision provisions match the international legal requirements of UN Fish Stocks Agreement Annex I Article 3(1).

¹⁶⁹ *WCPFC-Statistics and Data - Status of the Provision of Data to the Commission*, [website] (WCPFC, 23 November 2007 [cited 9 March 2008]); available from <http://www.spc.int/oceanfish/html/wcpfc/statistics/StatProv.asp:Provision of Annual Catch Estimates 2003-2006>.

¹⁷⁰ *Ibid.*:Provision of Annual Catch Estimates 2003-2006.

¹⁷¹ See Appendix 8 for a summary table of provision of annual catch estimates by WCPFC members.

¹⁷² See Appendix 8 for a summary table of provision of annual catch estimates by WCPFC members. Also *WCPFC-Statistics and Data - Status of the Provision of Data to the Commission*, [website] (WCPFC, 23 November 2007 [cited 9 March 2008]); available from <http://www.spc.int/oceanfish/html/wcpfc/statistics/StatProv.asp:Provision of Annual Catch Estimates 2003-2006> For 2003 annual catch estimates, seven of fourteen Pacific Island States received direct assistance from SPC-OFP. For 2004 and 2005 estimates, six Pacific Island States received assistance from SPC-OFP. However for 2006 annual catch estimates, no Pacific Island States received direct assistance from SPC-OFP.

¹⁷³ SPC-OFP, *Ocean Fisheries Programme - Annual Report 2007 and Work Plan 2008* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2008), p6. At the time of writing, ten Pacific Island States have TUFMAN are: Cook Islands, Federated States of Micronesia, Fiji, Marshall Islands, Nauru, Palau, Solomon Islands, Tonga, Tuvalu and Vanuatu. Papua New Guinea has its own customized national database management system. The remaining three Pacific Island States will be receiving TUFMAN in the short-term.

¹⁷⁴ These include the associated training with the TUFMAN software, as well as workshops such as the First Tuna Data Workshop, Noumea 23-27 October 2006.

Discard statistics by species

UN Fish Stocks Agreement Annex I Article 3(1c) requires WCPFC members to provide to the WCPFC *discard statistics, including estimates where necessary, reported as number or nominal weight by species, as is appropriate to each fishery*. This requirement has been implemented through the WCPFC decision on *Scientific data to be provided to the Commission*. This decision states that WCPFC members *should* provide estimates of annual discards. Use of “should” in this instance means that this is not a stringent requirement on WCPFC members, and WCPFC members should make best efforts to provide the Commission with estimates of discards. This general requirement is similar to the approach in other tuna RFMOs.¹⁷⁵ At the time of writing, there was no information on the availability of data on discards to the WCPFC. It is likely that the coverage of data on discards that are available to the WCPFC will improve as the WCPFC Regional Observer Programme is implemented.¹⁷⁶

Fishing location, date and time fished and other statistics on fishing operations as appropriate

UN Fish Stocks Agreement Annex I Article 3(1e) requires that WCPFC member provide to the Commission: *fishing location, date and time fished and other statistics on fishing operations as appropriate*. Monitoring of fishing gear and techniques are important because fishing gear and fishing techniques are continuously improved by fishers.¹⁷⁷ There are two requirements that the WCPFC has adopted that seek to ensure the WCPFC receives this information. First, WCPFC members are obliged to provide to the Commission, in accordance with Part 1 of the Annual Report to the Commission “information on fishing patterns (catch by time/area)” for the previous five calendar years.¹⁷⁸ Commonly, these are presented in graphical form showing the distribution of effort across the WCPFC Convention Area.

¹⁷⁵ See Chapter 2 2.3 *Catch and effort data to be provided to tuna RFMOs*.

¹⁷⁶ The progress on the implementation of the WCPFC Regional Observer Programme is discussed further in Chapter 8: 8.2 *Verifying data on tuna fisheries*.

¹⁷⁷ FAO, *Guidelines for the routine collection of capture fishery data*. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382 (Rome: FAO, 1999), p20.

¹⁷⁸ WCPFC, *Decision on Template for Annual Report to the Commission - Part 1 Information on Fisheries, Research and Statistics* (As refined and adopted at Second Regular Session of the Commission, Pohnpei, Federated States of Micronesia, 12-16 December 2005), 1.1 Annual Fisheries Information - Essential Information. See Appendix 7.

Second, WCPFC members are to provide summary information on their active fleet structure during the previous calendar year. This summary information is required in both the WCPFC decision on *Scientific data to be provided to the Commission*, and the Part 1 of the Annual Report to the Commission. The WCPFC decision on *Scientific data to be provided to the Commission* requires that WCPFC members provide to the Commission information on “The number of vessels active in the WCPFC Statistical Area during each calendar year” by size class.¹⁷⁹ The requirement in Part I to the Annual Report to the Commission is more general, WCPFC members are required to submit details on the number of vessels by gear type and size.¹⁸⁰ At the time of writing, there was no detailed information measuring the availability of data on national fleet structure to the WCPFC.¹⁸¹

This completes the analysis of WCPFC practices to collect catch and effort data. Appendix 8 includes summary tables matching the WCPFC practices to the international legal requirements of UN Fish Stocks Agreement Annex I Article 3(1), as well as summary tables of information on implementation by WCPFC members of these requirements. The next section considers the WCPFC practices to collect data other than catch and effort data, which are needed to support scientific analyses of impacts of tuna fishing.

7.4 Collection of other data and information by WCPFC

This section continues the analysis of implementation of WCPF Convention obligations for collection of data on tuna fisheries. It will comprise four parts. First, data that are required by the WCPFC to support stock assessment, as set out in UN Fish Stocks Agreement

¹⁷⁹ WCPFC, *Decision on Scientific Data to be Provided to the Commission* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 2.

“For longliners, pole-and-line vessels and purse seiners, the number of vessels active shall be provided by gross registered tonnage (GRT) class. The GRT classes are defined as follows: Longline: 0–50, 51–200, 201–500, 500+ ; Pole-and-line: 0–50, 51–150, 150+ ; Purse seine: 0–500, 501–1000, 1001–1500, 1500+.

For trollers targeting albacore in the Pacific Ocean south of the Equator, the number of vessels active in the WCPFC Statistical Area during the fishing season (July to June), shall also be provided and should be provided for the Pacific Ocean south of the Equator.”

¹⁸⁰ WCPFC, *Decision on Template for Annual Report to the Commission - Part 1 Information on Fisheries, Research and Statistics* (As refined and adopted at Second Regular Session of the Commission, Pohnpei, Federated States of Micronesia, 12-16 December 2005), 1.1 Annual Fisheries Information - Essential Information. Number of vessels by gear type, size (fleet structure): for previous calendar year (x-1) and previous 4 years (x-2 to x-5).

¹⁸¹ See Appendix 8 for a table that summarises the WCPFC decision provisions match the international legal requirements of UN Fish Stocks Agreement Annex I Article 3(1).

Annex I Article 3(2). Second, data that are required by the WCPFC on vessel data and information, as set out in UN Fish Stocks Agreement Annex I Article 4. Third, the data that are required by the WCPFC to assess the impacts of fishing on non-target, dependent and associated species, as is required in WCPF Convention Article 5(d) and to implement the precautionary approach as is required in WCPF Convention Articles 5(c) and 6.

Data to support stock assessment

Chapter 2 noted that in addition to information on removals from the fishery (catch and effort data), there are other types of data that are necessary for tuna fish stock assessment analyses. These include information on the basic biology and life history of individual tuna species or stocks, such as *inter alia* age and growth relationships, size composition of catch and discards, stock movement, stock structure and stock abundance, and influence of environmental parameters on abundance of recruits and fish behaviour.¹⁸²

WCPF Convention Article 23(2a) and Article 10(1d) requires WCPFC members to provide data to the Commission in accordance with UN Fish Stocks Agreement Annex I. UN Fish Stocks Agreement Annex I Article 3(2) lists three types of biological data and research information to support stock assessment that should, where appropriate, be included in the scientific data to be provided by WCPFC members to the Commission. In particular UN Fish Stocks Agreement Annex I, Article 3(2) states that:

States shall also collect where appropriate and provide to the relevant subregional or regional fisheries management organization or arrangement information to support stock assessment, including: (a) composition of the catch according to length, weight and sex; (b) other biological information supporting stock assessments, such as information on age, growth, recruitment, distribution and stock identity; and (c) other relevant research, including surveys of abundance, biomass surveys, hydro-acoustic surveys, research on environmental factors affecting stock abundance, and oceanographic and ecological studies.¹⁸³

As was noted in Chapter 2, the wording “where appropriate” of Annex I Article 3(2) implies that States are obliged to collect and contribute this information to the WCPFC if it is relevant to support stock assessment.¹⁸⁴ Note that the data and research requirements as set out in Annex I Article 3(2) are required for target tuna and billfish species, and equally

¹⁸² See Chapter 2 2.4 *Collection of other data and information by tuna RFMOs*.

¹⁸³ UN Fish Stocks Agreement, Annex I Article 3(2).

¹⁸⁴ See Chapter 2 2.4 *Collection of other data and information by tuna RFMOs*.

for non-target, dependent and associated species. However, the discussions within the present section will focus on target tuna and billfish stocks. Non-target, dependent and associated species will be covered in a subsequent and specific section. The practices in the WCPFC for each of the three groups of data to support stock assessment will now be examined, starting with UN Fish Stocks Agreement Annex I 3(2) paragraph a).

Composition of the catch according to length, weight and sex

Data on composition of the catch (by weight, length and sex) provide information on the nature of the impact of fishing on target and non-target stocks of different fleets, fishing method and operations within a fishery. This can be used to infer changes in the stock structure over time, and whether it is likely that current levels of catch will lead to recruitment failure in later years. Chapter 2 noted that analytical stock assessment models require catch composition data, because these types of models are based on more detailed descriptions of the fish stock such as age and size composition of the stock. The stock assessment model commonly used for tuna stock assessments in the western and central Pacific Ocean, is MULTIFAN-CL, which is an analytical model with length-based age-structured components.¹⁸⁵ Thus, tuna stock assessment analyses in the western and central Pacific Ocean, require length frequency data as well as catch and effort data. For this reason catch composition data, particularly by length and weight, has been recognised as essential data to be collected by the WCPFC. Accordingly, the PrepCon recommended “that size composition data should be collected at the operational level ...long line and purse-seine sets, and pole and line and troll by day fished...where practical, according to a

¹⁸⁵ D. A. Fournier, J. Hampton, and J. R. Sibert, "MULTIFAN-CL: a length-based, age-structured model for fisheries stock assessment, with application to South Pacific albacore, *Thunnus alalunga*," *Canadian Journal of Fisheries and Aquatic Sciences* 55 (1998): 2105-2116, P. Kleiber, M. G. Hinton, and Y. Uozumi, "Stock assessment of blue marlin (*Makaira nigricans*) in the Pacific using MULTIFAN-CL," *Marine and Freshwater Research* 54 (2003): 349-360, WCPFC, *Summary Report of the Second Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 8-19 August 2005, WCPFC3-2006/12* (Noumea, New Caledonia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2006), WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2007).

statistically sound sampling design to ensure that the data are representative of the fishery.”¹⁸⁶

This recommendation of PrepCon was taken into account when the WCPFC decision *Scientific data to be provided to the Commission* was drafted. Paragraph 5 of the WCPFC decision states: “Length and/or weight composition data that are representative of catches by the fisheries are essential for stock assessments and shall therefore be provided to the Commission at the finest possible resolution of time period and geographic area.”¹⁸⁷ This is more a statement of principle and intent for WCPFC members to provide catch composition data to the WCPFC. This approach of a voluntary requirement to submit available catch composition data is however common practice in other tuna RFMOs.¹⁸⁸

In spite of the voluntary nature of the WCPFC decision for members to provide catch composition data, the WCPFC currently has a reasonable holding of catch composition data. However, noting findings in Chapter 6 on this topic, the majority of catch composition data that is currently utilised by the WCPFC for stock assessments, are probably those data that were already held in the regional statistical database that is maintained by SPC-OFP.¹⁸⁹ These data have been sourced by earlier SPC-led tagging experiments, from port sampling programmes of Pacific Island States, as well as various national and subregional observer programmes in Pacific Island States, and from French and American port-sampling programmes in their territories.¹⁹⁰ Together these port sampling and observer programmes in Pacific Island States and Pacific Island Territories probably provide fairly good coverage of most purse-seine and longline fleets operating in the western and central Pacific Ocean. But the coverage of catch composition data held by SPC-OFP is expected to be lower for fleets that operate mostly on the high seas and do not enter ports of Pacific Island States.

¹⁸⁶ *Working Group II: Scientific Structure and Provision of Interim Scientific Advice - Summary Report by the Chairman of Working Group II on its work during PrepConV: WCPFC/PrepCon/32*, (Rarotonga, Cook Islands: 2003), para 20 and 22.

¹⁸⁷ WCPFC, *Decision on Scientific Data to be Provided to the Commission* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 5.

¹⁸⁸ See Chapter 2 2.4 *Collection of other data and information by tuna RFMOs*.

¹⁸⁹ See Chapter 6 6.2 *Collection of data on tuna fisheries by Pacific Island States*.

¹⁹⁰ *SPC-OFP Data Catalogue - Introduction*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/DataCat/intro.htm>. Data are submitted from the following Pacific Island States: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands and Tonga. Data are also submitted to SPC-OFP by the Pacific Territories of American Samoa, French Polynesia and New Caledonia.

This is consistent with what has been reported in a recent paper by SPC-OFP informing the Scientific Committee of the main data gaps used in stock assessments for the target tuna species.¹⁹¹ SPC-OFP notes that improved data are required for estimates of species composition of yellowfin and bigeye in purse seine fleets other than those operating under arrangements for subregional access to EEZs of Pacific Island States.¹⁹² Also noted was that the coverage in SPC-OFP database holdings of size composition data for longline fleets was lower than for purse-seine fleets.¹⁹³ This report is not surprising given that a lesser proportion of total longline fishing activities occurs in the waters of Pacific Island States than does purse seining. Additionally, there are some concerns about the quality of some of the longline catch composition data that has been received from Asian States.¹⁹⁴

The next section discusses WCPFC arrangements to implement paragraphs b) and c) of UN Fish Stocks Agreement Annex I Article 3(2).¹⁹⁵

Biological information to support stock assessment and other relevant research

Chapter 2 discussed in some detail the utility of the types of biological information that are required to support stock assessment which were listed in UN Fish Stocks Agreement Annex I Article 3(2b), such as information on age, growth, recruitment, distribution and stock identity. Also discussed in some detail was the utility for stock assessment of other relevant research that were listed in Article 3(2c), including surveys of abundance, biomass surveys, hydro-acoustic surveys, research on environmental factors affecting stock abundance, and oceanographic and ecological studies. It is common in tuna RFMOs for these sorts of studies and research on biology of tuna and the surrounding environment and

¹⁹¹ SPC-OFP, *Scientific Data Available to the Western and Central Pacific Fisheries Commission*, WCPFC-SC3-2007/ST-Information Paper 3 (Noumea, New Caledonia: 2007).

¹⁹² Ibid., p4. Improved data are required for estimates of species composition of yellowfin and bigeye in purse seine fleets other than those operating under the Multilateral Treaty on Fisheries and Federated States of Micronesia Arrangement.

¹⁹³ Ibid.

¹⁹⁴ Ibid. For example, Chinese Taipei longline size data have been provided for the period 2004-2006, covering north and south Pacific albacore, yellowfin, bigeye, striped marlin, swordfish and skipjack, and stratified by year, quarter and 2cm intervals, but do not include a breakdown by area, so are not useful for stock assessments.

¹⁹⁵ UN Fish Stocks Agreement, Annex I Article 3(2): “States shall also collect where appropriate and provide to the relevant subregional or regional fisheries management organization or arrangement information to support stock assessment, including: (b) other biological information supporting stock assessments, such as information on age, growth, recruitment, distribution and stock identity; and (c) other relevant research, including surveys of abundance, biomass surveys, hydro-acoustic surveys, research on environmental factors affecting stock abundance, and oceanographic and ecological studies.”

ecology to be undertaken on an *ad hoc* basis by scientific agencies or universities as a contribution to improve and expand scientific knowledge.¹⁹⁶ This is likely to be the reason that tuna RFMOs do not have specific decisions relating to the collection of these sorts of data, which is the case in the WCPFC. Instead, tuna RFMOs often ask their respective Scientific Committee or Secretariats to identify gaps in knowledge and information. Once the gaps have been identified, research can then be undertaken as the opportunities arise, either by individual States, groups of States or research agencies.

At the time of writing, a significant amount of the biological data that is available to the WCPFC to support stock assessment are those data collected under pre-existing arrangements and held in the databases of SPC-OFP. Although they are held by SPC-OFP, and not by the WCPFC, pursuant to the contract for scientific services of SPC-OFP to the WCPFC these data are already being utilised for scientific analyses of the impacts of tuna fishing in the western and central Pacific Ocean.¹⁹⁷ As was elaborated in Chapter 6, these information include age and growth studies, tagging studies, reproductive biology studies, surveys of abundance, biomass surveys, genetic studies.¹⁹⁸ However there remain areas where information could be improved. For example, SPC-OFP notes in a recent paper that a more general gap related to implementation of an ecosystem approach to fisheries: “Other gaps include quality-controlled ocean bathymetry data, especially regarding seamount definitions and locations, oceanographic data products resolving mesoscale features relevant to fisheries, and acoustic data for the validation of models of mid-trophic components of oceanic ecosystems.”¹⁹⁹

In the WCPFC the process of strategic scientific research planning is still evolving.²⁰⁰ In 2006, the WCPFC adopted a *Strategic Research Plan 2007-2011*, which

¹⁹⁶ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p47.

¹⁹⁷ The details of the contractual arrangements between SPC-OFP and WCPFC will be further discussed in Chapter 8 8.1 *Compiling data on tuna fisheries*.

¹⁹⁸ See Chapter 6 6.2 *Collection of data on tuna fisheries by Pacific Island States*.

¹⁹⁹ SPC-OFP, *Scientific Data Available to the Western and Central Pacific Fisheries Commission*, WCPFC-SC3-2007/ST-Information Paper 3 (Noumea, New Caledonia: 2007), p5.

²⁰⁰ WCPFC, *Report of the First Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 8-19 August 2005*, WCPFC/Comm.2/22 (Noumea, New Caledonia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2005), p47, para 7.39. For example, the Report of SC1 listed four priorities areas under the heading of “Improved understanding of the life-history parameters and the habitat preferences and associations of species in the

seeks to provide a more general direction to the Scientific Committee on the broad areas for all data gathering and scientific research in the WCPFC.²⁰¹ At the time of writing, the most recent version of the WCPFC Strategic Research Plan did not identify specific priority gaps where additional scientific research is required. The identification of priority gaps for scientific research on western and central Pacific Ocean tunas and their ecosystem is likely to be an important area for future planning in the Scientific Committee.²⁰²

The WCPFC has made some progress in developing research programmes that will be important to filling gaps in biological data relevant to stock assessment. For instance, in Chapter 8 under the section on WCPFC arrangements for data verification it will be shown that the WCPFC is in the process of implementing the WCPFC observer and WCPFC VMS programmes and developing a WCPFC port monitoring scheme.²⁰³ These will be important, because SPC-OFP has noted that a key data gap for western and central Pacific Ocean tuna stock assessments is the low observer data coverage rates for most longline and purse seine fleets, particularly for distant water longline fleets, for which observer coverage

western and central Pacific Ocean ”. In this instance, associated with these each area was bracketed text that indicated the anticipated party to undertake the research. The four priority areas for research were: a) Maturity ogives for albacore (Australia) and bigeye tuna (Chinese Taipei); b) Weight-length relations and processed-to-whole weight conversion factors for those fisheries for which weight frequency data are used in the MFCL analyses especially for yellowfin tuna and bigeye tuna (SPC OFP, member data contributions, possible exercise in capacity building for Small Island Developing States and Territories); c) Further archival tagging studies in areas throughout the western and central Pacific Ocean , especially areas away from seamounts and FADs, and on a wide range of tuna ages in order to better parameterise habitat-based standardisation models (SPC OFP/GEF project); and d) Determination of associated dynamics of target and non-target species around FADs with a view to identifying possible measures to mitigate catches of juvenile yellowfin tuna, bigeye tuna and non-target species by purse seine (ongoing work in Hawaii, expansion to other areas would require new funding).

²⁰¹ WCPFC, *Summary Report of the Second Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 8-19 August 2005, WCPFC3-2006/12* (Noumea, New Caledonia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2006), Attachment P Strategic Research Plan 2007-2011. The Commission has four overall research and data collection priorities: collection and validation of data from the fishery; monitoring and assessment of stocks; monitoring and assessment of the ecosystem; evaluation of management options.

²⁰² Development and adoption of the Scientific Committee budget and work programme has been quite a contentious area of the Scientific Committee’s work. In part, the issues of contention arise because there are limited resources to be distributed across a wide range of research areas, and different expectations about the total budget figure. A more “strategic” Scientific Committee Strategic Plan could assist in resolving the differences through agreement on priority scientific research areas. (Authors personal observations at SC3, 13-24 August 2007, Honolulu, Hawaii USA.)

²⁰³ See Chapter 8 8.2 *Verifying data on tuna fisheries*.

has been negligible.²⁰⁴ From 2003 – 2005 coverage of western and central Pacific Ocean fishing activities by observer data available to SPC-OFP was 5.8% across all gear, 10.8% for purse seine fisheries and 0.5% for longline fisheries.²⁰⁵

Progress has also been made in improving the availability of tagging data. As was noted in Chapter 6, the previous two large-scale tagging projects by SPC-OFP have provided valuable information about the movement of tuna in the western and central Pacific Ocean that has been instrumental for western and central Pacific Ocean tuna stock assessments.²⁰⁶ As has the contribution from various small-scale tagging programmes in the western and central Pacific Ocean by national and other research agencies.²⁰⁷ The third large-scale tagging project that is currently underway with an intended second phase across wider regions of the western and central Pacific Ocean and Eastern Pacific Ocean, is also expected to improve availability of data for stock assessments in the Pacific Ocean of skipjack, yellowfin and bigeye.²⁰⁸ Presumably in a similar way WCPFC members, individually or collaboratively through the Scientific Committee, will seek ways and means to address other research gaps so that the WCPFC receives the best scientific information available for analyses of impacts of tuna fishing in the western and central Pacific Ocean .

The next section discusses the implementation of requirements for collection of data on vessel and gear characteristics in the WCPFC.

²⁰⁴ SPC-OFP, *Scientific Data Available to the Western and Central Pacific Fisheries Commission, WCPFC-SC3-2007/ST-Information Paper 3* (Noumea, New Caledonia: 2007), p5. Exceptions are longline fleets of New Zealand, Papua New Guinea, USA –based in Hawaii. Also exceptions are purse seine fleets of Papua New Guinea, under the Multilateral Treaty of Fisheries and FSM Arrangement.

²⁰⁵ See Table 6.2 Average percent coverage of total catches within western and central Pacific Ocean tuna fisheries by data held by SPC-OFP (2003-2005) (*SPC-OFP Data Coverage*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/Coverage/index.asp>.)

²⁰⁶ 1977 – 1981 Skipjack Survey and Assessment Programme; 1989 – 1992 Regional Tuna Tagging Project.

²⁰⁷ For further detail see Chapter 6 or T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002), *SPC-OFP Data Catalogue - Introduction*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/DataCat/intro.htm>.

²⁰⁸ SPC-OFP, *Pacific Tuna Tagging Programme -Phase 2: Western and Central Pacific - Executive Summary* November 2007 2007 [cited March 16 2008]; available from <http://www.spc.int/mrd/doc/tag2-nov2007.pdf>.

Vessel-related data and information

As was discussed in Chapter 2, vessel and gear attributes are required to standardize fishing effort data, which in turn are used in stock assessment analyses.²⁰⁹ The maintenance of records of the total annual number of vessels active or the total number of vessels active by size class is a basic way of monitoring the effort in the fishery. International legal requirements specify that States must maintain national records of fishing vessels.²¹⁰ Chapter 2 noted that tuna RFMOs have developed mechanisms for States to submit this information from their national record of fishing vessels. Tuna RFMOs compile these information into a regional list of vessels authorized to fish, otherwise known as positive lists.²¹¹ These international legal requirements are reflected in the WCPF Convention.

The WCPF Convention Article 24(4) requires that each member of the Commission shall maintain a national record of fishing vessels entitled to fly its flag and authorized to be used for fishing in the Convention Area beyond its area of national jurisdiction.²¹² WCPFC members are to contribute this information from their national record to the WCPFC, and members are to promptly inform the WCPFC Secretariat of any changes to their national record.²¹³ The WCPFC Secretariat compiles this information as a WCPFC Record of Fishing Vessels.²¹⁴ Annex IV of WCPF Convention specifies the information that each member shall provide to the Commission in accordance with the record that is to be maintained under WCPF Convention Article 24(4).²¹⁵ Note that pursuant to Article 24(5)

²⁰⁹ See Chapter 2 2.4 *Collection of other data and information by tuna RFMOs*.

²¹⁰ LOS Convention, Article 94(2a) requires flag States to “maintain a register of ships containing the names and particular of ships flying its flag, except those which are excluded from generally accepted international regulations on account of their small size”. UN Fish Stocks Agreement, Article 18(3c) Measures to be taken be a flag State in respect of vessels flying its flag shall include: “establishment of a national record of fishing vessel authorised to fish on the high seas and provision of access to the information contained in that record on request by directly interested States, taking into account any national laws of the flag State regarding the release of such information.” A similar obligation regarding the establishment of a national record of fishing vessels by flag States can be found in the FAO Compliance Agreement, Article IV : “Each Party shall, for the purposes of this Agreement, maintain a record of fishing vessels entitled to fly its flag and authorized to be used for fishing on the high seas, and shall take such measures as may be necessary to ensure that all such fishing vessels are entered in that record” Also see Code of Conduct for Responsible Fisheries, Article 8.1.2 (all States) and Article 8.21 (flag States), IPOA-IUU, para 24(2).

²¹¹ See Appendix 8 for a table that summarises the similarities and differences between the requirements of WCPFC record of fishing vessel and the requirements of other tuna RFMOs.

²¹² WCPF Convention, Article 24(4, 5, 6 and 7).

²¹³ Ibid., Article 24(5 and 6).

²¹⁴ Ibid., Article 24(7).

²¹⁵ Ibid., Annex IV.

the information listed in Annex IV is to be provided to the Commission, “in accordance with such procedures as may be agreed by the Commission.”²¹⁶ These procedures were adopted by the Commission in 2004: *Conservation and Management Measure on Record of Fishing Vessels and Authorization to Fish*.²¹⁷ The data fields that are required to be provided by WCPFC members to the WCPFC, are not markedly different from the data fields that are required in other tuna RFMOs.²¹⁸

Related to the obligations for the WCPFC Record of Fishing Vessels, WCPFC members are also obliged to provide certain vessel-related gear information to the WCPFC in accordance with UN Fish Stocks Agreement Annex I Article 4. The vessel-related gear information to be provided are:

1. States should collect the following types of vessel-related data for standardizing fleet composition and vessel fishing power and for converting between different measures of effort in the analysis of catch and effort data: (a) vessel identification, flag and port of registry; (b) vessel type; (c) vessel specifications (e.g., material of construction, date built, registered length, gross registered tonnage, power of main engines, hold capacity and catch storage methods); and (d) fishing gear description (e.g., types, gear specifications and quantity).
2. The flag State will collect the following information: (a) navigation and position fixing aids; (b) communication equipment and international radio call sign; and (c) crew size.²¹⁹

Chapter 2 found that the record of fishing vessel requirements in other tuna RFMOs would meet UN Fish Stocks Annex I Article 4(1) and FAO Compliance Agreement Article VI.²²⁰

²¹⁶ The list of fields in WCPF Convention Annex IV are slightly modified from that listed in Conservation and Management Measure on Record of Fishing Vessels and Authorization to Fish CMM 2004-01 paragraph 5, in three ways. First, CMM2004-01 includes a WCPFC Identification Number (WIN), which is defined as the International Radio Call Sign Number (which is a unique number, but not all vessels that fish beyond their area under national jurisdiction have one), or if there is not an International Radio Call Sign Number assigned to a vessel a specific WIN can be assigned. Second, inclusion in CMM 2004-01 of “vessel communication types and numbers” which are probably useful information to have if there is a need for the WCPFC Secretariat to contact the vessel directly. Third, expansion of the provision in Annex IV from “The nature of the authorisation to fish granted by the flag State” to “the form and number of the authorisation granted by the flag State including any specific areas, species and time periods for which it is valid” in CMM 2004-01. The latter being more explicit about the detail a member has to provide to the Commission.

²¹⁷ WCPFC, *Conservation and Management Measure on Record of Fishing Vessels and Authorization to Fish (CMM 2004-01)* (As adopted at First Regular Session of the Commission, Pohnpei, Federated States of Micronesia, 9-10 December 2004).

²¹⁸ See Appendix 8 *Vessel and Gear Data* for further detail on the specific differences between the WCPFC requirements that those requirements for other tuna RFMOs.

²¹⁹ UN Fish Stocks Agreement, Annex I Article 4. Also the International Plan on Action on IUU fishing recommends that vessels authorised to fish on the high seas should collect data listed in FAO Compliance Agreement Article VI and some additional information such as details of the persons responsible for the fishing vessels beneficial ownership and ownership history of the fishing vessel. IPOA-IUU, para 28(1).

Likewise, the data that WCPFC members are to provide for the WCPFC Record of Fishing Vessel will also meet these same international legal requirements.²²¹

In practice, the WCPFC Secretariat has reported that many WCPFC members are facing challenges providing all the information required in *Conservation and Management Measure on Record of Fishing Vessels and Authorization to Fish*. “During 2007 the Commission Secretariat worked collaboratively with several [WCPFC members] to remedy deficiencies in their respective vessel records.”²²² For example, the WCPFC Secretariat recently reported to the Commission that it has incomplete records of “colour photographs” for eight Pacific Island States, six developed WCPFC members and one participating territory.²²³ It should be noted that the information contained in the WCPFC Record of Fishing Vessels is limited in coverage to those vessels that are authorised to fish beyond areas under national jurisdiction of the flag State. Therefore the WCPFC Record of Fishing Vessels does not provide vessel-related information for vessels that fish exclusively in the flag States areas under national jurisdiction. However, as was discussed in Chapter 2, these types of information should be fairly standard information that is collected by a coastal State when fishing licenses, authorisations to fish, or permits to fish are issued by a coastal State.²²⁴

The WCPFC decision *Scientific Data to be provided to the Commission* requires that WCPFC members provide to the Commission information on “The number of vessels

²²⁰ However, tuna RFMO vessel record practices do not meet the data requirements of UN Fish Stocks Agreement Annex I Article 4(2) nor the additional information to that listed in FAO Compliance Agreement Article VI which the IPOA-IUU recommends also be collected. See Chapter 2 2.4 *Collection of other data and information by tuna RFMOs*.

²²¹ Additionally, unlike the other tuna RFMOs, the information fields that are unique to WCPFC Record would allow the WCPFC to collect from WCPFC members, most of the additional vessel-related information that are specified in UN Fish Stocks Agreement Article 4(2) and IPOA-IUU paragraph 28(1). Although, as was noted in Chapter 2, these “additional” vessel-related information are more relevant for fisheries compliance purposes than for fisheries conservation and management purposes.

²²² WCPFC Secretariat, *Information Paper to Support the Commission's Review of Existing Conservation and Management Measures, WCPFC4-2007/Information Paper 13* (Pohnpei, Federated States of Micronesia: Western and Central Pacific Fisheries Commission, 2007), para 20.

²²³ Ibid., Table 3. Pacific Island States listed were: Cook Islands, Fiji, Kiribati, Marshall Islands, Papua New Guinea, Solomon Islands, Tonga, Vanuatu. Developing States listed were: Australia, Canada, China, Japan, European Union and Chinese Taipei. French Polynesia was the participating territory that was listed.

²²⁴ LOS Convention, Article 62 (4) (a, c and e) enables a coastal State to adopt terms and conditions on fishing in the EEZ applicable to nationals of other States fishing in the EEZ of that coastal State. These include *inter alia* “licensing of fishermen, fishing vessels and equipment, including payment of fees and other forms of remuneration...”, “regulating seasons and areas of fishing, the types, sizes and amount of gear, and the types, sizes and number of fishing vessels that may be used” and “specifying information required of fishing vessels including catch and effort statistics and vessel position reports”.

active in the WCPFC Statistical Area during each calendar year” by size class.²²⁵ In addition, the Annex to the WCPFC decision (see Appendix 6) specifies the data standards for operational level catch and effort data that members are to provide to the Commission. For all operational-level catch and effort data, it is a requirement that such data be accompanied by vessel identifiers that shall include the name of the vessel, country of registration, registration number and international radio call sign.²²⁶ As was discussed in Chapter 2, such information could enable operational-level catch and effort data to be linked to individual vessel specific characteristics, which would be useful to effort standardisation.²²⁷ However as was discussed in Chapter 2 and 6, the coverage of vessel records can be problematic, and some degree of cross-checking and data gap-filling are often required before such vessel-related data can be effectively used for the purpose of effort standardisation, as is required pursuant to UN Fish Stocks Agreement Annex I Article 4.²²⁸

A further and related issue has arisen recently with respect to the WCPFC Record of Fishing Vessels. Concerns have been raised that relate to the fact that several WCPFC members provide global authorisations for their vessels to fish on the high seas.²²⁹ The issue is that the WCPFC Record of Fishing Vessels may not be an accurate indicator of active fishing capacity in the western and central Pacific Ocean, because it may include

²²⁵ WCPFC, *Decision on Scientific Data to be Provided to the Commission* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 2.

For longliners, pole-and-line vessels and purse seiners, the number of vessels active shall be provided by gross registered tonnage (GRT) class. The GRT classes are defined as follows: Longline: 0–50, 51–200, 201–500, 500+ ; Pole-and-line: 0–50, 51–150, 150+ ; Purse seine: 0–500, 501–1000, 1001–1500, 1500+.

For trollers targeting albacore in the Pacific Ocean south of the Equator, the number of vessels active in the WCPFC Statistical Area during the fishing season (July to June), shall also be provided and should be provided for the Pacific Ocean south of the Equator.

²²⁶ WCPFC, *Report of the First Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean*, 8-19 August 2005, WCPFC/Comm.2/22 (Noumea, New Caledonia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2005), Annex VIII p116-118.

²²⁷ See Chapter 2 2.4 *Collection of other data and information by tuna RFMOs*.

²²⁸ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998*, FAO Fisheries Technical Paper 382 (Rome: FAO, 1999), p20, T. Lawson et al., *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report 47* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002), p30.

²²⁹ WCPFC Secretariat, *Information Paper to Support the Commission's Review of Existing Conservation and Management Measures, WCPFC4-2007/Information Paper 13* (Pohnpei, Federated States of Micronesia: Western and Central Pacific Fisheries Commission, 2007), para 20.

vessels that have never operated, or never plan to operate, in the western and central Pacific Ocean. For this reason the Commission took a decision at WCPFC4 as follows:

Before 1 July of each year, each Commission Member shall submit to the Executive Director a list of all vessels that appeared in its record of fishing vessels at any time during the preceding calendar year, together with each vessel's registration number, the WCPFC identification number (WIN), and an indication of whether each vessel fished for highly migratory fish stocks in the Convention Area beyond its area of national jurisdiction. The indication shall be expressed as (a) fished, or (b) did not fish.²³⁰

The creation of an “active” category is more of a fisheries compliance issue. However, this has similarities to the WCPFC decision *Scientific Data to be provided to the Commission* requirement for WCPFC members to report the number of vessels active in a particular year, by size class.²³¹ The two decisions differ in two ways. First, the active category provides more detailed information, because each vessel is classed as active or non-active, whereas the data reported pursuant to the scientific data decision is total number of vessels, by fishing method and by size class. Second, the reporting deadline is April 30 for the scientific data decision, but is July 1 for the active category decision. These differing deadlines and requirements have the potential to cause some confusion for WCPFC members, but would provide some useful information on current levels of fishing effort, that would be relevant for western and central Pacific Ocean tuna stock assessments and other scientific analyses.

The next section discusses the implementation by the WCPFC of arrangements for collection of data on non-target, dependent and associated species.

Data on non-target, dependent and associated species

Consistent with a responsible approach to fisheries management, WCPFC members are obliged to “assess impacts of fishing, other human activities and environmental factors on target stocks, non-target species and species belonging to the same ecosystem or dependent

²³⁰ WCPFC, *Summary Record of the Fourth Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 3-7 December 2007* (Tumon, Guam, USA: 2007), para 300(e). The WCPFC Record of Active Fishing Vessels shall identify those fishing vessels so listed that were active in the Convention Area in the preceding year, consistent with the information provided by Members. The Commission also noted that some WCPFC members will not be able to provide full information in 2008.

²³¹ WCPFC, *Decision on Scientific Data to be Provided to the Commission* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 2.

upon or associated with the target stocks.”²³² In meeting this obligation, and consistent with the application of the precautionary approach, members of the Commission are to develop data collection and research programmes and where necessary adopt plans to ensure the conservation of species impacted by fishing and to protect habitats of special concern.²³³

Chapter 2 pointed out that requirements with respect to collection of data on non-target, dependent and associated species come in three forms.²³⁴ First, WCPFC members are obliged to collect catch and effort fisheries data, and basic biological information on non-target and associated or dependent species so that the impact of fishing on these species can be assessed.²³⁵ Possible sources for these data include those considered previously as sources for catch and effort data and for biological data for target tuna stocks, such as logsheets, landings and observer programmes.

Second, WCPFC members are obliged to establish and implement specific data collection and research programmes to assess impacts of fishing on non-target and associated or dependent species.²³⁶ Independent on-board observers are useful for estimating interactions, including catches of non-target, associated and dependent species with fisheries.²³⁷ During the PrepCon it was noted that like in other contexts, that within

²³² WCPF Convention, Article 5(d). The relevant international requirements are: UN Fish Stocks Agreement, Article 5(d - g) and Article 18(3i), LOS Convention, Article 61(4) and Article 119(1b).

²³³ WCPF Convention, Article 6(1). The relevant international requirements are: UN Fish Stocks Agreement, Article 6(3d), Code of Conduct for Responsible Fisheries, Articles 7.2.3, 8.4.7, 8.4.8, 12.5 and in respect of fishing gear selectivity Articles 8.5.1 and 12.10.

²³⁴ See Chapter 2 2.4 *Collection of other data and information by tuna RFMOs*.

²³⁵ UN Fish Stocks Agreement, Annex I Article 1(1) “Data collected should also include information on non-target and associated or dependent species.” and UN Fish Stocks Agreement, Annex I Article 3(1b) States shall collect and make available to the relevant subregional or regional fisheries management organization or arrangement the following types of data in sufficient detail to facilitate effective stock assessment in accordance with agreed procedures: “(b) total catch in number, nominal weight or both by species (both target and non-target) as is appropriate to each fishery.” IPOA-Sharks, para 21 says that the “consistent collection of data including inter alia catch and data leading to improved species identification and, ultimately, the establishment of abundance indices.” IPOA-Seabirds, para 4-5 requires collection of data on interactions of seabirds with fisheries for assessment purposes.

²³⁶ UN Fish Stocks Agreement, Article 6(3d), Code of Conduct for Responsible Fisheries, Articles 7.2.3, 8.4.7, 8.4.8, 12.5 and in respect of fishing gear selectivity Articles 8.5.1 and 12.10.

²³⁷ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics. La Jolla, California, USA, 13-16 December 1993*, FAO Fisheries Report 500 (Rome: FAO, 1994), p8, B. Molony, “Estimates of the mortality of non-target species with an initial focus on seabirds, turtles and sharks (WCPFC-SC1 Working Paper EB WP-1),” in *1st Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2005).

the western and central Pacific Ocean there was a “need for more reliable statistics on catches of non-target species through improved observer coverage and other means.”²³⁸ Furthermore the PrepCon advised that the Commission should “consider specific work plans, and associated costs” to *inter alia* assess “the effects of the environment on pelagic fish stocks, and the effects of fishing on the environment”.²³⁹ PrepCon also recommended that the Commission, through the Scientific Committee, should in the short-term “identify data deficiencies that exist to address these issues, and make plans to rectify them. Priorities of ecosystem research need to be reconciled with the need to assess the major tuna stocks.”²⁴⁰

To respond to these recommendations, at its first session, the Commission adopted the *Resolution on Conservation and Management Measures*.²⁴¹ This non-binding resolution reflected a balance between the uneasiness of some WCPFC members to fully commit to adopting binding conservation and management measures at WCPFC1, with the resolve of other WCPFC members to take action to respond to scientific advice on the impact of tuna fishing.²⁴² The *Resolution on Conservation and Management Measures* did set in place a process to ensure the Commission received scientific information and advice that could underpin conservation and management measures for both target tuna stocks as well as

²³⁸ *Working Group II: Scientific Structure and Provision of Interim Scientific Advice - Summary Report by the Chairman of Working Group to the third session of the Preparatory Conference: WCPFC/PrepCon/20*, (Manila, Philippines: 2002), para 5(g). During PrepCon2 it was recommended that the Secretariat produce “a review of relevant information on ecosystem and bycatch issues for use by the Commission taking into account information available from existing bodies, including the SCTB Billfish and Bycatch Research Group, and paying particular attention to incidental catches of sensitive species” “Working Group II: Scientific Structure and Provision of Interim Scientific Advice - Summary Report by the Chairman of Working Group: WCPFC/PrepCon/15”, (paper presented at the Preparatory Conference for the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: Second Session 25 February - 1 March 2002, Madang, Papua New Guinea, 2002). This review was completed as: *Review of Ecosystem-Bycatch Issues for the Western and Central Pacific Region. A paper prepared for Preparatory Conference Third Session, Manila, Philippines 18-22 November 2002, WCPFC/PrepCon/WP.9* (Florida, United States of America: MRAG Americas Inc., 2002), p39. One conclusion of that report was that “Enhanced and directed monitoring is an essential element of an ecosystem approach that seeks to take into consideration unintentional, secondary and/or indirect effects of fishing on target species with particular fishing gears. A major feature of this monitoring is likely to be increased use of observers”.

²³⁹ *Report of the Third Meeting of the Scientific Coordinating Group: WCPFC/PrepCon/41*, (Pohnpei, Federated States of Micronesia: 2004), para 29.

²⁴⁰ Ibid.

²⁴¹ WCPFC, *First Session of the Commission - Summary Record: WCPFC/Comm.1/8, WCPFC/Comm.1/8* (Pohnpei, Federated States of Micronesia: 2004), Annex II.

²⁴² Ibid.

non-target species.²⁴³ More recently, a report by SPC-OFP on the main gaps in information availability for stock assessment and other analyses noted that: “Biological data for non-target species are lacking; the type of data required include length and weight, length and age at maturity, longevity, growth rate, fecundity, habitat use (vertical and horizontal range), and trophic interactions.”²⁴⁴

The WCPFC has adopted some requirements for WCPFC members to provide data to the Commission on non-target, dependent and associated species. Similar to practices in other tuna RFMOs,²⁴⁵ efforts in the WCPFC to date for non-target, dependent and associated species have focussed on sharks, seabirds and sea turtles.²⁴⁶ However, these requirements are not specified in the WCPFC Decision *Scientific Data to be provided to the Commission*.²⁴⁷ Instead, the requirements are specified in the body of WCPFC decisions for non-target species, as conservation and management measures or resolutions. At the time of writing, Conservation and Management Measures had been adopted by the WCPFC for sharks and seabirds: *Conservation and Management Measure to mitigate impacts of*

²⁴³ The resolution did not go so far as to prescribe the conservation and management measures necessary to address sustainability concerns, which were to be adopted at WCPFC2. But language was included to re-emphasise the desirability of adopting conservation and management measures at WCPFC2 such as “In responding to the advice of the Scientific Committee and the Technical and Compliance Committee and any information provided by members at least thirty (30) days in advance of the second annual session, the Commission shall adopt in accordance with article 5 of the Convention conservation and management measures necessary to address sustainability concerns.” (para 5) and “In accordance with article 6 of the Convention the precautionary approach will be applied and the absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures.” (para 5) One suggestion for a possible conservation and management measure was “Mitigation measures to address the mortality of non-target species e.g. seabirds, turtles and sharks.” (para 4 (e))

²⁴⁴ SPC-OFP, *Scientific Data Available to the Western and Central Pacific Fisheries Commission*, WCPFC-SC3-2007/ST-Information Paper 3 (Noumea, New Caledonia: 2007), p5.

²⁴⁵ See Chapter 2 2.4 *Collection of other data and information by tuna RFMOs* and Table 2-1. Summary of data required by tuna RFMOs, other than WCPFC, to be submitted by contracting Parties that relate to non-target, dependent or associated species and implementation of the precautionary approach.

²⁴⁶ WCPFC, *First Session of the Commission - Summary Record: WCPFC/Comm.1/8, WCPFC/Comm.1/8* (Pohnpei, Federated States of Micronesia: 2004), Annex II, para 1(d). The emphasis on these three groups of species arose in part from a provision in the WCPFC *Resolution on Conservation and Management Measures* that was adopted by the Commission in 2004. The resolution requested scientific advice on estimates of the mortality of non-target species with an initial focus on seabirds, turtles and sharks.

A Resolution was adopted in 2005 for non-target species, however no data reporting requirements were specified therein. WCPFC, *Resolution on non-target fish species (Resolution 2005-03)* (As adopted at Second Regular Session of the Commission, Pohnpei, Federated States of Micronesia, 12-16 December 2005).

²⁴⁷ WCPFC, *Decision on Scientific Data to be Provided to the Commission* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007). Requires that members provide data to the Commission for target tuna and billfish species (bigeye, yellowfin, skipjack, albacore, blue marlin, black marlin, striped marlin, and Pacific bluefin tuna. Also paragraph 1 states that ‘Catch estimates shall also be provided for other species as determined by the Commission.’ But the WCPFC has not formally decided on the inclusion of any other species.

fishing for highly migratory fish stocks on Seabirds;²⁴⁸ and *Conservation and Management Measure for Sharks in the Western and Central Pacific Ocean*.²⁴⁹ These two conservation and management measures seek to implement the *International Plan of Action for reducing incidental catch of seabirds in longline fisheries* (IPOA-Seabirds) and the *International Plan of Action for the conservation and management of sharks* (IPOA-Sharks), respectively.²⁵⁰ A resolution has been adopted for sea turtles: *Resolution to Mitigate the Impact of Fishing For Highly Migratory Fish Species on Sea Turtles* which seeks to implement the *FAO Guidelines to reduce sea turtle mortality in fishing operations* (FAO Guidelines-Sea Turtles).²⁵¹ WCPFC members are required to provide in their annual reporting all available data on fishery interactions with seabirds, sharks and sea turtles.²⁵² The data reporting requirements for sea turtles, sharks and seabirds in the WCPFC are similar to those in other tuna RFMOs.²⁵³ Likewise, is the approach of taking formal

²⁴⁸ WCPFC, *Conservation and Management Measure to mitigate impacts of fishing for highly migratory fish stocks on seabirds* (CMM 2006-02) (As adopted at Third Regular Session of the Commission, Apia Samoa, 11-15 December 2006). Initially the Commission adopted a voluntary Resolution at WCPFC2 (Resolution on the Incidental Catch of Seabirds, Resolution 2005-01). This resolution was later repealed at WCPFC3 by CMM 2006-02. Technical Specifications for seabird mitigation measures were added to CMM 2006-02 at WCPFC4 in 2007.

²⁴⁹ WCPFC, *Conservation and Management Measure for Sharks in the Western and Central Pacific Ocean* (CMM 2006-05) (As adopted at Third Regular Session of the Commission, Apia Samoa, 11-15 December 2006).

²⁵⁰ International Plan of Action for reducing incidental catch of seabirds in longline fisheries, adopted by the FAO Conference in 1999 (IPOA-Seabirds,); International Plan of Action for the conservation and management of sharks, adopted by the FAO Conference in 1999. (IPOA-Sharks,); and Guidelines to reduce sea turtle mortality in fishing operations, endorsed by COFI in 2005, for voluntary implementation by States and RFMOs (FAO Guidelines-Sea Turtles,).

²⁵¹ WCPFC, *Resolution to Mitigate the Impact of Fishing For Highly Migratory Fish Species on Sea Turtles* (Resolution 2005-04) (As adopted at Second Regular Session of the Commission, Pohnpei, Federated States of Micronesia, 12-16 December 2005). Similar to the process of evolution of the CMM on seabirds, the Commission made a commitment in paragraph 6 of Resolution 2005-04 to “consider measures related to the use of circle hook gear technology in longline fisheries at its annual Session in 2006, taking into account the results of research and trials.” However negotiations at WCPFC3 and WCPFC4 have not been able to achieve consensus on the form of such a Conservation and Management Measure for sea turtle mitigation. The Resolution 2005-04 seeks to implement the *Guidelines to reduce sea turtle mortality in fishing operations, endorsed by COFI in 2005, for voluntary implementation by States and RFMOs* (FAO Guidelines-Sea Turtles,).

²⁵² WCPFC, *Resolution to Mitigate the Impact of Fishing For Highly Migratory Fish Species on Sea Turtles* (Resolution 2005-04) (As adopted at Second Regular Session of the Commission, Pohnpei, Federated States of Micronesia, 12-16 December 2005), para 2, WCPFC, *Conservation and Management Measure to mitigate impacts of fishing for highly migratory fish stocks on seabirds* (CMM 2006-02) (As adopted at Third Regular Session of the Commission, Apia Samoa, 11-15 December 2006), para 9, WCPFC, *Conservation and Management Measure for Sharks in the Western and Central Pacific Ocean* (CMM 2006-05) (As adopted at Third Regular Session of the Commission, Apia Samoa, 11-15 December 2006), para 4.

²⁵³ See Appendix 8 for further detail on WCPFC data requirements for non-target, dependent and associated species.

decisions (binding or non-binding) to specify data on non-target species that WCPFC members are to provide that is in addition to the WCPFC decision *Scientific data to be provided to the Commission*.

In accordance, with the provisions of Article 30 of the WCPF Convention, the *Conservation and Management Measure for Sharks in the Western and Central Pacific Ocean* and *Resolution to Mitigate the Impact of Fishing For Highly Migratory Fish Species on Sea Turtles* recognise the need for assistance to be provided to assist developing States to implement these WCPFC decisions.²⁵⁴ At the time of writing, there was no information available on the extent to which developed WCPFC members have provided assistance to developing WCPFC members, particularly small-island developing States, towards assisting them to obtain improved data on non-target, dependent and associated species.

There are a couple of outstanding tasks with regard to WCPFC members implementing these reporting requirements. First, pursuant to *Conservation and Management Measure for Sharks in the Western and Central Pacific Ocean*, the Scientific Committee is yet to specify the key shark species that WCPFC members are to provide data for.²⁵⁵ Second, noting that these reporting requirements are fairly recent WCPFC decisions, there is limited information on compliance by WCPFC members with these obligations. Further efforts by the Scientific Committee and Technical and Compliance Committee are required to encourage WCPFC members to provide available data on non-target, dependent and associated species. In terms of future developments, the WCPFC Regional Observer Programme, which at the time of writing had commenced implementation, can be expected

²⁵⁴ WCPFC, *Resolution to Mitigate the Impact of Fishing For Highly Migratory Fish Species on Sea Turtles (Resolution 2005-04)* (As adopted at Second Regular Session of the Commission, Pohnpei, Federated States of Micronesia, 12-16 December 2005), para 10, WCPFC, *Conservation and Management Measure for Sharks in the Western and Central Pacific Ocean (CMM 2006-05)* (As adopted at Third Regular Session of the Commission, Apia Samoa, 11-15 December 2006), para 5, para 9. Also these provisions are summarised in Appendix 8.

²⁵⁵ WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2007), para 200.: “The SC was not in a position to define what constitutes a “key” shark species. CCMs shall provide details of the shark species that are caught to assist in the identification of key shark species at next year’s SC. Future consideration should include information on the known distribution of those species (e.g. tropical or temperate, coastal or pelagic).”

to improve the future availability of data on non-target, dependent and associated species.²⁵⁶ The research plan for application of Ecological Risk Assessment in the WCPFC by 2010 was only recently endorsed by the Commission.²⁵⁷ Ecological Risk Assessment has the potential to assist the Commission in prioritizing non-target, dependent and associated species for management action or further research.²⁵⁸

The third type of requirement with respect to collection of data on non-target, dependent and associated species relates to the application of the precautionary approach to fisheries management. The WCPFC is obliged in accordance with the WCPF Convention to apply the precautionary approach to fisheries management.²⁵⁹ In accordance with the application of the precautionary approach, WCPFC decisions should be more cautious when information is uncertain, unreliable and inadequate.²⁶⁰ Also, where the status of tuna and billfish stocks, or other species of the ecosystem is of concern, such stocks or species should be subject to enhanced monitoring.²⁶¹ Accordingly, the WCPFC will need to follow the lead of other tuna RFMOs, particularly in response to the sustainability concerns for bigeye and yellowfin tuna in the western and central Pacific Ocean. As was discussed in Chapter 2, other tuna RFMOs have subjected tuna and billfish stocks in their region that are showing signs of being significantly impacted by fishing activities to enhanced monitoring.²⁶²

For example, in the eastern Pacific Ocean the *Inter-American Tropical Tuna Commission* (IATTC) has received scientific advice that the eastern Pacific bigeye stock likely to be overfished and that overfishing is occurring. In response, IATTC now requires Contracting Parties and cooperating non-Contracting Parties, whose longline fleets annually

²⁵⁶ Further details on the WCPFC Regional Observer Programme can be found in Chapter 8 8.2 *Verifying data on tuna fisheries*.

²⁵⁷ WCPFC, *Summary Record of the Fourth Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 3-7 December 2007* (Tumon, Guam, USA: 2007), para 95.

²⁵⁸ WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2007), 47-48.

²⁵⁹ WCPF Convention, Article 6.

²⁶⁰ *Ibid.*, Article 6(2).

²⁶¹ *Ibid.*, Article 6(4) also UN Fish Stocks Agreement, Article 6(5).

²⁶² See Chapter 2 2.4 *Collection of other data and information by tuna RFMOs*.

catch greater than 500 Mt of bigeye, to report, to the IATTC Secretariat, the monthly catches of their national longline fleets of bigeye tuna.²⁶³ For transparency in the implementation of this decision, the reported catches by national fleet are made publicly available on the IATTC website. The requirement applying to the longline fleet is significant because, unlike what is the case for purse seine fisheries, longline catch data is reported in aggregated format to IATTC Secretariat.²⁶⁴ Also recently for southern bluefin tuna the *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT) has implemented monthly catch monitoring by each State participant in the fishery.²⁶⁵ This action was taken following concerns about underreporting through the CCSBT Statistical Documentation Scheme. The monthly catch reporting has been implemented to more closely monitor the southern bluefin tuna stock which has sustainability concerns (see Chapter 1).²⁶⁶ In the Atlantic Ocean, the *International Commission for the Conservation of Atlantic Tunas* (ICCAT) has also indicated that is considering some form of near-real time monitoring of compliance with catch limits applicable to species with sustainability concerns.²⁶⁷

Conclusion

This Chapter has analysed the fisheries data practices that have been established by the WCPFC to collect the fisheries data required to support scientific analyses of the impacts of western and central Pacific tuna fisheries on tuna stocks and the marine ecosystem. The

²⁶³ *IATTC-Monthly longline catches of bigeye tuna*, [website] (IATTC, [cited 23 February 2008]); available from <http://www.iattc.org/IATTCLonglineCatches2007ENG.htm>, IATTC, *Resolution for a program on the Conservation of Tuna in the Eastern Pacific Ocean for 2007 (Resolution C-06-02)*. The reported longline catches of bigeye for 2007 by relevant IATTC Parties and cooperating non-contracting Parties are included in the public access section on the IATTC website.

²⁶⁴ In IATTC purse-seine fisheries provide operational level catch and effort data direct to the IATTC Secretariat, and the vessels are subject to one-hundred percent observer coverage.

²⁶⁵ CCSBT, "CCSBT Report on Intersessional Developments in Fisheries Statistics since CWP21 (March 2005) (CWP-22/CCSBT)," in *Coordinating Working Party on Fishery Statistics 22nd Session (26 February - 2 March)* (Rome, Italy: 2007), "Report of the Joint Meeting of Tuna RFMOs", (paper presented at the Joint Meeting of Tuna RFMOs, January 22-26, Kobe, Japan, 2007), Appendix 13 - CCSBT Report.

²⁶⁶ CCSBT, "CCSBT Report on Intersessional Developments in Fisheries Statistics since CWP21 (March 2005) (CWP-22/CCSBT)," in *Coordinating Working Party on Fishery Statistics 22nd Session (26 February - 2 March)* (Rome, Italy: 2007), "Report of the Joint Meeting of Tuna RFMOs", (paper presented at the Joint Meeting of Tuna RFMOs, January 22-26, Kobe, Japan, 2007), Appendix 13 - CCSBT Report.

²⁶⁷ "Report of the Joint Meeting of Tuna RFMOs", (paper presented at the Joint Meeting of Tuna RFMOs, January 22-26, Kobe, Japan, 2007), Appendix 10 - Paper by ICCAT.

approach of the WCPFC to collect these fisheries data has been three-fold. First, through the adoption of standards specifying the types of data and the form in which that fisheries data is required to be provided by members to the WCPFC. Second, through the adoption of a template for annual reports to the Commission which members are required to use. This report template enables members to report annually to the Commission on their fishing activities in the Convention Area and the steps they have taken to implement and comply with WCPFC decisions. Finally, the Commission has on an *ad hoc* basis required members to provide certain information to the WCPFC Secretariat. These three WCPFC approaches are similar to the approaches in other tuna RFMOs, with some differences that reflect the unique circumstances of the WCPFC relative to other tuna RFMOs. One particular unique feature of the WCPFC is the significant proportion of the most productive fishing grounds in the western and central Pacific Ocean being within areas under national jurisdiction of coastal developing States (Pacific Island States, Pacific Island territories, Philippines and Indonesia). The approaches of the WCPFC to collect data on tuna fisheries reflects international legal requirements and takes into account this unique feature of the WCPO tuna fisheries.

Linked to this unique feature, the Chapter has shown that the previously applied practices and standards for data on tuna fisheries, particularly those implemented by Pacific Island States in areas under national jurisdiction, have been influential in shaping the WCPFC practices to collect fisheries data. In fact, the majority of fisheries data that are currently used by the WCPFC to support scientific analyses of tuna fishing were collected through pre-existing data practices of Pacific Island States, supported by SPC-OFP and FFA. These fisheries data include catch and effort data, particularly operational-level catch and effort data, other biological data and research information to support stock assessment, and data on impacts of fishing on non-target, dependent and associated species.

Another important policy consideration in the development of requirements for fisheries data that WCPFC members are to provide to the WCPFC, which again is linked to this unique feature of the western and central Pacific Ocean tuna fisheries, has been the special requirements of developing States. Accordingly some flexibility has been provided in data provision requirements for the capabilities and challenges faced by developing States. However, accommodating the special requirements of developing States has not

meant lowered standards for data practices. The Chapter has shown that the WCPFC approaches aspire to build upon existing practices and standards in the region, so as to ensure that the best quality fisheries data is available to the WCPFC to support scientific analyses of impacts of tuna fishing on tuna stocks and the marine ecosystem. The WCPFC approach reflects an appreciation that the best available scientific advice to underpin conservation and management decisions is the surest way for the long-term conservation and sustainable use of western and central Pacific Ocean tuna fisheries to be achieved, for the benefit of all, particularly developing coastal States including Pacific Island States. An important next step for the WCPFC will be to ensure that the WCPFC requirements for data provision are being implemented fully by all WCPFC members.

Chapter 8.

Analysis of WCPFC practices for compilation, verification, exchange and dissemination of data on tuna fisheries

Effective arrangements within a tuna regional fisheries management organisation (RFMO) are required to ensure that the best scientific evidence is available to effectively underpin decisions for conservation and management measures to achieve long-term conservation and sustainable use of tuna fisheries. Accordingly, Article 10 of the *Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPF Convention) obliges States to: “adopt standards” for verification and timely exchange of fisheries data, in accordance with Annex I of the UN Fish Stocks Agreement;¹ and to “compile and disseminate accurate and complete statistical data to ensure that the best scientific evidence is available, while maintaining confidentiality where appropriate;”² This Chapter is the second of a two-part analysis of the fisheries data practices established in the *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPFC or Commission).³ The framework for the analyses was outlined in the introduction to the present thesis and expanded in Chapter 7 7.1 *Background of WCPFC and practices for data on tuna fisheries*). Chapter 7 analysed the WCPFC fisheries data practices to collect data on tuna fisheries to support scientific analyses of impacts of tuna fishing in the western and central Pacific Ocean. The purpose of this Chapter is to analyse the fisheries data practices that have been established by the WCPFC that occur following the receipt fisheries data by the WCPFC.

¹ Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean of 5 September 2000, [2000] ATNIF No.11/WCPF Convention, Article 10(1d).

² Ibid., Article 10(1e).

³ Note that within this thesis two abbreviations will be used to refer to the *Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean*. The “WCPFC” is the commonly used abbreviation that is used to distinguish this tuna RFMO from the other tuna RFMOs. The phrase “Commission” is used herein to refer specifically to the decision-making body of the WCPFC as distinct from the other bodies that together comprise the WCPFC. These other bodies of the WCPFC include *inter alia* the WCPFC Secretariat and the subsidiary bodies such as the Scientific Committee or Technical and Compliance Committee.

There are three parts to this Chapter, and in each part the WCPF Convention requirements will be examined, WCPFC data practices will be analysed and implications for Pacific Island States discussed. Chapter 7 traced the background to the WCPFC and WCPFC data practices (*7.1 Background of WCPFC and practices for data on tuna fisheries*) and provided the necessary context for the analyses in the present Chapter. First, data practices for compilation of fisheries data will be analysed and future implications discussed. Second, practices for data verification, to ensure completeness and accuracy of data, will be analysed. Third, data practices to maintain confidentiality of data and share fisheries data and information will be analysed.

8.1 Compiling data on tuna fisheries

As was noted in Chapter 3 *3.1 Compiling data on tuna fisheries*, compilation refers to the process of storing and arranging data from multiple sources into one place. The data on tuna fisheries provided by WCPFC members to the WCPFC must be stored securely, but made easily available to effectively support scientific analysis and where appropriate, for dissemination to other WCPFC members and other parties.⁴ In other tuna RFMOs fisheries data are compiled for the purpose of undertaking scientific analyses of impacts of fishing such as stock assessments, which underpin scientific advice to the Commission.⁵ Database system used in tuna RFMOs differ depending on the agreed format and specifications for the provision of data on tuna fisheries within the respective RFMO and the institutional arrangements for undertaking of stock assessment.⁶

In relation to arrangements for data compilation, the WCPF Convention describes one of the functions of the Commission as compiling fisheries data “to ensure

⁴ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999).

⁵ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics. La Jolla, California, USA, 13-16 December 1993, FAO Fisheries Report 500* (Rome: FAO, 1994), 125-126.

⁶ For example *International Commission for the Conservation of Atlantic Tunas* (ICCAT) and *Indian Ocean Tuna Commission* (IOTC) catch and effort data are received in aggregated format and the databases compile data in this public domain form. In contrast, the *Inter-American Tropical Tuna Commission* (IATTC) receives operational-level catch and effort data for purse-seine fishing activities and will compile data in this form for use in stock assessments, but have aggregated form for public dissemination. For further detail see Chapter 3 *3.1 Compiling data on tuna fisheries*.

that the best statistical data is available”.⁷ The WCPF Convention also identifies, under Article 15(4) paragraph b), a role for the WCPFC Secretariat in facilitating the compilation of fisheries data “to accomplish the objective of the Convention”.⁸ WCPF Convention Article 15(5) stipulates two considerations for establishing the WCPFC Secretariat. These considerations include, first that the Secretariat is to be cost-effective, to minimise costs of operating the WCPFC Secretariat for WCPFC members. Second, where appropriate and possible the Secretariat shall utilise the capacity of existing regional institutions.

Also another source of guidance for the establishment of WCPFC practices for fisheries data compilation is Annex I “Standard requirements for collection and sharing of data” of the *Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks* (UN Fish Stocks Agreement).⁹ Annex I forms an integral part of the WCPF Convention.¹⁰ As was noted in Chapter 3, Annex I sets out a number of relevant minimum standards for the compilation of data on tuna fisheries.¹¹ In particular, Article 1(1) of UN Fish Stocks Agreement Annex I, states that fisheries data should be “compiled in such a way as to enable statistically meaningful analysis for the purposes of fishery resource conservation and management.”¹² Additionally, the WCPFC should “to the extent feasible, develop database systems which provide efficient access to data.”¹³ A fundamental principle underpinning the compilation of fisheries data is that confidentiality of non-aggregated data must be maintained; WCPFC practices for

⁷ WCPF Convention, Article 10(1e) “Without prejudice to the sovereign rights of coastal States for the purpose of exploring and exploiting, conserving and managing highly migratory fish stocks within areas under national jurisdiction, the functions of the Commission shall be to: ... compile and disseminate accurate and complete statistical data to ensure that the best scientific information is available, while maintaining confidentiality, where appropriate;”

⁸ Ibid., Article 15(4b) “The Secretariat functions shall include the following: (b) facilitating the compilation and dissemination of data necessary to accomplish the objective of this Convention.”

⁹ Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, of 4 December 1995, entered into force from 11 December 2001 (1995) 34 ILM 1542 (UN Fish Stocks Agreement,) Note that for reference Annex I is reproduced herein as Appendix 2.

¹⁰ WCPF Convention, Article 10(1d) refers to adoption of standards for collection, verification and for the timely exchange and reporting of data on fisheries in accordance with Annex I of the UN Fish Stocks Agreement, ... “which shall form an integral part of this Convention.”

¹¹ See Chapter 3 3.1 *Compiling data on tuna fisheries*.

¹² UN Fish Stocks Agreement, Annex I Article 1(1).

¹³ Ibid., Annex I Article 7(1).

confidentiality of fisheries data will be analysed later in the present Chapter in 8.3 *Maintaining confidentiality of data on tuna fisheries and sharing data.*¹⁴

As part of formulating a policy response to these WCPF Convention provisions, the *Preparatory Conference for the Establishment of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (PrepCon) took note of the WCPF Convention Article 13 provisions relating to the Commission being able to engage the services of scientific experts.¹⁵ In particular paragraph (1) that allows the Commission to “enter into administrative and financial arrangements to utilize the scientific services” of scientific experts. When entering into such arrangements “the Commission shall, to the greatest extent possible utilize the services of existing regional organizations.”¹⁶ The scientific experts work for the Commission may specifically involve undertaking “the collection, compilation and dissemination of fisheries data according to agreed principles and procedures established by the Commission, including procedures and policies relating to the confidentiality, disclosure and publication of data.”¹⁷

Based on the above considerations, the PrepCon also took into account the contribution of the system of data collection and compilation that has evolved in the Pacific Islands region over many years, particularly that of the regional tuna statistical database managed by the Oceanic Fisheries Programme of the Secretariat of the Pacific Community (SPC-OFPP).¹⁸ As was noted in Chapter 6, the Secretariat of the Pacific Community (SPC) has successfully compiled, on behalf of Pacific Islands States, tuna fisheries data for the Western and Central Pacific Ocean (western and central Pacific

¹⁴ WCPF Convention, Article 10(1e), refers to a function of the Commission being to compile and disseminate fisheries data “while maintaining confidentiality, where appropriate”.

¹⁵ One of the tasks of the PrepCon was to endeavour to formulate recommendations for consideration by the Commission concerning the implementation of WCPF Convention Article 11, 12, 13 and 14 (MHLC Resolution I Establishing a Preparatory Conference for the establishment of the WCPFC, paragraph 7(ai)). Articles 11-13 relate to the role of the Scientific Committee and structure for provision of scientific advice to the Commission (Article 14 is concerned with the role of the TCC). Within the PrepCon process Working Group II was tasked to “identify for the PrepCon various options or mechanisms, including the use of existing organisations and arrangements, by which the requirements of articles 12 and 13 can be provided.” (*Final Report of Working Group II: WCPFC/PrepCon/45, WCPFC/PrepCon/41* (Pohnpei, Federated States of Micronesia: 2004), p5 para 16.)

¹⁶ WCPF Convention, Article 13(1).

¹⁷ Ibid., Article 13(3a).

¹⁸ *Final Report of Working Group II: WCPFC/PrepCon/45, WCPFC/PrepCon/41* (Pohnpei, Federated States of Micronesia: 2004), p5 para 16, *Report of the Technical Consultation on the Collection and Exchange of Fisheries Data, Tuna Research and Stock Assessment, 15-19 July 1996, Noumea New Caledonia*, (Noumea, New Caledonia: Oceanic Fisheries Programme, South Pacific Commission, 1996), p6 para 38.

Ocean) since 1977.¹⁹ In recognition of these contributions, consequently PrepCon recommended to the Commission that it “take account of the unique characteristics of the region and utilize the data management services of the OFP during the transitional period (expected to last some 3 to 5 years and representing the period between the Convention coming into force and a fully functioning Commission).”²⁰ This recommendation was adopted by the Commission at its first regular session in December 2004. Following the adoption of the *Memorandum of Understanding between the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean and the Secretariat of the Pacific Community* (WCPFC-SPC memorandum of understanding) by the Commission at its second regular session in 2005, SPC-OFP formally began to operate as data-contractor to the WCPFC.²¹

An advantage from the SPC-OFP contractual arrangements with the WCPFC is that they ensure efficient access to fisheries data to support stock assessment. The current contracting of SPC-OFP as “data contractor” and “scientific services provider” to the WCPFC ensures that WCPFC data are being housed with the pre-existing data holdings in the regional statistical database at SPC-OFP.²² Also because SPC-OFP is the scientific service provider to the WCPFC as well, the most complete and up-to-date

¹⁹ In 1982, SPC began compiling operational-level catch and effort data that were provided by SPC member countries and territories, under the Tuna and Billfish Assessment Programme. Since the early 1990s, other types of fisheries data such as port sampling data, observer data and unloadings data have been compiled by SPC through the SPC-OFP. Cooperation for scientific purposes through the Standing Committee on Tuna and Billfish, also facilitated the voluntary submission from fishing States of aggregated catch and effort data to SPC-OFP for use in western and central Pacific Ocean tuna stock assessments. For further detail see Chapter 6 *6.1 Regional institutions and instruments that assist Pacific Island States* and *6.3 Analysis of arrangements post-collection of data on tuna fisheries in Pacific Island States*.

²⁰ *Final Report of Working Group II: WCPFC/PrepCon/45, WCPFC/PrepCon/41* (Pohnpei, Federated States of Micronesia: 2004), p5 para 16, *Report of the Second Meeting of the Scientific Coordinating Group (SCG2): WCPFC/PrepCon/28*, (Rarotonga, Cook Islands: 2003), para 25, *Working Group II: Scientific Structure and Provision of Interim Scientific Advice - Summary Report by the Chairman of Working Group II on its work during PrepConV: WCPFC/PrepCon/32*, (Rarotonga, Cook Islands: 2003), para 25.

²¹ A copy of the latest WCPFC-SPC memorandum of understanding can be found in WCPFC Secretariat, *Cooperation with other organisations, WCPFC4-2007/18 (Rev 1)* (Pohnpei, Federated States of Micronesia: Western and Central Pacific Fisheries Commission, 2007).

²² PrepCon also recommended a second role for SPC-OFP to the WCPFC which is as the Scientific Service Provider to the Commission. Like the recommendation for the role of SPC-OFP in data services, the PrepCon recommendation for the role of SPC-OFP as scientific service provider was endorsed by the Commission at WCPFC1. The WCPFC-SPC memorandum of understanding characterises these particular aspects of SPC-OFPs role in the Commission as possibly including *inter alia* conduct of stock assessments for key target and non-target species; scientific evaluation of management options; scientific advice in relation to impact of fishing on the stocks; and the design and conduct of scientific and ecological research programmes.

data are available to support western and central Pacific Ocean tuna stock assessments and other scientific analyses of impacts of fishing, which are undertaken by SPC-OFP as scientific service provider to the WCPFC.²³

Pursuant to the WCPFC-SPC memorandum of understanding, SPC-OFP data-related services include first, “Data management services, including, as appropriate, the collection, compilation and dissemination of fisheries data according to agreed principles and procedures established by the Commission, data processing, and database development and maintenance, taking full account of the procedures and policies of both organisations relating to the confidentiality, disclosure and publication of data.”²⁴ For example, incorporation of data provided by WCPFC members, particularly under the WCPFC decision on *Scientific data to be provided to the Commission* into existing databases.²⁵ Second, “data summaries and analyses that the Commission may routinely require to carry out its functions and other data summaries and analyses that the Commission may require from time to time.”²⁶ Third, SPC-OFP facilitates access to these data by WCPFC Secretariat staff, as was appropriate.²⁷

The arrangements in the WCPFC are probably most similar to those of *Inter-American Tropical Tuna Commission* (IATTC).²⁸ The difference is that there is a contractual relationship between WCPFC Secretariat and SPC-OFP for housing of the WCPFC database and provision of scientific services, whereas in IATTC the database and scientific capacity is housed within the IATTC Secretariat.²⁹ In IATTC, the majority of data for the purse seine fishery are collected by the IATTC Secretariat directly from logbooks directly provided to IATTC Secretariat, through the IATTC

²³ As will be discussed under 8.3 *Maintaining confidentiality of data on tuna fisheries and sharing data* there are effective arrangements in place within SPC-OFP databases to ensure that data provided to SPC-OFP can be distinguished and easily isolated from data provided to the WCPFC.

²⁴ WCPFC-SPC memorandum of understanding, p2.

²⁵ Ibid., Annex I Agreement for the Provision of Scientific Services to the Commission and Assistance to Members by the Secretariat of the Pacific Community, 1 January – 31 December 2007.

²⁶ Ibid., p2.

²⁷ Ibid., Annex I Agreement for the Provision of Scientific Services to the Commission and Assistance to Members by the Secretariat of the Pacific Community, 1 January – 31 December 2007.

²⁸ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics. La Jolla, California, USA, 13-16 December 1993*, FAO Fisheries Report 500 (Rome: FAO, 1994), 43-46, *IATTC_Data*, [website] (IATTC, 05 September 2007 [cited 29 January 2008]); available from <http://www.iatcc.org/DataENG.htm>, P. Ward, N. Tsirbas, and R. Kearney, *Getting Science into Regional Fisheries Management - A Global View* (Canberra, Australia: Bureau of Research Sciences, 1998), 29-31.

²⁹ P. Ward, N. Tsirbas, and R. Kearney, *Getting Science into Regional Fisheries Management - A Global View* (Canberra, Australia: Bureau of Research Sciences, 1998), 29-31.

observer programme and from unloading data directly provided by the canneries.³⁰ Detailed records for the longline fishery are not maintained by IATTC, and instead the IATTC Secretariat compiles aggregated catch and effort data provided by the relevant flag State (generally five-degree-square by flag, by month for each tuna species).³¹

Issues for Pacific Island States

Chapter 6 showed that the Oceanic Fisheries Programme of the Secretariat of the Pacific Community (SPC-OFP) has a pivotal role in assisting Pacific Island States with the collection, compilation and analysis of data on western and central Pacific Ocean tuna fisheries.³² Recognising this role of SPC-OFP, this section will discuss some of the implications of the WCPFC-SPC memorandum of understanding to Pacific Island States.

Pacific Islands States gave extensive consideration to the services of SPC-OFP being utilized by the WCPFC including during the negotiation of the WCPF Convention. The report of the inaugural SPC Heads of Fisheries Meeting in 1999 stated that “OFP involvement in the provision of such activity would enhance the value of scientific support for member countries and should be supported, provided: (1) that the delivery of existing additional services to member countries would not be compromised; (2) that additional scientific advisory work for the Commission be undertaken only if additional resources are made available for such work; and (3) that periodic review of OFP work be undertaken to ensure that the needs and interests of member countries are being fully accommodated.”³³ Similar support for SPC-OFP involvement as scientific service provider and database contractor to the WCPFC were expressed at the 2003

³⁰ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics*. La Jolla, California, USA, 13-16 December 1993, FAO Fisheries Report 500 (Rome: FAO, 1994), 43-46, *IATTC_Data*, [website] (IATTC, 05 September 2007 [cited 29 January 2008]); available from <http://www.iattc.org/DataENG.htm>, P. Ward, N. Tsirbas, and R. Kearney, *Getting Science into Regional Fisheries Management - A Global View* (Canberra, Australia: Bureau of Research Sciences, 1998), 29-31.

³¹ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics*. La Jolla, California, USA, 13-16 December 1993, FAO Fisheries Report 500 (Rome: FAO, 1994), 43-46, *IATTC_Data*, [website] (IATTC, 05 September 2007 [cited 29 January 2008]); available from <http://www.iattc.org/DataENG.htm>, P. Ward, N. Tsirbas, and R. Kearney, *Getting Science into Regional Fisheries Management - A Global View* (Canberra, Australia: Bureau of Research Sciences, 1998), 29-31.

³² See Chapter 6 6.1 *Regional institutions and instruments that assist Pacific Island States* and 6.3 *Analysis of arrangements post-collection of data on tuna fisheries in Pacific Island States*.

³³ SPC, *First Heads of Fisheries Meeting, Noumea New Caledonia 9 -13 August* (Noumea: Secretariat of the Pacific Community, 1999), Section 8.3 Future role of OFP.

Heads of Fisheries Meeting.³⁴ Furthermore the PrepCon briefing paper to Pacific Island States, which was prepared by the FFA Secretariat and SPC-OFP, identified a number of reasons why Pacific Island States interests would be served by ensuring that SPC-OFP should be the principal data and scientific service provider to the WCPFC, at least for the medium-term.³⁵ These rationale for supporting SPC-OFP being contracted by the WCPFC included that such an arrangement was consistent with the WCPFC Convention, and that would be cost-effective for the WCPFC to use the existing capacities of SPC-OFP, especially in the early years of WCPFC's establishment, rather than directing efforts and resources of the Commission to duplicate capacities which already exist.³⁶ Also noted was that "SPC-OFP is the pre-eminent organisation in the handling of data and undertaking of scientific research on the major stocks covered by the Commission, with a demonstrated capacity to do the kind of work that the Commission will need."³⁷ The contracting of SPC-OFP by the WCPFC was noted to be consistent with practices in other tuna RFMOs of keeping data management function and core stock assessment functions in the same institution, so as to facilitate efficient access to data.

Pacific Island States were also particularly concerned about the implications that might arise if the WCPFC did not utilise the services of SPC-OFP as data contractor and scientific services provider. It was felt that there would be potential for duplication of efforts, because the alternative to having SPC-OFP provide these services would be through the WCPFC Secretariat itself or maybe another organisation would provide them to the WCPFC.³⁸ There was some concern that under this alternative scenario, it would be difficult to justify to donors that there was a need to maintain levels of funding to SPC-OFP for regional data collection and stock assessment.³⁹ Furthermore, reduced funding to SPC-OFP in these areas would undermine the current levels of assistance to Pacific Island States. For example if the WCPFC established a separate database service this would duplicate the existing data arrangements at SPC-OFP, but

³⁴ SPC, *Outputs to the Third Heads of Fisheries Meeting, Noumea New Caledonia 8 -23 August* (Noumea: Secretariat of the Pacific Community, 2003).

³⁵ FFA, *FFA Negotiation Brief for the Fifth Session of the Preparatory Conference (Rarotonga, Cook Islands. 29 September – 3 October 2003)*, FFA54/WP1 (Honiara: Pacific Islands Forum Fisheries Agency, 2003).

³⁶ Ibid.

³⁷ Ibid.

³⁸ Authors personal observations during PreCon3 (2001) – PrepCon6 (2004) and personal communications with J. Hampton, Oceanic Fisheries Programme Manager, SPC, and T. Adams, SPC, Director Marine Fisheries.

³⁹ Ibid.

Pacific Island States would still need the kind of data services provided by SPC-OFP for national tuna fisheries management and compilation of data on tuna fisheries.⁴⁰ Also, the quality of the scientific advice SPC-OFP could provide to Pacific Island States (as SPC and FFA members) could be undermined, because of lack of involvement of SPC-OFP in western and central Pacific Ocean tuna stock assessments and possibly lack of access to data from fishing nations that were traditionally provided to SPC-OFP.⁴¹ Even if the WCPFC were to take on some of the assistance provision to Pacific Island States, it was unlikely that the WCPFC would provide these services to Pacific Island States, in the way that it is a core function of SPC-OFP. These concerns have been considered in the current form of the WCPFC-SPC memorandum of understanding.

The WCPFC-SPC memorandum of understanding states that SPC-OFP is to continue the assistance it already provides to Pacific Island States and other SPC members. These forms of assistance are noted to possibly include *inter alia* assistance in monitoring the fishing activities of national fleets and foreign fleets fishing within Pacific Island exclusive economic zones (EEZs); assistance in data management, and in particular in satisfying the data reporting obligations to the Commission; and auditing of national fishery monitoring and data management systems.⁴² These services to the WCPFC in many ways are complementary to those that SPC-OFP already provides to assist Pacific Island States in data compilation and analysis.⁴³

Importantly for Pacific Island States, a fundamental principle that underpins the current terms of the WCPFC-SPC memorandum of understanding is that “additional tasks that might be undertaken by the OFP to service this arrangement would be on a full cost-recovery basis, without impacting existing OFP services to member countries.”⁴⁴ Accordingly the WCPFC-SPC memorandum of understanding states:

The Commission will provide financial support for the provision of scientific services and for the provision of assistance to Commission members as agreed

⁴⁰ Ibid.

⁴¹ Ibid.

⁴² Other forms of assistance that are more related to the “scientific services provider” aspects of SPC-OFPs role may include *inter alia* assistance in the interpretation of scientific information being provided to the Commission; scientific advice for the management of national fisheries consistent with the objectives of the Commission; and assistance in the implementation of management measures adopted by the Commission. (WCPFC-SPC memorandum of understanding, p3).

⁴³ See Chapter 6 6.3 *Analysis of arrangements post-collection of data on tuna fisheries in Pacific Islands States*.

⁴⁴ Secretariat of the Pacific Community, *Marine Resources Division Director's Report 2003, HoF4/WP1* (Noumea: Secretariat of the Pacific Community, 2004), p6. The Marine Resources Division Director describes the Commission that this was something that was clearly understood within the Commission at its first meeting in December 2004.

in the Service Agreements. In respect of scientific services, it is recognised that the SPC-OFP through its regular work programme, already undertakes a considerable portion of the scientific work required by the Commission. Initially, it is expected that the Commission will fund only the work required for the provision of scientific services that is additional to the SPC OFP's regular work programme. However, as the Commission's financial base becomes established, the Commission will assume, over a time-frame and according to a formula to be mutually agreed, a greater responsibility for the full range of scientific services provided by SPC OFP in support of the work of the Commission.⁴⁵

The additional costs are included in the Annual Service Agreement annexed to the WCPFC-SPC memorandum of understanding. These database-related expenses are the annual salary of a professional staff member within SPC-OFP and some computing costs.⁴⁶ An example of additional work to that in SPC-OFP regular work programme, where the WCPFC would have to provide additional budgetary resources, would be the provision of assistance services to WCPFC members outside the SPC membership, for example assistance to Indonesia and the Philippines with provision of data on tuna fisheries to the Commission.⁴⁷

Long-term arrangements for compiling of data on tuna fisheries in the western and central Pacific Ocean

The WCPFC contracting of SPC-OFP as data contractor and scientific services provider is a short-term arrangement. This is because recommendation of PrepCon, which was adopted by the Commission, was that the services of SPC-OFP be utilised during the “transitional period” and the transitional period was noted to be “the period between the Commission being established and the Commission becoming a fully-functional regional fisheries management organisation”. During PrepCon it was agreed that there were advantages in utilising pre-existing arrangements of SPC-OFP as scientific service provider and data-contractor. However, some PrepCon participants had a level of discomfort in committing permanently to the WCPFC utilising SPC-OFP as contractor for database services to the WCPFC and preferred maintaining the option of the WCPFC in the long-term establishing in-house data compilation capability and

⁴⁵ WCPFC-SPC memorandum of understanding, p3.

⁴⁶ Ibid., Annex I Agreement for the Provision of Scientific Services to the Commission and Assistance to Members by the Secretariat of the Pacific Community, 1 January – 31 December 2007. The Annual Service Agreement includes a total cost for data management services by SPC-OFP on behalf of the Commission in 2007.

⁴⁷ Ibid., p3.

scientific services.⁴⁸ Therefore the compromise that was reached during the PrepCon was that the PrepCon should recommend to the Commission that the SPC-OFP should be contracted as the data-contractor (and scientific services provider) for the transitional period (3-5 years). Additionally there should also be an *independent review of the transitional scientific structure and function* “to determine the effectiveness of the science structure and to recommend changes as appropriate.”⁴⁹

The “independent review” was originally recommended to occur within two years following entry into force of the WCPF Convention that is by the end of 2006. However, the finalisation and approval of the terms of reference for the “independent review” has taken some time to negotiate through the Commission process.⁵⁰ The Scientific Committee finalised a recommendation to the Commission relating to the scope, steering committee, reviewer attributes, indicative time line, budget and draft expression of interest circular.⁵¹ At WCPFC4 in 2007, this Scientific Committee recommendation was subsequently approved, and an expression of interest for consultants to undertake the “independent review” was circulated by the WCPFC Secretariat in early 2008.⁵² Assuming the expression of interest is successful, the indicative timeframe proposes that the reviewers will participate in WCPFC meetings throughout 2008, with a report back to each of the relevant subsidiary bodies in 2009

⁴⁸ Authors personal observations, participating in WGII discussions on this particular issue.

⁴⁹ *Final Report of Working Group II: WCPFC/PrepCon/45, WCPFC/PrepCon/41* (Pohnpei, Federated States of Micronesia: 2004), p5 para 16, *Report of the Second Meeting of the Scientific Coordinating Group (SCG2): WCPFC/PrepCon/28*, (Rarotonga, Cook Islands: 2003), para 25, *Working Group II: Scientific Structure and Provision of Interim Scientific Advice - Summary Report by the Chairman of Working Group II on its work during PrepConV: WCPFC/PrepCon/32*, (Rarotonga, Cook Islands: 2003), para 25.

⁵⁰ At SC2, the Scientific Committee formulated a recommendation for a process, a schedule and an information package for the expression of interest for the independent review which was to commence in 2007. However the Commission at WCPFC3 requested the Scientific Committee to re-examine the terms of reference for the review and to resubmit for consideration of the Commission at WCPFC4. At SC3, the Scientific Committee subsequently revised the recommendation to the Commission. This revised recommendation included specific recommendations on the proposed review’s scope, steering committee, terms of reference for the steering committee, review attributes, dissemination of expression of interest for the review, budget and indicative schedule. This revised recommendation was subsequently adopted by the Commission at WCPFC4.

⁵¹ WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2007), Attachment P - Independent Review of the Commission's Transitional Science Structure and Function.

⁵² The terms of reference for the independent review are included herein as Appendix 9. WCPFC, *Summary Record of the Fourth Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 3-7 December 2007* (Tumon, Guam, USA: 2007), para 107-108.

and a final report to the Commission in December 2009 (WCPFC6). It should be noted that based on the previous discussion, the outcome from the Independent Review of Scientific Structure and Function will be important to Pacific Island States and long-term data practices in the WCPFC.⁵³

8.2 Verifying data on tuna fisheries

As was discussed in Chapter 3 (3.2 *Verifying data on tuna fisheries*), verification of data is essential to ensure the highest quality data on tuna fisheries are obtained, that is data are accurate, complete and give a true indication of the state or value of the factors under question.⁵⁴ The WCPFC should give high priority to the verification of data on catch, effort and bycatch, given that misreporting of commercial data is recognised as a factor leading to errors in scientific assessments.⁵⁵ Verification of data involves crosschecking multiple sources of data to fill in gaps in time series of data, to identify errors and anomalies, and to detect and adjust for sources of bias in data.

The WCPF Convention obliges WCPFC members, in giving effect to their duty to cooperate through WCPFC, to collect and share, *complete* and *accurate* data concerning fishing activities.⁵⁶ As was discussed in Chapters 2 and 3, the references to “complete” data implies that data on tuna fisheries should be without gaps or omissions and the references to “accurate” implies that data on tuna fisheries should be without errors. Together these references to “complete and accurate” imply that data verification practices are required in the WCPFC.

The Commission is required, in accordance with WCPF Convention Article 10(1d) to “adopt standards” for verification of data on fisheries “for highly migratory

⁵³ Authors personal observation at WCPFC3, SC2 and SC3. Through the negotiation of the terms for the independent review at Scientific Committee and WCPFC sessions, Pacific Island States together with like-minded participants sought to ensure that the review was adequately resourced and also remained independent and impartial. A few participants appeared concerned that there was a need for formal committee oversight of the review process, to retain control of the outcomes of the review process. The concern of Pacific Island States and many other like-minded participants was that such an oversight committee might compromise the transparency and independence of the review process. The eventual role of the review committee will be to assist the WCPFC Secretariat with selection of the successful consultant bid and in administration of the independent review process.

⁵⁴ FAO, *Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, FAO Fisheries Technical Paper 382* (Rome: FAO, 1999), p73.

⁵⁵ FAO, *Report of the Technical Consultation on High Seas Fishing. Rome, 7-15 September 1992, FAO Fisheries Report 484* (Rome: FAO, 1992), p4 (para 28).

⁵⁶ WCPF Convention, Article 5(i). The corresponding international legal provisions are: UN Fish Stocks Agreement, Article 5 (j) and Article 10 (f).

fish stocks in accordance with the Annex I of the [UN Fish Stocks Agreement], which shall form an integral part of this Convention.” As was noted in Chapter 3, Annex I of the UN Fish Stocks Agreement states that where possible, it should be a standard requirement in collecting and sharing fisheries data that “all data should be verified to ensure accuracy” and WCPFC members “should ensure that fishery data are verified through an appropriate system.”⁵⁷ Some guidance on the tools that could be used to verify fisheries data is provided in UN Fish Stocks Agreement Annex I Article 6. These include (1) position verification through vessel monitoring systems (VMS); (2) scientific observer programmes to monitor catch, effort, catch composition (target and non-target) and other details of fishing operations; (3) vessel trip, landing and transshipment reports; and (4) port sampling.⁵⁸ Similarly, international best practice recommended for tuna RMFOs is to establish integrated monitoring, control and surveillance systems, which include as components these four verification tools.⁵⁹ For example, the meeting report for the Joint Tuna RFMO stated that integrated monitoring, control and surveillance systems were necessary in tuna RFMOs, and should include “VMS, observers, boarding and inspection schemes, port state controls, market state measures, stronger controls on transshipment, and monitoring of bluefin tuna farming, and the harmonisation of those measures across the five tuna RFMOs where appropriate to avoid duplication and increase cost efficiency.”⁶⁰ An integrated monitoring control and surveillance system should ensure that the quality of data on tuna fisheries is

⁵⁷ UN Fish Stocks Agreement, Annex I Article 1(1) and 2(b).

⁵⁸ Ibid., Annex I Article 6.

⁵⁹ FAO Fishery Resources Division and Fishery Policy and Planning Division, *Fisheries Management*, vol. 4, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 1997), p28. recommended the same four possible mechanisms as those set out in UN Fish Stocks Agreement Annex I Article 6, as well as five additional possible mechanisms: comparing landing statistics with certificates of origin, trade and commodity; production statistics (eg processed fish) and similar sources of information; inspecting data collection methods by statistical staff; interviews with fishers; reporting from sea on retained catch on entering and leaving the fishing zones; and, instituting airborne and shipboard surveillance, associated with the boarding of vessels. FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics. La Jolla, California, USA, 13-16 December 1993*, *FAO Fisheries Report 500* (Rome: FAO, 1994). A similar list to that of FAO Technical Guidelines was noted as possible mechanisms to verify fisheries data, however no particular verification procedure/s were recommended. They were to be determined for each fishery based on its size and characteristics. Also noted the importance of data verification at national and regional levels and that standard procedures should be developed and employed.

⁶⁰ *Report of the Joint Meeting of Tuna RFMOs, January 22-26*, (Kobe, Japan: 2007). Also see High Seas Task Force, *Closing the net: Stopping illegal fishing on the high seas* (France: Governments of Australia, Canada, Chile, Namibia, New Zealand and the United Kingdom, WWF, IUCN and the Earth Institute at Columbia University, 2006), M. W. Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007).

improved, because landing and/or catch of WCPFC members within the Convention Area can be verified and illegal unregulated and unreported (IUU)-caught tuna products can be detected.⁶¹ The key elements of such an integrated monitoring control and surveillance system within the WCPFC should include the following four elements.

The first element is data verification for the location of fishing effort through *vessel monitoring systems* (VMS), preferably with the central operation of the VMS through the WCPFC or simultaneous transmission to both the WCPFC and flag State.⁶² The second element is *at-sea scientific observer programmes and port sampling* as a means of collecting and verifying catches of target and non-target species and for estimating discards.⁶³ The third is *documentation schemes covering all components* of the catch of tunas rather than just that portion of fishery products entering international trade, so that catch and landing statistics can be compared with certificates of origin, trade and commodity. A comprehensive documentation scheme would provide for verification of the species caught, the weight of the catch, when the catch was taken and the area in which the catch was taken.⁶⁴ Fourth, *a prohibition of transshipment at-sea or closer monitoring* through a comprehensive compliance observer programme to supervise all transshipment operations at sea and to verify the amount and composition

⁶¹ M. Lack, *Catching On? Trade-related Measures as a Fisheries Management Tool* (Sydney: TRAFFIC International, 2007), *Report of the Joint Tuna RFMO Working Group on Trade and Catch Documentation Schemes, 22-23 July 2007*, (Rahleigh, North Carolina, USA: 2007).

⁶² Mary Lack, *Catching On? Trade-related Measures as a Fisheries Management Tool* (Sydney: TRAFFIC International, 2007), p20, Mary Lack, *With an eye to the future: addressing failures in the global management of bigeye tuna* (Sydney, Australia: Traffic International and WWF Australia, 2007), p55, Michael W Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007), p31.

⁶³ FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p57, M. Lack, *With an eye to the future: addressing failures in the global management of bigeye tuna* (Sydney, Australia: Traffic International and WWF Australia, 2007), p55, M. W. Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007), p31.

⁶⁴ FAO Fisheries Department, *Implementation of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing*, vol. 9, FAO Technical Guideline for Responsible Fisheries (Rome: FAO, 2002). Catch certification and catch documentation schemes provide market and trade incentives to improve real time monitoring of the fishery and act as a deterrent to IUU fishing, such schemes have the added advantage of providing a real time verification of the data, particularly catch data. Constraints include the need for regional and international coordination, compatibility of multiple schemes, requirement to have market states cooperation, skipper cooperation and a reliable third party to verify the catch source. Whether or not such schemes can be justified for lower value species or species caught in bulk is questionable, although for high value species under exploitation threats such as Bluefin and Bigeye Tuna there should be easy justification.

transhipped.⁶⁵ Chapter 3 found that at the time of writing this thesis most tuna RFMOs had not yet fully implemented the four elements that are recommended as international best practice for an integrated system of monitoring control and surveillance, but tuna RFMOs are making progress towards meeting recommended standards for best practice for verification of fisheries data.⁶⁶

The progress of the WCPFC in establishing each of the above four elements of an integrated monitoring control and surveillance system will now be analysed. The analyses will detail the progress in the WCPFC in establishing the programmes for each element, relative to (1) WCPF Convention obligations; (2) international best practice recommendations for an integrated monitoring control and surveillance system for verification of data on tuna fisheries; and (3) approaches in other tuna RFMOs. The implications for Pacific Island States of WCPFC practices will also be discussed. It should be noted that the WCPF Convention specifies that the Technical and Compliance Committee (TCC) has a role in the development and implementation and review of WCPFC mechanisms to verify data on tuna fisheries.⁶⁷

Establishment of Commission VMS for the WCPFC

The contribution of vessel monitoring systems (VMS) to an integrated monitoring, control and surveillance system in a tuna RFMO is that it enables the location of fishing effort to be verified. As was noted in Chapter 3, international best practice for RFMOs recommends the central operation of a VMS through the relevant tuna RFMO Secretariat, or with simultaneous transmission to both the relevant tuna RFMO and flag State.⁶⁸ Chapter 3 found that progress in other tuna RFMOs in the establishment of a

⁶⁵ M. Lack, *With an eye to the future: addressing failures in the global management of bigeye tuna* (Sydney, Australia: Traffic International and WWF Australia, 2007), M. Lack, *Catching On? Trade-related Measures as a Fisheries Management Tool* (Sydney: TRAFFIC International, 2007), M. W. Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007).

⁶⁶ See Chapter 3 3.2 *Verifying data on tuna fisheries*.

⁶⁷ WCPF Convention, Article 14(2) Functions of the TCC: “in carrying out its functions, the committee shall... (d) consider and investigate such other matters as may be referred to it by the Commission, including developing and reviewing measures to provide for the verification and validation of fisheries data.”

⁶⁸ Mary Lack, *Catching On? Trade-related Measures as a Fisheries Management Tool* (Sydney: TRAFFIC International, 2007), p20, Mary Lack, *With an eye to the future: addressing failures in the global management of bigeye tuna* (Sydney, Australia: Traffic International and WWF Australia, 2007), p55, Michael W Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional*

VMS has been mixed and there is only initial progress in meeting international best practice recommendations.⁶⁹

The *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT) has an in-principle agreement to establish a VMS program, but is currently negotiating the specifics of the program.⁷⁰ *Inter-American Tropical Tuna Commission* (IATTC), *International Commission for the Conservation of Atlantic Tunas* (ICCAT) and *Indian Ocean Tuna Commission* (IOTC) have all established VMS programs. However, in general these VMS programs rely on flag State implementation, and the requirements are limited to larger-sized fishing vessels: fishing vessels greater than 24m length for IATTC and ICCAT; and greater than 15m length for IOTC.⁷¹ ICCAT is the only of these other tuna RFMOs to have established a requirement for the flag State to transmit VMS reports to the Commission Secretariat; however this requirement whilst commencing in 2008 will initially be applicable to fishing vessels larger than 24 m length that are catching Atlantic bluefin tuna.⁷² Also by 2010, the ICCAT eastern Atlantic and Mediterranean Atlantic bluefin recovery program will expand the coverage of the VMS program to fishing vessels that are larger than 15 m length that are catching bluefin tuna.⁷³

For the WCPFC VMS program, there are specific provisions within the WCPFC Convention that are important. Article 24 paragraphs 8, 9 and 10 requires that flag

Fisheries Management Organizations (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007), p31.

⁶⁹ See Chapter 3 3.2 *Verifying data on tuna fisheries*.

⁷⁰ CCSBT, *Report of the Thirteenth Annual Meeting of the Commission, 10-13 October 2006* (Miyazaki, Japan: Commission for the Conservation of Southern Bluefin Tuna, 2006).

⁷¹ IATTC, *Resolution on the Establishment of a Vessel Monitoring System (VMS) (Resolution C-04-06)*, ICCAT, *Recommendation by ICCAT concerning minimum standards for the establishment of a vessel monitoring system in the ICCAT Convention Area (Recommendation 03-14)* (June 19 2004), IOTC, *Resolution on establishing a vessel monitoring system programme (Resolution 06/03)*.

⁷² ICCAT, *Recommendation by ICCAT to establish a multi-annual recovery plan for bluefin tuna in the eastern Atlantic and Mediterranean (Recommendation 06-05)* (June 13 2007), ICCAT, *Recommendation by ICCAT concerning data exchange format and protocol in relation to the vessel monitoring system (VMS) for the bluefin tuna fishery in the ICCAT Convention Area (Recommendation 07-08)*.

⁷³ ICCAT, *Recommendation by ICCAT to establish a multi-annual recovery plan for bluefin tuna in the eastern Atlantic and Mediterranean (Recommendation 06-05)* (June 13 2007). In regards to the requirements on flag States to verify bluefin catch and effort data, the ICCAT eastern Atlantic and Mediterranean Bluefin Tuna Recovery Program states that ICCAT members: “shall verify, including by using VMS data, the submission of logbooks and relevant information recorded in the logbooks of their vessels, in the transfer/transshipment document and in the catch documents. The competent authorities shall carry out administrative cross checks on all landings, all transshipment or caging between the quantities by species recorded in the vessel logbook or quantities by species recorded in the transshipment declaration and the quantities recorded in the landing declaration or caging declaration, and any other relevant document, such as invoice and/or sales notes”(ICCAT, *Recommendation by ICCAT to establish a multi-annual recovery plan for bluefin tuna in the eastern Atlantic and Mediterranean (Recommendation 06-05)* (June 13 2007), para 44.)

States ensure that their flag vessels have and use VMS transmitters when within the Convention Area.⁷⁴ Furthermore, the VMS transmitters must be used in accordance with standards, specifications and procedures for the use of such transmitters that are adopted by the Commission for high seas areas and, that are determined by coastal States for its areas under national jurisdiction.⁷⁵ The Commission is to receive VMS data in accordance with procedures to be agreed by the Commission, relating to the high seas areas of the Convention Area.⁷⁶ WCPFC members that are coastal States may request that waters under its national jurisdiction be included in the area covered by the Commission VMS, and through this can receive VMS data relating to its areas under national jurisdiction.⁷⁷ The Commission is to adopt appropriate procedures to protect the confidentiality of information received through the Commission VMS.⁷⁸ However, the WCPF Convention is silent on the potential application of VMS data for position verification of vessels logsheet catch and effort data.

In terms of progress to date in the WCPFC for the establishment of a WCPFC VMS some good progress has been made in negotiations to implement WCPF Convention Article 24 paragraphs 8, 9 and 10. In 2007, the Commission took a formal decision to establish the Commission VMS: the framework is set out in Conservation and Management Measure for Commission VMS.⁷⁹ The Commission VMS will be activated on 1 January 2008 initially for vessels only larger than 24 m but after one year will apply to all vessels.⁸⁰ Except that there is a north-west quadrant of the Convention Area (north of 20°N and west of 175 °E that will be activated at a date to be determined by the Commission.⁸¹

⁷⁴ WCPF Convention, Article 24(8 and 9).

⁷⁵ Ibid., Article 24(8 & 9).

⁷⁶ Ibid., Article 24(8).

⁷⁷ Ibid.,

⁷⁸ Ibid.,

⁷⁹ This decision is reproduced herein as Appendix 10. WCPFC, *Conservation and Management Measure for Commission Vessel Monitoring System (CMM 2007-02)* (As adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007). The 2007 decision rescinds the previous decision of the Commission in 2006 on the Commission VMS (WCPFC, *Conservation and Management Measure for Commission VMS (CMM 2006-06)* (As adopted at Third Regular Session of the Commission, Apia Samoa, 11-15 December 2006).)

⁸⁰ WCPFC, *Conservation and Management Measure for Commission Vessel Monitoring System (CMM 2007-02)* (As adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 6(a and b).

⁸¹ Ibid., para 3. Pursuant to WCPF Convention Article 11(7), this northern quadrant is within the area of competence of the Northern Committee. The Commission may await a recommendation from the Northern Committee before activating the Commission VMS in this part of the Convention Area. However to ensure that any delay in implementing the Commission VMS to this area does not result in creation of a loophole, CMM 2007-02 paragraph 4 states that “Any fishing vessels fishing for highly

The WCPFC Commission VMS will be “a stand-alone system: developed in and administered by the Secretariat of the WCPFC under the guidance of the Commission, which received data directly from fishing vessels operating on the high seas in the Convention Area.”⁸² This arrangement in the WCPFC of having central operation of the Commission VMS within the WCPFC Secretariat is unlike the VMS programs currently operating in other tuna RFMOs. As was discussed above in other tuna RFMOs, VMS data are collected by the flag State and only where required is the VMS data then re-transmitted by the flag State to the relevant tuna Commission. Unlike other tuna RFMOs, the WCPFC Commission VMS system, once fully-implemented, should achieve the recommended standard for international best practice relating to data verification for the location of fishing effort through VMS.⁸³

There are a number of rules and procedures for the operation of the Commission VMS that are still to be developed.⁸⁴ The rules and procedures that are to be developed include those for *inter alia* vessel reporting, such as the specification of data required, its format and reporting frequencies; rules on polling; contingency reporting; cost issues obligations and roles of fishing vessels, WCPFC members, FFA Secretariat and the Commission Secretariat.⁸⁵ Additionally security standards of the Commission VMS data are to be developed, and these will be essential to enabling access to Commission VMS data for data verification purposes. Consequently, it will be some time before the WCPFC Commission VMS can be used for verification of catch and effort data.⁸⁶

migratory fish stocks on the high seas within the areas of the Convention Area described in para 2 that move into the area north of 20°N and west of 175 °E shall keep their ALCs activated and continue to report the Commission in accordance with this Conservation and Management Measure.”

⁸² Ibid., para 7(a).

⁸³ Mary Lack, *Catching On? Trade-related Measures as a Fisheries Management Tool* (Sydney: TRAFFIC International, 2007), p20, Mary Lack, *With an eye to the future: addressing failures in the global management of bigeye tuna* (Sydney, Australia: Traffic International and WWF Australia, 2007), p55, Michael W Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007), p31.

⁸⁴ WCPFC, *Conservation and Management Measure for Commission Vessel Monitoring System (CMM 2007-02)* (As adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 7(b).

⁸⁵ Ibid.

⁸⁶ At the time of writing, a timeline for towards finalising these rules and procedures was circulated by the Chair of the WCPFC VMS Working Group, that aims to have all necessary tasks completed before the 1 January 2008 activation date. WCPFC Secretariat, "Re: VMS Working Group," *WCPFC Circular* 2008/02 February 4, 2008.

Issues for Pacific Island States

The outcomes to date of negotiations in the Commission for the establishment of the Commission VMS have a number of positive implications for Pacific Islands States. First, the WCPFC decision for the Commission VMS includes that the Commission VMS will have “the added capability that it can accept VMS data forwarded from the FFA VMS, so that the fishing vessels operating on the high seas in the Convention Area will have the option to report data via the FFA VMS.”⁸⁷ This provision recognises the existing arrangements and existing standards for VMS that are currently used by Pacific Island States in their exclusive economic zones (EEZ).⁸⁸ The FFA VMS is already being used by many fishing vessels currently operating in the WCPFC Convention Area. For Pacific Island States this arrangement ensures the Commission VMS will be developed in a way that is compatible with the FFA VMS. So it will be technologically feasible for VMS data to be exchanged between the Commission VMS and FFA VMS, whether or how such exchange occurs to enable Pacific Island States to access Commission VMS data will be dependent on the WCPFC rules for access to Commission VMS data that are still to be negotiated.⁸⁹

Second, the *Conservation and Management Measure for Commission Vessel Monitoring System* also includes that any WCPFC member or participating territory “may request, for the Commission’s consideration and approval, that waters under its national jurisdiction be included within the area covered by the Commission VMS. Necessary expenses incurred in the inclusion of such area into the Commission VMS shall be borne by the [WCPFC member or participating territory] which made the request.”⁹⁰ This provision could be important, if for example Pacific Island States wanted to access data from the Commission VMS to monitor the activities of all fishing vessels in the areas immediately adjacent to their EEZ. Alternatively Pacific Island States might want to verify that fishing vessels active in their EEZ were in fact licensed,

⁸⁷ WCPFC, *Conservation and Management Measure for Commission Vessel Monitoring System (CMM 2007-02)* (As adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 7(a)..

⁸⁸ See Chapter 6 *Analysis of arrangements post-collection of data on tuna fisheries in Pacific Island States*. The FFA VMS was discussed in Chapter 6 as one of the monitoring control and surveillance tools that Pacific Island States have developed with the support of FFA Secretariat to monitor the activities of foreign fishing vessels in their EEZ. Also discussed in Chapter 6 was that the FFA VMS is being used for Pacific Island States to monitor vessels operating under the vessel days scheme.

⁸⁹ For further details on data exchange practices see 8.3 *Maintaining confidentiality of data on tuna fisheries and sharing data*.

⁹⁰ WCPFC, *Conservation and Management Measure for Commission Vessel Monitoring System (CMM 2007-02)* (As adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 6(c).

and verify that such fishing vessels did accurately report their fishing activities. For instance, such an arrangement would be in support of the Pacific Island States “Vessel Days Scheme” and its use as an effective conservation and management measure. For these benefits to be realised will depend, first, on the outcomes of negotiations on the WCPFC rules for access to VMS data and, second, the receipt of approval of the Commission for inclusion of that Pacific Island States EEZ. In regards to the latter, the potential cost-implications are expected to be minimal to Pacific Island States given the existing arrangements for the FFA VMS.

Third, at WCPFC4 the Commission adopted the “Pacific VMS cost-option” for the Commission VMS.⁹¹ It was noted in taking this decision that this option was “clearly superior in terms of capital and operating costs, and would meet all performance standards.”⁹² The selection of the “Pacific VMS cost-option” is consistent with the provisions of WCPF Convention Article 15(5), which relate to ensuring that the establishment and functioning of the WCPFC Secretariat is cost-effective through in this instance, taking into account the capacity of existing regional institutions to perform certain technical secretariat functions.⁹³ The advantage of the adoption of this arrangement is that immediate costs to WCPFC members are minimised, and as a result subject to the finalisation of the outstanding rules and procedures for the operation of the Commission VMS that were noted above, the WCPFC is on-track to have the Commission VMS activated by the date specified in *Conservation and Management Measure for Commission Vessel Monitoring System* on 1 January 2008. Use of a higher cost-option, may have further delayed the implementation start date of the Commission VMS.

⁹¹ WCPFC, *Summary Record of the Fourth Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 3-7 December 2007* (Tumon, Guam, USA: 2007), para 146 and Attachment K. The other two alternative cost options considered were first “Pohnpei Turn-key” which was establishment of all hardware and infrastructure at the Commission headquarters in Pohnpei, Federated States of Micronesia. Second, “Contracted data centre” which involved consideration of hosting of the Commission VMS at an unspecified site with appropriate, also with establishment of all hardware and infrastructure. The second option had some cost-savings relative to the first because the second would be housed outside of Pohnpei where telecommunications systems are more advanced. The “Pacific VMS option” however shared most of the recently upgraded FFA VMS hardware and infrastructure, but the Commission VMS and FFA VMS will be securely operated independent of one another.

⁹² Ibid., para 146.

⁹³ WCPF Convention, Article 15(5).

Establishment and design of the WCPFC Regional Observer Programme

As was noted previously throughout this thesis, observer programmes are the best way to estimate fishery interactions, including catches, of non-target, associated and dependent species. Especially those species which are difficult for fishers to identify to species level or which are of little commercial value and that tend not to be accurately reported by fishers on logsheets.⁹⁴ As part of an integrated monitoring, control and surveillance framework, observer programmes and port sampling programmes are required to verify the catches of and to estimate levels of discards of target and non-target species in fishing operations.

Chapter 3 noted that observer programmes in other tuna RFMOs vary in coverage and how they are administered.⁹⁵ *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT) and *Indian Ocean Tuna Commission* (IOTC) have implemented flag State administered national observer programmes.⁹⁶ Similarly, *International Commission for the Conservation of Atlantic Tunas* (ICCAT) has flag State administered observer programmes with minimum coverage level of 20% for fishing vessels catching bluefin tuna and 5% percent for longline fishing vessels catching bigeye tuna.⁹⁷ Whereas, *Inter American Tropical Tuna Commission* (IATTC) has a dedicated observer program administered by the IATTC Secretariat for purse seine vessels with 100% observer coverage.⁹⁸

Also from 2008, IOTC, ICCAT and IATTC will have all implemented a requirement for 100% observer coverage for transshipment by all large-scale longline vessels.⁹⁹ These details of arrangements in other tuna RFMOs for monitoring

⁹⁴ B. Molony, "Estimates of the mortality of non-target species with an initial focus on seabirds, turtles and sharks (WCPFC-SC1 Working Paper EB WP-1)," in *1st Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2005).

⁹⁵ See Chapter 3 3.1 *Verifying data on tuna fisheries*.

⁹⁶ CCSBT, *Report of the Seventh Annual Meeting of the Commission, 18-21 April 2001* (Sydney, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2001), IOTC, *Recommendation concerning the National Observer Programmes for Tuna Fishing in the Indian Ocean (Recommendation 01/01)*.

⁹⁷ ICCAT, *Recommendation by ICCAT on a Multi-year Conservation and Management Program for Bigeye tuna (Recommendation 04-01)* (June 13 2005), ICCAT, *Recommendation by ICCAT to establish a multi-annual recovery plan for bluefin tuna in the eastern Atlantic and Mediterranean (Recommendation 06-05)* (June 13 2007).

⁹⁸ IATTC, *Resolution on At-Sea Reporting (Resolution C-03-04)*, IATTC, *Resolution on Establishing a Program for Transshipments by Large-Scale Fishing Vessels (Resolution C-06-04)*.

⁹⁹ IATTC, *Resolution on Establishing a Program for Transshipments by Large-Scale Fishing Vessels (Resolution C-06-04)*, ICCAT, *Recommendation by ICCAT establishing a programme for Transshipment (Recommendation 06-11)* (June 13 2007), IOTC, *Resolution on establishing a programme for transshipment by large-scale fishing vessels (Resolution 06/02)*.

transshipment will be discussed in more detail in a subsequent section. However it should be noted that these forms of observer programmes for transshipment vessels are designed to verify the quantity and composition of unloadings from a subset of the fishing fleet (large-scale longline vessels). Transshipment observer programmes do not verify the catches of all species caught in longline fishing operations including discards.

The WCPF Convention requires that the WCPFC “Regional Observer Programme” is to be established by the Commission “to collect verified catch data, other scientific data and additional information related to the fishery from the Convention Area and to monitor the implementation of the conservation and management measures adopted by the Commission.”¹⁰⁰ Article 28 also sets out guidelines and principles for the Regional Observer Programme. These principles include that the Regional Observer Programme should provide a sufficient level of coverage, there should be appropriate procedures for ensuring security of non-aggregated data and for facilitating the dissemination of data to members.¹⁰¹

The WCPFC Regional Observer Programme was established by adoption of the *Conservation and Management Measure for the Regional Observer Programme*.¹⁰² Implementation commences in early 2008 based on the use of existing regional, subregional and national programmes already in operation in the WCPF Convention Area.¹⁰³ The implementation schedule provides for gradual development of the programme through to 2012, where 5% coverage of the effort in each fishery under the jurisdiction of the Commission will be achieved.¹⁰⁴ The objectives of the WCPFC

¹⁰⁰ WCPF Convention, Article 28(1).

¹⁰¹ Ibid., Article 28: “(6) The regional observer programme shall operate in accordance with the following guidelines and under the conditions set out in article 3 of Annex III of this Convention: (a) the programme shall provide a sufficient level of coverage to ensure that the Commission receives appropriate data and information on catch levels and related matters within the Convention Area, taking into account the characteristics of the fisheries; (7) The Commission shall develop further procedures and guidelines for the operation of the regional observer programme, including: (a) to ensure the security of non-aggregated data and other information which the Commission deems to be of a confidential nature; (b) for the dissemination of data and information collected by observers to the members of the Commission;”

¹⁰² This decision is reproduced herein as Appendix 11. WCPFC, *Conservation and Management Measure for the Regional Observer Programme (CMM 2007-01)* (As adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007). At WCPFC3, the Commission adopted Conservation and Management Measure 2006-07 ‘Conservation and Management Measure for the Regional Observer Programme’ which seeks to ensure the adoption of a programme document for the Regional Observer Programme at WCPFC4 in December 2007. The programme document was not finalised in time for WCPFC4, but a revised CMM was adopted by the Commission that set out the framework for the Regional Observer Programme and an implementation schedule.

¹⁰³ Ibid., Annex C - Implementation programme for the Regional Observer Programme.

¹⁰⁴ There three special exceptions provided for in Ibid., Annex C - Implementation programme for the Regional Observer Programme, para 9 and 10.. First, for fishing vessels that fish exclusively for fresh

Regional Observer Programme as set out in the measure shall be to “collect verified catch data, other scientific data, and additional information related to the fishery from the Convention Area and to monitor the implementation of conservation and management measures adopted by the Commission.”¹⁰⁵ The WCPFC Regional Observer Programme applies to vessels fishing exclusively on the high seas in the Convention Area, and to vessels that fish beyond their flag States area of national jurisdiction within the Convention Area¹⁰⁶ and it is to “consist of independent and impartial observers qualified in accordance with criteria approved by the Commission.”¹⁰⁷ The data verification activities of the Regional Observer Programme are likely to include: verification activities is likely to include verification of catch composition by species and sizes, particularly of bycatch and discards that are known to be underreported on logbooks, and also verification of catch and effort data, an operational level (set by set, haul by haul), that commonly is not able to be done with landings data.

Although progress has been made, more needs to be done for the WCPFC Regional Observer Programme to meet international best practice standards. There are two areas for improvement that are relevant to the future role of the WCPFC Regional Observer Programme in verification of data on western and central Pacific Ocean tuna fisheries. First, the implementation schedule currently anticipates a minimum level of coverage of 5% of fishing effort in each fishery by 2012.¹⁰⁸ This is a target that should be achievable within the time-frame, given that Chapter 6 reported that recent 2003-2005 average levels of coverage of total catches across all gear in the western and central Pacific Ocean, in data held by SPC-OFP is 5.8%, but for some fleets and gears that currently have negligible coverage, achieving the 5% minimum will still require a significant effort.¹⁰⁹

fish (highly migratory fish stocks that are live, whole or dressed/gutted but not further processed or frozen) in the area north of 20°N (area of the Northern Committee) awaiting recommendation from the Northern Committee. Second, for small vessels the implementation of the measure shall be deferred, subject to a definition for small vessels. Third, troll and pole-and-line vessels used for fishing skipjack tuna or albacore shall be deferred.

¹⁰⁵ Ibid., para 4.

¹⁰⁶ Ibid., para 5. “vessels fishing exclusively on the high seas and vessels fishing on the high seas and in waters under the jurisdiction of one or more coastal States and vessels fishing in the waters under the national jurisdiction of two or more coastal States.”

¹⁰⁷ Ibid., para 14(i).

¹⁰⁸ Ibid., Annex C - Implementation programme for the Regional Observer Programme.

¹⁰⁹ See Table 6.2 Average percent coverage of total catches within the western and central Pacific Ocean tuna fisheries by data held by SPC-OFP *SPC-OFP Data Coverage*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/Coverage/index.asp>. It should be noted that

However, it is likely that the five percent target minimum level of coverage is only a start towards achieving one of the general principles of the WCPFC Regional Observer Programme that it “shall provide a sufficient level of coverage as approved by the Commission to ensure that the WCPFC receives appropriate data and information on catch levels and any additional information related to the fisheries within the Convention Area, taking into account the characteristics of the fisheries.”¹¹⁰ As was discussed in Chapter 6, a minimum observer coverage rate of 20% across all gears, areas and flags, was shown to statistically achieve most scientific objectives in the western and central Pacific Ocean tuna fisheries, for instance providing adequate coverage of non-target, dependent and associated species.¹¹¹ Additionally, in order to monitor future conservation and management measures, dedicated observer programmes with higher levels of coverage may be required as part of the WCPFC Regional Observer Programme, for instance if the Commission adopted conservation and management measures that specify catch retention requirements for fishing vessels, fish aggregation device (FAD) requirements or non-target species mitigation requirements.¹¹²

Second, the data requirements of the WCPFC Regional Observer Programme are still to be determined, including the form of the Regional Observer Programme Workbook that will be used by observers to record data.¹¹³ It is a general principle of the WCPFC Regional Observer Programme that it “shall ensure the security and confidentiality of non-aggregated data and other information which the Commission deems to be of a confidential nature; the release of data and other information collected

coverage is inconsistent across fleets and areas, for example longline fisheries have 0.5% and purse-seine fisheries have 10.8%.

¹¹⁰ WCPFC, *Conservation and Management Measure for the Regional Observer Programme (CMM 2007-01)* (As adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 14(v).

¹¹¹ T. Lawson, *Data related tasks for the WCPFC Scientific Committee* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2005), p20. “In order to accurately and reliably estimate the catches of all species, including species of special interest, 100% coverage by observers is appropriate. If 100% coverage is not possible, then 20% is an appropriate target coverage rate for scientific objectives, given that further increases in coverage result in small incremental improvements in reliability of catch estimates based on observer data.”

¹¹² WCPFC, *Conservation and Management Measure for the Regional Observer Programme (CMM 2007-01)* (As adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), Annex C - Implementation programme for the Regional Observer Programme, para 8. WCPFC members “shall also be expected to meet any additional ROP observer obligations that may be included in any measure adopted by WCPFC, such as provisions of a catch retention measure, a FAD management measure or a transshipment measure. Such measures may include observer requirements for freezer longliners, purse seiners and/or carriers.”

¹¹³ Ibid., Annex C - Implementation programme for the Regional Observer Programme, para 2.

by the Commission ROP shall be in accordance with guidelines set out in the Commission's Rules and Procedures for Access to, and Dissemination of, Data compiled by the Commission."¹¹⁴ The WCPFC has made some progress in development of these rules and procedures, but there are some aspects that are still outstanding. The details of progress to date in development of such rules and procedures in the WCPFC will be discussed in a later section of the present Chapter. It will be contingent on finalisation of the Regional Observer Programme data requirements, Regional Observer Programme Workbook, as well as such rules and procedures for access to data, before the WCPFC and WCPFC members can use data from the Commission Regional Observer Programme to be able to effectively verify catches and estimate discards of target and non-target species.

Issues for Pacific Island States

The outcome to date in the establishment of the WCPFC Regional Observer Programme raises a few issues for Pacific Islands States. First, at least in the short-term, the WCPFC Regional Observer Programme will be implemented largely through using the existing subregional and national programmes of Pacific Islands States.¹¹⁵

First, it is the existing subregional and national observer programmes that largely are those of Pacific Island States which will comprise the Commission Regional Observer Programme at least in the short term. Chapter 7 found that these observer and port sampling programmes of Pacific Island States have contributed significantly to the current holdings of catch composition data, including data on impacts of fishing on non-target species, in the SPC-OFP regional statistical database.¹¹⁶ It is these catch composition data that are currently being utilised, in accordance with the WCPFC-SPC memorandum of understanding, for western and central Pacific Ocean tuna stock assessments and other scientific analyses of impacts of fishing on non-target species.

The arrangement to utilise all existing subregional and national observer programmes is in the short-term a cost-effective solution for the WCPFC Secretariat to establish the WCPFC Regional Observer Programme, and it is in accordance with the provisions of WCPF Convention Article 15(5). However in respect of the current

¹¹⁴ Ibid., para 14(viii).

¹¹⁵ The extent of subregional and national observer programmes and port-sampling programmes of Pacific Islands States were discussed in Chapter 6 6.3 *Analysis of arrangements post-collection of data on tuna fisheries in Pacific Island States*.

¹¹⁶ See Chapter 7 7.3 *Catch and effort data to be provided to WCPFC*.

arrangements for the WCPFC Regional Observer Programme it appears that in the short-term there is a “disproportionate burden of conservation action” on Pacific Island States who are small-island developing States. Article 30(2c) obliges the Commission to ensure that conservation and management measures adopted for highly migratory fish stocks in the Convention Area, do not transfer, directly or indirectly, a disproportionate burden of conservation action onto developing State parties and territories and possessions.¹¹⁷ It is fair to say that Pacific Island States have accepted some level of this burden, as otherwise the Commission would not have been able to adopt *Conservation and Management Measure for the Regional Observer Programme*. In fact, it is in the interests of Pacific Island States, as coastal States, to ensure that the WCPFC Regional Observer Programme is effectively and efficiently implemented, so that the quality of data on tuna fisheries is improved. Improving the quality of data on tuna fisheries will improve the quality of scientific advice that underpins the conservation and management measures to ensure the long-term conservations and sustainable use of tuna fisheries in the western and central Pacific Ocean.

Second, the Commission is obliged in accordance with Article 8 of the WCPF Convention to ensure the implementation of compatible measures for observer coverage for the high seas. Chapter 6 showed that gaps in current coverage of observer data are largely in high seas areas, for example large-scale longline vessels in the western and central Pacific Ocean for operational-level catch and effort data and by observer programmes is very low.¹¹⁸ Also, noting the relative burden on Pacific Island States for the implementation of the WCPFC Regional Observer Programme, the impetus is on the WCPFC to ensure that coverage by other fleets is matched.

Third, as was noted in Chapter 6 the existing subregional and national observer programmes of Pacific Island States have developed and are managed to a high standard, both in terms of training of observers and data collected for use in stock assessment.¹¹⁹ The existing standards for data collection by observer programmes and port sampling programmes in Pacific Island States are largely developed by the Tuna Fishery Data Collection Committee (DCC) and implemented by Pacific Island States,

¹¹⁷ WCPF Convention, Article 30(2c)

¹¹⁸ This finding was based on data currently held in the regional statistical database maintained by SPC-OFP and in the WCPFC database that is administered by SPC-OFP on behalf of the WCPFC Secretariat. *SPC-OFP Data Coverage*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/Coverage/index.asp>.

¹¹⁹ See Chapter 6 6.3 *Analysis of arrangements post-collection of data on tuna fisheries in Pacific Island States*.

with the support of SPC-OFP and FFA. As was mentioned previously the standards for data collection and observer training are still to be developed for the WCPFC Regional Observer Programme. In this regard it will be important that in accordance with the provisions of Article 8(bi), the standards that are eventually adopted for the WCPFC Regional Observer Programme should not undermine the existing level of standards currently in place for Pacific Island States areas under national jurisdiction.

Fourth, the implementation schedule that is attached to *Conservation and Management Measure for the Regional Observer Programme* states the following with respect to the status of existing subregional and national observer programmes “No later than 31 December 2008: Existing sub-regional programmes and national programmes shall be regarded as a part of the [*Regional Observer Programme*], and shall continue unless otherwise determined by the Commission. Data obtained through these observer programmes shall be submitted to the Commission and shall be considered Commission data.”¹²⁰ Therefore Pacific Island States are required to commence at the latest in 2009, the provision to the Commission of their subregional and national observer programme data. This would apply to all observer data covering activities that fall within the scope of the WCPFC Regional Observer Programme. That is, applicable fishing vessels that fish in high seas waters of the Convention Area or applicable fishing vessels that fish outside their flag States area of national jurisdiction (noting that small-vessels will be excluded from the WCPFC Regional Observer Programme and the definition of small-vessels is still to be determined). However, the format for submission of that data to the Commission is still to be determined. Also the requirement to submit data can only be considered to be voluntary requirements, because the coverage level requirements are still being developed, and the minimum level of coverage does not apply until 2012. Furthermore, the disproportionate burden of conservation action is probably again an issue, because the majority of data that will be received by the Commission will be those collected from Pacific Island States national and subregional observer programmes.

¹²⁰ WCPFC, *Conservation and Management Measure for the Regional Observer Programme (CMM 2007-01)* (As adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), Annex C - Implementation programme for the Regional Observer Programme, para 4. See Appendix 11.

Development of a Catch and/or trade documentation scheme for the WCPFC

As was noted in Chapter 3, Statistical Documentation Schemes (formerly Trade Information Schemes) have been adopted by all other tuna RFMOs with the exception of WCPFC, the initial one was developed in 1992 by *International Commission for Conservation of Atlantic Tunas* (ICCAT).¹²¹ As was noted in Chapter 3, the key feature of Statistical Documentation Schemes is that they monitor international trade between or to members and cooperating non-members of a RFMO. It should be noted that Statistical Documentation Schemes do not monitor domestic trade and landings. The alternative type of documentation scheme is a Catch Documentation Scheme, which is more comprehensive and are designed to monitor landings (including transshipments) and trade flows of a species.

From the point of view of international best practice for data verification, it is recognized that there are major shortcomings with the tuna RFMO Statistical Documentation Schemes currently used in tuna RFMOs.¹²² As was noted in Chapter 3, identification of these shortcomings in current Statistical Documentation Schemes was informed by recent experience in *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT), where over one-third to one-half of catch were being underreported over a fifteen year period under the CCSBT trade information scheme.¹²³ These findings from reviews farming data and data from markets for southern bluefin tuna, have led to concerns about the overall reliability and accuracy of stock assessments that were based on inaccurate catch and effort time series.¹²⁴ Following the lead of CCSBT, ICCAT also has undertaken a review of its three Statistical Documentation

¹²¹ See Chapter 3 3.2 *Verifying data on tuna fisheries*.

¹²² *Report of the Joint Tuna RFMO Working Group on Trade and Catch Documentation Schemes*, 22-23 July 2007, (Raleigh, North Carolina, USA: 2007), 1-2.

¹²³ CCSBT, *Report of the Thirteenth Annual Meeting of the Commission, 10-13 October 2006* (Miyazaki, Japan: Commission for the Conservation of Southern Bluefin Tuna, 2006), CCSBT, *Report of the Fourteenth Annual Meeting of the Commission, 16-19 October 2007* (Canberra, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2007), CCSBT, "CCSBT Report on Intersessional Developments in Fisheries Statistics since CWP21 (March 2005) (CWP-22/CCSBT)," in *Coordinating Working Party on Fishery Statistics 22nd Session (26 February - 2 March)* (Rome, Italy: 2007), M. Riepen, Consultant, FFA, Personal Communication by Email, February 2007.

¹²⁴ CCSBT, *Report of the Thirteenth Annual Meeting of the Commission, 10-13 October 2006* (Miyazaki, Japan: Commission for the Conservation of Southern Bluefin Tuna, 2006). See for example Australia Statement (Attachment 4-1), CCSBT, *Report of the Fourteenth Annual Meeting of the Commission, 16-19 October 2007* (Canberra, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2007). See for example Australia and New Zealand Statement (Attachment 4-1 and 4-5), CCSBT, "CCSBT Report on Intersessional Developments in Fisheries Statistics since CWP21 (March 2005) (CWP-22/CCSBT)," in *Coordinating Working Party on Fishery Statistics 22nd Session (26 February - 2 March)* (Rome, Italy: 2007).

Programmes.¹²⁵ As was noted in Chapter 3 in late 2007, ICCAT adopted a recommendation to implement a Catch Documentation Scheme for bluefin tuna, for the purpose of identifying the origin of any bluefin tuna in order to support implementation of conservation and management measures.¹²⁶

Based on these experiences, international best practice recommends that tuna RFMOs establish documentation schemes covering all components of the catch of tunas, rather than just that portion of fishery products entering international trade. Comprehensive documentation schemes will ensure that catch and landing statistics can be compared with certificates of origin, trade and commodity. Inclusion of a comprehensive documentation scheme, as part of an integrated monitoring control and surveillance system in the WCPFC, would enable the WCPFC to verify the species caught, the weight of the catch, when the catch was taken and the area in which the catch was taken.¹²⁷

There are no specific obligations in the WCPF Convention that relate to the requirement for the WCPFC to establish a documentation scheme. Nevertheless, as was mentioned previously in the introduction to the present section on verification arrangements, the WCPF Convention obliges WCPFC members, in giving effect to their duty to cooperate through WCPFC, to collect and share, *complete* and *accurate* data concerning fishing activities.¹²⁸ Also the Commission is required, in accordance with WCPF Convention Article 10(1d) to “adopt standards” for verification of data on fisheries for highly migratory fish stocks “in accordance with the Annex I of the [UN Fish Stocks Agreement], which shall form an integral part of this Convention.” Annex I

¹²⁵ Covering exports or re-exports of bluefin tuna or bluefin tuna products; swordfish or swordfish products; and all frozen bigeye and bigeye products (except bigeye tuna caught by purse seine and pole-and-line vessels destined for canneries in the ICCAT area). ICCAT, "ICCAT Report on Agency Programmes in Fisheries Statistics (CWP-22/ICCAT)," in *Coordinating Working Party on Fishery Statistics 22nd Session (26 February - 2 March)* (Rome, Italy: 2007).

¹²⁶ ICCAT, *Recommendation by ICCAT on an ICCAT Bluefin Tuna Catch Documentation Program (Recommendation 07-10)*.

¹²⁷ FAO Fisheries Department, *Implementation of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing*, vol. 9, FAO Technical Guideline for Responsible Fisheries (Rome: FAO, 2002). Catch certification and catch documentation schemes provide market and trade incentives to improve real time monitoring of the fishery and act as a deterrent to IUU fishing, such schemes have the added advantage of providing a real time verification of the data, particularly catch data. Constraints include the need for regional and international coordination, compatibility of multiple schemes, requirement to have market states cooperation, skipper cooperation and a reliable third party to verify the catch source. Whether or not such schemes can be justified for lower value species or species caught in bulk is questionable, although for high value species under exploitation threats such as Bluefin and Bigeye Tuna there should be easy justification.

¹²⁸ WCPF Convention, Article 5(i) The corresponding international legal provisions are: UN Fish Stocks Agreement, Article 5 (j) and Article 10 (f).

of the UN Fish Stocks Agreement, states that where possible, it should be a standard requirement in collecting and sharing fisheries data that “all data should be verified to ensure accuracy” and WCPFC members “should ensure that fishery data are verified through an appropriate system.”¹²⁹ So it is for the Commission of the WCPFC to determine how these obligations for verification are fulfilled, including whether, if at all, a documentation scheme is required for the WCPFC.

Since 2005, there has been considerable debate in the WCPFC on the form of a trade and/or catch documentation scheme for the WCPFC.¹³⁰ There have generally been two polarised views expressed on the matter. Pacific Island States, Australia, New Zealand, Canada and the European Union, have expressed a desire that the WCPFC develop a more comprehensive documentation scheme for the WCPFC that would complement an integrated monitoring control and surveillance system for the WCPFC. Asian States have expressed a desire that the WCPFC adopt a consistent approach to that in other tuna RFMOs with the adoption of a Statistical Documentation Scheme of some form.¹³¹ The extent of further progress in the WCPFC on the development of a documentation scheme is uncertain. The summary record of WCPFC4 indicates that negotiations on the development of a documentation scheme for the WCPFC will continue, but it is unclear exactly what the form of the conservation and management measure decision will be.¹³²

¹²⁹ UN Fish Stocks Agreement, Annex I Article 1(1) and 2(b).

¹³⁰ At WCPFC2, Japan tabled a proposal for the adoption and implementation of a statistical documentation scheme for frozen bigeye, which was consistent with the schemes in IOTC, IATTC and ICCAT. But the Commission deferred the proposal “concerned members should work intersessionally with Japan to develop a more comprehensive scheme covering all catch for the consideration at the Third Regular Session of the Commission.” (WCPFC, *Summary Record of the Second Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 12-16 December* (Pohnpei, Federated States of Micronesia: 2005), para 44.) At WCPFC3, FFA members tabled a proposal for a catch documentation scheme. However there was no consensus for a Catch Documentation Scheme, although there was a general feeling that times have moved on and that statistical documentation schemes have proven inadequate. The matter was deferred to the next session of TCC. (WCPFC, *Summary Record of the Third Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 11-15 December 2006, Apia Samoa (Final Draft as at Feb 2006)* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 2006), para 165.)

¹³¹ Authors personal observation to WCPFC and TCC sessions.

¹³² WCPFC, *Summary Record of the Fourth Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 3-7 December 2007* (Tumon, Guam, USA: 2007), para 295-296. “A small working group, ... developed terms of reference for an intersessional working group to examine the idea of a [Catch Documentation Scheme] for fisheries in the Convention Area. Divergent opinions were expressed by [WCPFC members] participating in the small working group. ... The Commission was not able to adopt terms of reference for this work during WCPFC4. The EC, noting its experience with [Catch Documentation Scheme] issues in this and other

358

Issues for Pacific Island States

For Pacific Island States, the development in the WCPFC of a documentation scheme has remained a lower priority than the development and implementation of the Commission VMS and Regional Observer Programme. As was noted previously the WCPFC has made some considerable progress towards the development of these latter two monitoring control and surveillance programmes. Nevertheless, Pacific Island States have recognised the potential for a documentation scheme to contribute to an integrated monitoring control and surveillance system in the WCPFC. For example a comprehensive documentation scheme would enable Pacific Island States to verify catches taken in their EEZs by licensed vessels and would also be a deterrent to IUU catches.

The framework of a documentation scheme for the WCPFC is still to take shape, including the extent to which it will contribute to an integrated monitoring control and surveillance system for the WCPFC. It is therefore important for Pacific Island States to be active participants in any processes to develop documentation schemes for the WCPFC. Importantly Pacific Island States will have to ensure that they can clearly articulate the principles and characteristics of a documentation scheme that meets their needs. Pacific Island States will also need to be mindful to ensure that the development of such documentation schemes does not place a disproportionate burden of conservation action onto themselves. To this end, it would be appropriate for the FFA Secretariat and SPC-OFP to assist Pacific Island States in developing a proposal for a documentation scheme for tabling at a future Technical and Compliance Committee session.

Development of a WCPFC transshipment scheme and a WCPFC port monitoring scheme

As was noted in Chapter 3, *Inter American Tropical Tuna Commission* (IATTC) prohibits transshipment at sea by purse seine vessels, and transshipment may only take place in port so that the catch can be verified and monitored.¹³³ Also, from 2008, *Indian Ocean Tuna Commission* (IOTC), *International Commission for the Conservation of Atlantic Tunas* (ICCAT) and IATTC will have all implemented a requirement for 100%

RFMO forums, ... volunteered to lead an intersessional working group (operating electronically) to work toward designing an appropriate [Catch Documentation Scheme] for the region that focuses on the most critical species. This intersessional working group will operate independently from the TCC in order to reduce the TCC's workload. The report of the working group will be tabled at TCC4... ."

¹³³ See Chapter 3 3.2 *Verifying data on tuna fisheries*, and IATTC, *Resolution on Fish Aggregating Devices* (Resolution C-99-07).

observer coverage for transshipment by all large-scale longline vessels.¹³⁴ As was noted previously, these forms of observer programmes for transshipment vessels are designed to verify the amount and composition of transshipments from a subset of the fishing fleet (large-scale longline vessels). So there is minimal contribution by these transshipment observer programmes to verifying catches of all species in longline fishing operations, including discards. *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT) has an in-principle commitment to implement a transshipment scheme.¹³⁵ It was noted in Chapter 3, that international best practice recommends that RFMOs prohibit transshipment at sea or closer monitoring through a comprehensive compliance observer programme to supervise all transshipment operations at sea and to verify the amount and composition transhipped.¹³⁶ Most tuna RFMOs have implemented a transshipment scheme, but these schemes do not cover transshipment activities for all catch. For example “smaller” longline vessels are not covered.

The WCPF Convention provisions reflect the international best practice recommendation for verification and regulation of transshipment activities. Article 29(1) states that “In order to support efforts to ensure accurate reporting of catches, the members of the Commission shall encourage their fishing vessels, to the extent practicable, to conduct transshipment in port.”¹³⁷ Paragraph 2 of Article 29 provides the justification for encouraging transshipment to occur in port, which is to ensure that catches can be inspected and verified, because transshipment activities in port must take place in accordance with the applicable national laws of a port State.

In respect of port State rights and duties, Article 27(1) notes the right and duty of port States to take measures to ensure the effectiveness of conservation and management measures. Also for purposes of verification of catches, Article 27(2) states that “Whenever a fishing vessels of a member of the Commission voluntarily enters a

¹³⁴ IATTC, *Resolution on Establishing a Program for Transshipments by Large-Scale Fishing Vessels* (Resolution C-06-04), ICCAT, *Recommendation by ICCAT establishing a programme for Transshipment* (Recommendation 06-11) (June 13 2007), IOTC, *Resolution on establishing a programme for transshipment by large-scale fishing vessels* (Resolution 06/02).

¹³⁵ CCSBT, *Report of the Thirteenth Annual Meeting of the Commission, 10-13 October 2006* (Miyazaki, Japan: Commission for the Conservation of Southern Bluefin Tuna, 2006).

¹³⁶ M. Lack, *With an eye to the future: addressing failures in the global management of bigeye tuna* (Sydney, Australia: Traffic International and WWF Australia, 2007), M. Lack, *Catching On? Trade-related Measures as a Fisheries Management Tool* (Sydney: TRAFFIC International, 2007), M. W. Lodge et al., *Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations* (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007).

¹³⁷ WCPF Convention, Article 29(1).

port or offshore terminal of another member, the port State may, inter alia, inspect documents, fishing gear and catch on board such fishing vessels.”¹³⁸ To this end, the Commission is to develop procedures to obtain and verify data on quantity and species transhipped through the transshipment activities in port and at sea.¹³⁹

The WCPF Convention also requires that where transshipment beyond areas under national jurisdiction does occur, transshipment activities must be undertaken in accordance with the terms and conditions set out in Annex III to the WCPF Convention, as well as any procedures that the Commission develops.¹⁴⁰ WCPF Convention Annex III sets out terms and conditions for regulation of transshipment, these include that “The operator shall comply with any procedures established by the Commission to verify the quantity and species transhipped, and any additional procedures and measures established by the Commission with respect to transshipment in the Convention Area.”¹⁴¹ Also in accordance with these terms and conditions, the operator is to allow any authorized inspector to have full access to areas of the fishing vessel, equipment, documentation and catch that the authorized inspector may determine is necessary to carry out their duties.¹⁴² The operator shall also allow and assist any such authorized inspector to remove samples and gather any information required to fully monitor the activity.

The final provision of the WCPF Convention that relates to regulation of transshipment activities is a general prohibition on transshipment at sea by purse seine vessels operating within the Convention Area.¹⁴³ Except that the WCPF Convention notes that the Commission can adopt specific exemptions that reflect existing operations.¹⁴⁴ However any exemptions to the prohibition on transshipment at sea by purse seine vessels are required to be in accordance with the terms and conditions of fishing as set out in WCPF Convention Annex III, including the requirement for appropriate monitoring of these activities (see Appendix 12).

¹³⁸ Ibid., Article 27(2).

¹³⁹ Ibid., Article 29: “(3) The Commission shall develop procedures to obtain and verify data on the quantity and species transhipped both in port and at sea in the Convention Area and procedures to determine when transshipment covered by this Convention has been completed.”

¹⁴⁰ Ibid., Article 29(4).

¹⁴¹ Ibid., Annex III Article 4(1). Note that Article 4 (WCPF Convention Annex III) is reproduced herein as Appendix 12.

¹⁴² Ibid., Annex III Article 4(2). Note that Article 4 (WCPF Convention Annex III) is reproduced herein as Appendix 12.

¹⁴³ Ibid., Article 29(5).

¹⁴⁴ Ibid.,

Since 2004, there has been considerable debate in the WCPFC on how to implement the provisions of WCPF Convention Article 29. However agreement has not yet been reached on a transshipment conservation and management measure decision for the WCPFC. In the meantime, noting the provisions of Article 29(5) the Commission each year has granted a one-year exemption for the Philippines and FFA members from the ban on at sea purse seine transshipment.¹⁴⁵ The views expressed during Technical and Compliance Committee and Commission sessions on the form of a transshipment conservation and management measure decision have been diverse. Initially it was proposed that there be a simple translation of the existing carrier vessel observer transshipment schemes from IATTC, ICCAT and IOTC for large-scale freezer longline vessels to the WCPFC, to ensure consistency in the first-instance with other tuna RFMOs.¹⁴⁶ Subsequent proposals have appeared to be based on different interpretations of the provision relating to “shall encourage their fishing vessels, to the extent practicable, to conduct transshipment in port.”¹⁴⁷ For example, one interpretation has been that all transshipment at sea shall be banned in the Convention Area, to encourage transshipment activities into ports where they can be more effectively monitored.¹⁴⁸ An alternative proposal is that transshipment at sea should be banned unless certain strict monitoring, control and surveillance requirements are met, such as 100% observer coverage and use of VMS on the fishing vessels.¹⁴⁹ However, at the time of writing it was not clear what the eventual shape of the WCPFC transshipment verification and regulation scheme would be.

A parallel development in the WCPFC that is relevant to implementation of the provisions of Article 29 is the consideration of port State rights and responsibilities. Since 2006 the WCPFC Secretariat has been gathering information on existing port State practices to inform the development of a draft port State conservation and

¹⁴⁵ WCPFC, *Summary Record of the Fourth Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 3-7 December 2007* (Tumon, Guam, USA: 2007), para 158.

¹⁴⁶ Authors personal observations to TCC and WCPFC sessions. Japans proposal to TCC3 was originally along these lines.

¹⁴⁷ WCPF Convention, Article 29(1).

¹⁴⁸ Authors personal observations to TCC and WCPFC sessions. This largely was the basis of the Marshall Islands proposal on transshipment to WCPFC4.

¹⁴⁹ Authors personal observations to TCC and WCPFC sessions. This is the form of an attempt to find middle-ground on transshipment verification and regulation.

management measure or draft port State minimum standards.¹⁵⁰ Such standards or measures would of course be relevant to the implementation of transshipment verification and regulation measures applied by port States when transshipment activities take place in-port. The negotiations on the form of such port State measures or standards for the WCPFC continue in 2008.¹⁵¹ The outcomes from development of an international port State measures instrument by Food and Agriculture Organisation of the United Nations (FAO) through 2008 will also be relevant to WCPFC's consideration of port State measures and standards.¹⁵²

Issues for Pacific Island States

There are a number of issues relating to the development of transshipment and port State conservation and management measure for Pacific Island States that are relevant to the potential application of these conservation and management measures to verification of data on tuna fisheries. First, there are current and future potential economic opportunities for Pacific Island States from in port transshipment activities. These economic opportunities include employment of nationals during unloading operations; business opportunities for supply of fuel, food and other supplies to vessels; increased possibilities for supply to on-shore processing facilities and transshipment fees.¹⁵³ Importantly the outcomes from the development of these conservation and management measures have the potential to provide incentive for or provide disincentives for transshipment activities to occur in ports of Pacific Island States. So indirectly could have positive or negative economic impacts to Pacific Island States.

Second, from the point of view of data collection and verification, a portion of the fees paid for transshipment in port, either directly or as part of the fishing licence fee, could be used to cover the costs of observer and port sampling activities. Levying of

¹⁵⁰ Developments in the WCPFC appear to be heading more in the direction of port State minimum standards, rather than a more prescriptive approach. In part, this reflects a recognition that port State sovereignty applies to transshipment activities conducted in port.

¹⁵¹ WCPFC, *Summary Record of the Fourth Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 3-7 December 2007* (Tumon, Guam, USA: 2007), para 162.

¹⁵² FAO held consultations in September 2007 for experts to review a preliminary draft for a legally binding instrument on port State measures based on the 2005 FAO Model Scheme on Port State Measures to Combat IUU Fishing, and the 2001 FAO International Plan of Action to Prevent, Deter, and Eliminate IUU Fishing. The draft text from these consultations is to be finalised at FAO Technical Consultations to be held from 23-27 June 2008.

¹⁵³ There have also been reports of negative socio-economic impacts of in port transshipment activities that have developed in Pacific Island States such as increased rates of prostitution and sexually transmitted diseases.

such fees could assist Pacific Island States to meet their obligations to monitor and regulate unloading activities that occur in their ports. Further employment opportunities might also be created for Pacific Island States nationals as observers and port samplers. Additionally, such arrangements might create less direct costs to the Commission for monitoring unloading activities, than might be the case were a dedicated observer programme to be established to monitor transshipment activities occurring on the high seas.

Third, there is the issue of ensuring that the reporting requirements of any new conservation and management measures adopted by the WCPFC as part of the transshipment scheme and port State scheme are compatible with existing standards in the western and central Pacific Ocean for reporting on unloadings. As was noted in Chapter 6, SPC-OFP currently has some existing holdings of unloadings data that are effectively used to verify catch and effort data.¹⁵⁴ Coverage of total catches by unloadings data in 1993-2002 was approximately twenty-three percent across all gear: forty-one percent for purse seine gear and approximately seventeen percent for longline gear.¹⁵⁵ These unloadings data are collected from the ports of Pacific Island States and Pacific Island Territories, as well as ports outside of SPC members. Chapter 6 noted that port sampling programmes are currently operating in twenty-six harbours of Pacific Island States and Pacific Island Territories throughout the western and central Pacific Ocean.¹⁵⁶ Unloadings data is collected at these ports using a standard FFA/SPC Regional Unloadings Form. Compared to the transshipment declaration form that is currently used in *International Commission for the Conservation of Atlantic Tunas* (ICCAT), the FFA/SPC Regional Unloading Form collects more detailed

¹⁵⁴ As was discussed in Chapter 6, unloadings data is one of the types of data that are currently input into the TUFMAN database system that are used by Pacific Island States. As was noted in Chapter 6, the TUFMAN package enables Pacific Island States to cross-reference or verify different sources of data for the same fishing event, and can identify inconsistencies between these sources. TUFMAN also reconciles licensing data, unloadings data and vessel activity data with logsheets to identify gaps in coverage of data.

¹⁵⁵ T. Lawson, *Status of Data Collection, Compilation and Dissemination* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2003), 67-74. In 2003 – 2005 the coverage was much less 6.4% across all gears and 10.7% for purse seine and 6.4% for longline gear (*SPC-OFP Data Coverage*, [website] ([cited March 9 2008]); available from <http://www.spc.int/oceanfish/Html/Statistics/Coverage/index.asp>. and see Table 6-2 Average percent coverage of total catches within western and central Pacific Ocean tuna fisheries by data held by SPC-OFP (2003-2005).

¹⁵⁶ *Report of the Fifth Meeting of the Tuna Fishery Data Collection Committee, 2-6 December 2002, Brisbane, Queensland, Australia*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2003).

information.¹⁵⁷ Additionally, the FFA/SPC Regional Unloading Form has a more comprehensive application, than a transshipment specific form, which is that it covers transshipment activities to a carrier vessel and unloading activities to on-shore facilities.¹⁵⁸ In accordance with WCPF Convention Article 8(2b(i)), the Commission should take these existing reporting standards into account when establishing the WCPFC transshipment and port sampling schemes. Furthermore the new WCPFC transshipment and port sampling schemes should not undermine the standards of existing monitoring and report of unloadings by FFA/SPC members.

Fourth, is the requirement that the Commission avoid a disproportionate burden of conservation action on Pacific Island States and other developing States. Article 30(2c) obliges the Commission to ensure that conservation and management measures adopted for highly migratory fish stocks in the Convention Area, do not transfer, directly or indirectly, a disproportionate burden of conservation action onto developing State parties and territories and possessions.¹⁵⁹ It has previously been noted that the outcomes from the development of these conservation and management measures have the potential to provide incentive for or provide disincentives for transshipment activities to occur in ports of Pacific Island States. Therefore the Commission should be cautious to ensure that the development of transshipment and port State conservation and management measures do not transfer a disproportionate burden of conservation action onto Pacific Island States and other developing States. However to ensure the effectiveness of the measures that are for the benefit of all States involved in western and central Pacific Ocean tuna fisheries, the Commission might also consider options that would adequately offset some of the burden on developing States. For example, through the Commission providing forms of assistance to developing States, that may include establishment and funding of port sampling and transshipment monitoring programmes in Pacific Island States.

¹⁵⁷ L. Clark, Consultant, FFA, Personal Communication by Email, 7 February 2007. Note that a modified version of ICCAT transshipment form was attached to the original Japanese Proposal for the establishment of a WCPFC transshipment scheme.

¹⁵⁸ Ibid.

¹⁵⁹ WCPF Convention, Article 30(2c).

8.3 Maintaining confidentiality of data on tuna fisheries and sharing data

As was discussed in Chapter 3, individual fishers or the fishing industry are usually concerned that the information that they supply to fisheries management authorities are kept confidential, in particular those information or data that could be used by their competitors to gain an advantage.¹⁶⁰ The confidentiality of catch and fisheries-related data should be maintained to maintain the full cooperation of industry and national statistical reporting offices in the provision of timely data, and to ensure the reliability of data.¹⁶¹ Any perceived or alleged breaches of data confidentiality are likely to lead to difficulties in obtaining future data on tuna fisheries or to falsified or incomplete data.¹⁶²

WCPFC members are obliged, in fulfilling their duty to cooperate in order to conserve and manage highly migratory fish stocks in their entirety, to “collect *and share*, in a timely manner, complete and accurate data concerning fishing activities...”(emphasis added).¹⁶³ Furthermore it is a function of the Commission to adopt standards for *inter alia* “the timely exchange and reporting of data on fisheries for highly migratory fish stocks in the Convention Area in accordance with Annex I of the [UN Fish Stocks] Agreement, which shall form an integral part of this Convention.”¹⁶⁴ Additionally, it is also a function of the Commission to disseminate fisheries data “to ensure that the best statistical data is available, while maintaining confidentiality, where appropriate.”¹⁶⁵

¹⁶⁰ FAO Fishery Resources Division and Fishery Policy and Planning Division, *Fisheries Management*, vol. 4, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 1997), p29.

¹⁶¹ FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics. La Jolla, California, USA, 13-16 December 1993*, *FAO Fisheries Report 500* (Rome: FAO, 1994), p10.

¹⁶² FAO Fishery Resources Division and Fishery Policy and Planning Division, *Fisheries Management*, vol. 4, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 1997), 29-30.

¹⁶³ WCPF Convention, Article 5(i) “In order to conserve and manage highly migratory fish stocks in the Convention Area in their entirety, the members of the Commission shall, in giving effect to their duty to cooperate in accordance with the 1982 Convention, the Agreement and this Convention: ...collect and share, in a timely manner, complete and accurate data concerning fishing activities on, inter alia, vessel position, catch of target and non-target species and fishing effort, as well as information from national and international research programmes;” Relevant international obligations are UN Fish Stocks Agreement, Article 5(j) and Article 14(1a).

¹⁶⁴ WCPF Convention, Article 10(1d) “Without prejudice to the sovereign rights of coastal States for the purpose of exploring and exploiting, conserving and managing highly migratory fish stocks within areas under national jurisdiction, the functions of the Commission shall be to: adopt standards for collection, verification and for the timely exchange and reporting of data on fisheries for highly migratory fish stocks in the Convention Area in accordance with Annex I of the Agreement, which shall form an integral part of this Convention;” Relevant international obligations are UN Fish Stocks Agreement, Article 10(f)

¹⁶⁵ WCPF Convention, Article 10(1e) “Without prejudice to the sovereign rights of coastal States for the purpose of exploring and exploiting, conserving and managing highly migratory fish stocks within areas under national jurisdiction, the functions of the Commission shall be to: ... compile and disseminate accurate and complete statistical data to ensure that the best scientific information is available, while

The UN Fish Stocks Agreement Annex I, Article 7(1) provides further detail about how States are to fulfil this duty to share fisheries data through the WCPFC:

Data collected by flag States must be shared with other flag States and relevant coastal States through appropriate subregional or regional fisheries management organizations or arrangements. Such organizations or arrangements shall compile and make them available in a timely manner and in an agreed format to all interested States under the terms and conditions established by the organization or arrangement, while maintaining confidentiality of non-aggregated data, and should, to the extent feasible, develop database systems which provide efficient access to data.¹⁶⁶

The standard for “sharing” of fisheries data can be inferred from the UN Fish Stocks Agreement Annex I: fisheries data should be compiled and made “available in a timely manner and in an agreed format to all interested States under the terms and conditions established by the organization or arrangement.”¹⁶⁷

As was discussed in Chapter 3, WCPFC members have to find a balance between two competing obligations.¹⁶⁸ First, the obligation to share and exchange data with other WCPFC members for the purpose of ensuring the best scientific evidence is available for tuna conservation and management. Furthermore WCPFC members also have a general responsibility to make objective, reliable and credible information available to the international community relating to trends in the fisheries as well as on impacts of the fisheries on the stocks and ecosystem, so as to “assure the public at large that resources are managed responsibly”¹⁶⁹ And second, whilst sharing and disseminating data and information, WCPFC members have the responsibility to maintain the confidentiality of data on tuna fisheries.

In finding a balance between these two responsibilities the WCPF Convention notes that the Commission is to adopt standards for the timely exchange of data on fisheries for highly migratory fish stocks in the Convention Area.¹⁷⁰ The WCPF

maintaining confidentiality, where appropriate;” Relevant international obligations are UN Fish Stocks Agreement, Article 10(f).

¹⁶⁶ UN Fish Stocks Agreement, Annex I Article 1(1) also states that “Confidentiality of non-aggregated data shall be maintained.” The Code of Conduct also requires both States and subregional or regional fisheries management organisations and arrangements to maintain confidentiality of fisheries data (Article 7.4.4 in respect of States, and Article 7.4.7 in respect of subregional or regional fisheries management organisations or arrangements).

¹⁶⁷ Ibid., Annex I Article 2(e) and Article 7(1).

¹⁶⁸ See Chapter 3 3.3 *Maintaining confidentiality of data on tuna fisheries and sharing data*.

¹⁶⁹ FAO Fishery Resources Division and Fishery Policy and Planning Division, *Fisheries Management*, vol. 4, *FAO Technical Guideline for Responsible Fisheries* (Rome: FAO, 1997), p26, FAO Strategy on Improving Information in Fisheries,

¹⁷⁰ WCPF Convention, Article 10(1d) “Without prejudice to the sovereign rights of coastal States for the purpose of exploring and exploiting, conserving and managing highly migratory fish stocks within areas

Convention also identifies, under Article 15(4) paragraph b), a role for the WCPFC Secretariat in facilitating the dissemination of fisheries data “to accomplish the objective of the Convention.”¹⁷¹ As was discussed earlier in this Chapter, SPC-OFI has been contracted in accordance with WCPFC Convention Article 13 to compile fisheries data on behalf of the WCPFC Secretariat. Article 13 paragraph (3a) specifies that contractors may also undertake dissemination of fisheries data on behalf of the WCPFC Secretariat “according to agreed principles and procedures established by the Commission, including procedures and policies relating to the confidentiality, disclosure and publication of data.”¹⁷²

Issues related to data sharing and access have a long history in the WCPFC process tracing from the 1996 Technical Consultation on the Collection and Exchange of Fisheries Data, Tuna Research and Stock Assessment.¹⁷³ There have generally been two points of view through this process. First, Pacific Islands States, with the support of some other participants, particularly the USA, have proposed a relatively open approach to the sharing of WCPFC data. Pacific Island States have had particular concerns to ensure that the full range of WCPFC data should be available for compliance purposes, including data from foreign vessels relating to fishing in their national waters. However, Pacific Island States have also recognised the importance of commercial confidentiality of proprietary data as their own fleets have grown in importance.¹⁷⁴ Second, some other WCPFC participants, especially the Asian fishing states, have proposed a more closed approach to the sharing of WCPFC data, for a number of reasons including commercial and domestic legal concerns, but understood by Pacific Island States to also reflect an interest in avoiding disclosure of IUU fishing. However, there appears to have been some shift in this approach recently, perhaps in recognition of the importance of verification, especially for statistical documentation

under national jurisdiction, the functions of the Commission shall be to: adopt standards for collection, verification and for the timely exchange and reporting of data on fisheries for highly migratory fish stocks in the Convention Area in accordance with Annex I of the Agreement, which shall form an integral part of this Convention;” Relevant international obligations are UN Fish Stocks Agreement, Article 10(f).

¹⁷¹ WCPFC Convention, Article 15(4b).

¹⁷² Ibid., Article 13(3a).

¹⁷³ *Report of the Technical Consultation on the Collection and Exchange of Fisheries Data, Tuna Research and Stock Assessment, 15-19 July 1996, Noumea New Caledonia*, (Noumea, New Caledonia: Oceanic Fisheries Programme, South Pacific Commission, 1996).

¹⁷⁴ FFA Secretariat, *FFA Brief for the second regular session of the WCPFC Technical and Compliance Committee, Brisbane, Australia 28 September - 3 October 2006 - Supplementary Brief, FFA 06/06 Suppl. 1* (Honiara: 2006), 50-60.

schemes.¹⁷⁵ These two different approaches have made data issues in the WCPFC complex and challenging to resolve.

The Ad hoc Task Group [Data] was established by the Commission during WCPFC2.¹⁷⁶ The purpose of the Ad Hoc Task Group [Data] was “to identify types of data that must be treated as confidential and to develop draft rules and procedures to govern the security and confidentiality of data collected and held by the Commission.”¹⁷⁷ It was at WCPFC2 that the Commission first adopted the decision requiring WCPFC members to provide operational level catch and effort data to the Commission. The decision to also establish the Ad hoc Task Group [Data] essentially provided the balance between WCPFC members providing operational level catch and effort data to the Commission and matters of dissemination and security of data.¹⁷⁸ It was also noted that matters of dissemination and security involved broader interests

¹⁷⁵ Ibid.

¹⁷⁶ The Ad Hoc Task Group [Data] was established as a result of the adoption by the Commission in 2005 of the Report of the Scientific Committee and its recommendations, subject to budgetary considerations. The original recommendation from the Statistics Specialist Working Group of the Scientific Committee arose because after several evening sessions debating data issues, the Specialist Working Group did not have adequate time to address the issues of dissemination and security, and because these issues involved broader interests than just the scientific interest in data. The WCPFC Ad Hoc Task Group [Data] was convened from 31 July – 4 August 2006, Manila, Philippines; the week immediately prior to the second regular session of the WCPFC Scientific Committee. Participants of the Ad Hoc Task Group [Data] were from Korea, Japan, New Zealand, USA, Federated States of Micronesia, Solomon Islands, Marshall Islands, New Caledonia, Papua New Guinea, Kiribati, SPC, FFA Secretariat and WCPFC Secretariat. The meeting was chaired by Mr Kim Duckworth (NZ) who is also the current chair of the Statistics Specialist Working Group of the WCPFC Scientific Committee.

¹⁷⁷ WCPFC, *Summary Report of the Second Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 8-19 August 2005, WCPFC3-2006/12* (Noumea, New Caledonia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2006), para 6.7.

¹⁷⁸ WCPFC, *Report of the First Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 8-19 August 2005, WCPFC/Comm.2/22* (Noumea, New Caledonia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2005), p40 para 6.7. This Ad Hoc task group had originally been a recommendation of WGII to the PrepCon “Collection and management of operational level data raises questions of data confidentiality and security. WG.II recommends that PrepCon establish an ad hoc task group, composed of the Chairs of WGI, WG.II, WG.III and the SCG, and other experts to identify types of data that must be treated as confidential and to develop draft rules and procedures to govern the security and confidentiality of scientific data and other information collected and held by the future Commission. This task group should conduct its work intersessionally with the assistance of the Interim Secretariat, and primarily by electronic means. The task group should draw upon WCPFC/PrepCon/WP.16 and the rules, procedures, and standards adopted and developed by other regional fisheries management organizations and arrangements.” (*Working Group II: Scientific Structure and Provision of Interim Scientific Advice - Summary Report by the Chairman of Working Group II on its work during PrepConV: WCPFC/PrepCon/32*, (Rarotonga, Cook Islands: 2003), para 23.)

than just the scientific interest in data, such as use of data for enforcement and compliance purposes.¹⁷⁹

The outcomes of the Ad Hoc Task Group [data] were adopted by the Commission at WCPFC3.¹⁸⁰ However, the outcomes were classed as ‘living documents’, particularly noting a reservation that Japan had formally submitted to WCPFC3. Consequently, the decision of the Commission was to have the outcomes reconsidered by the Scientific Committee and the Technical and Compliance Committee during 2007, for possible refinement, and that the outcomes from this process will be considered by the Commission at WCPFC4. Through 2007, the outcomes from the Ad Hoc Task Group [data] were further refined and formally adopted by the Commission at WCPFC4.¹⁸¹ These outcomes are named *Rules and Procedures for the Protection of, Access to and Dissemination of, Data Compiled by the Commission* (WCPFC Data Rules and Procedures).¹⁸² For reference a copy of these WCPFC Data Rules and Procedures are reproduced as Appendix 13.

WCPFC arrangements to disseminate information and data on tuna fisheries

It is important that for purposes of transparency, tuna RFMOs make objective, reliable and credible information available to the international community relating to trends in the fisheries as well as on impacts of the fisheries on the stocks and ecosystem. As was discussed in Chapter 3, other tuna RFMOs have developed formats so that data can be disseminated publicly through their websites, used in presentations to meetings and

¹⁷⁹ WCPFC, *Summary Report of the Second Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 8-19 August 2005, WCPFC3-2006/12* (Noumea, New Caledonia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2006), para 6.8.

¹⁸⁰ There were three primary outcomes from the WCPFC Ad Hoc Task Group [Data]: Summary Record of the Ad Hoc Task Group [Data] (Access to, and Use of, WCPFC Data, and Data Confidentiality and Security WCPFC-TCC2-2006/18, Attachment A); Draft Rules and Procedures for the Access to and Dissemination of Data Compiled by the Commission (Access to, and Use of, WCPFC Data, and Data Confidentiality and Security WCPFC-TCC2-2006/18 Attachment G); Endorsement of approach presented by the WCPFC Secretariat in the draft Information Security Policy (ISP) for the Secretariat and encouragement for the WCPFC Secretariat to further elaborate the ISP. Since the Ad Hoc Task Group [Data] the Executive Director, in accordance with the directive from the Ad Hoc Task Group [Data], has developed a draft framework for access to WCPFC data by Members. A draft Information Security Policy is also under development.

¹⁸¹ WCPFC, *Summary Record of the Fourth Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 3-7 December 2007* (Tumon, Guam, USA: 2007), paras 231-234.

¹⁸² WCPFC, *Decision on Rules and Procedures for the Protection of, Access to, and Dissemination of, Data Compiled by the Commission* (WCPFC Data Rules and Procedures) (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007).

published in reports. This aggregated format for dissemination of catch and effort data is fairly standardised across the tuna RFMOs: (a) for surface fisheries such as purse seine: total catches by fish size, and effort by flag, gear type, month and one-degree-square, for each stock; and (b) for longline fisheries total catches by fish size, and effort by flag, gear type, month and five-degree-square for longline for each stock.¹⁸³ Also it is common practice for the tuna RFMO, or State as appropriate, to adjust the data so that the fishing activities of individual vessels or operators cannot be identified.

In practice, *International Commission for the Conservation of Atlantic Tunas* (ICCAT) and *Indian Ocean Tuna Commission* (IOTC) receive catch and effort data reports from their membership in the same format that can be disseminated, so in these instances it is the State which is responsible for ensuring that the data it submits to ICCAT or IOTC does not compromise confidentiality of that data. Whereas, for *Inter-American Tropical Tuna Commission* (IATTC) that collects its own purse seine catch and effort data, it is the IATTC Secretariat that is responsible for maintaining the confidentiality of the data that it releases publicly. Additionally other tuna RFMOs, such as IATTC and *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT), which hold non-public domain data in a central database, have established request mechanisms for to enable release of non-public domain data. These mechanisms allow for example scientists conducting research to request access to confidential data or to data other than that which is available on websites. The requests must state the nature of information sought and the purpose for which the information will be used – this may be facilitated through a standardised request form.¹⁸⁴ Access to such data can be granted once permission from the source of that data has been received.¹⁸⁵

¹⁸³ CCSBT, *Report of the Tenth Annual Meeting of the Commission, 7-10 October 2003* (Christchurch, New Zealand: Commission for the Conservation of Southern Bluefin Tuna, 2006), Attachment 13-Revised Confidentiality Policy of the CCSBT Central Database and the CCSBT Statistical Document Program, ICCAT - Assessments - Access to ICCAT Statistical databases, [website] (ICCAT, [cited 29 January 2008]); available from <http://www.iccat.int/accessingdb.htm>, P. Ward, N. Tsirbas, and R. Kearney, *Getting Science into Regional Fisheries Management - A Global View* (Canberra, Australia: Bureau of Research Sciences, 1998), p54.

¹⁸⁴ CCSBT, *Report of the Tenth Annual Meeting of the Commission, 7-10 October 2003* (Christchurch, New Zealand: Commission for the Conservation of Southern Bluefin Tuna, 2006), Attachment 13-Revised Confidentiality Policy of the CCSBT Central Database and the CCSBT Statistical Document Program, FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, FAO Fisheries Circular 963 (Rome: FAO, 2001), p44.

¹⁸⁵ As was noted in Chapter 3 3.3 *Maintaining confidentiality of data on tuna fisheries and sharing data*, often such access will be for certain specific fisheries data, and access to that data will be conditional and includes restrictions against subsequent release to others. Such conditions ensure that the confidentiality

The WCPFC Data Rules and Procedures address both aspects of other tuna RFMO practices for dissemination of data on tuna fisheries. That is, first the format for public dissemination of catch and effort data and second, establishment of a process for scientists to request access to non-public domain data.

Dissemination of WCPFC-designated public domain data

The WCPFC Data Rules and Procedures define *Public Domain Data* as data that fulfils three conditions. The first condition is that public domain data shall not reveal identify the activities of any vessel, company or person and shall not contain private information.¹⁸⁶ Second, catch and effort data in the public domain shall be made up of observations from a minimum of three vessels.¹⁸⁷ Third, annual catch estimates and aggregated catch and effort data that can be used to identify the activities of any vessel, company or person are not in the public domain.¹⁸⁸ Additionally, and subject to these three conditions, Appendix 1 to the WCPFC Data Rules and Procedures lists data that have been designated to be *Public Domain Data*.¹⁸⁹ These data include annual catch estimates, national fishery reports, aggregated catch and effort data.¹⁹⁰ Public Domain Data are accessible by downloading from the Commission's website, and release by the Commission on request.¹⁹¹ These WCPFC arrangements are essentially similar to those in other tuna RFMOs.

The Commission is still in the process of implementing the arrangements for the dissemination of Public Domain data on tuna fisheries. In 2005 the SPC-OFP produced a draft "WCPFC Tuna Fisheries Yearbook" that lists and summarises historical data and

of that data is maintained. There may also be a requirement that an account of the results obtained from the use of the data be presented for approval of the relevant tuna RFMO Secretariat or appropriate States, prior to publication or release of the results.

¹⁸⁶ WCPFC, *Decision on Rules and Procedures for the Protection of, Access to, and Dissemination of, Data Compiled by the Commission (WCPFC Data Rules and Procedures)* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 9.

¹⁸⁷ Ibid.

¹⁸⁸ Ibid., para 10.

¹⁸⁹ See Appendix 13 (Ibid., Appendix 1.)

¹⁹⁰ Subject to Ibid., para 9 & 10., Public Domain Data are: Annual catch estimates stratified by gear, flag and species for the WCPFC Statistical Area; Annual catch estimates stratified by gear, flag and species, and waters under the national jurisdiction of members and the high seas in the WCPFC Statistical Area; Annual numbers of vessels active in the WCPFC Statistical Area stratified by gear type and flag; Catch and effort data aggregated by gear type, flag, year/month, and for longline 5° latitude and 5° longitude, and, for surface gear types, 1° latitude and 1° longitude; Biological data; Tagging data; WCPFC record of fishing vessels; Information on vessel and gear attributes compiled by other sources; Any vessel record established for the purpose of the Commission VMS; Oceanographic and meteorological data; and Part 1 of the Annual Report by WCPFC Members to the Commission.

¹⁹¹ Ibid., para 13.

trends on the western and central Pacific Ocean tuna fisheries.¹⁹² The WCPFC-SPC memorandum of understanding specifies the dissemination tasks that the SPC-OFP will fulfil on behalf of the WCPFC Secretariat.¹⁹³ The 2007 service agreement states the following dissemination tasks were to be carried out by SPC-OFP on behalf of the WCPFC during 2007: (a) Produce and publish on the Commission's website two issues of the Regional Tuna Bulletin, containing estimates of monthly catch rates for WCPO fleets, based on the most recent data available; (b) Produce and publish on the Commission's website the Tuna Fishery Yearbook 2006, containing annual catch estimates by gear type, flag and species; and (c) Disseminate public domain catch, effort and size data on the Commission's website at agreed level of resolution.¹⁹⁴

Dissemination of non-public domain data in other circumstances, by request and approval

In the WCPFC, data that is not designated as public domain data is, by definition, Non-Public Domain Data.¹⁹⁵ Examples of non-public domain data are listed in Appendix 2 to the WCPFC Data Rules and Procedures lists data that have been designated to be *Public Domain Data*.¹⁹⁶ These include data that reveal identify the activities of any vessel, company or person and shall not contain private information, for example operational level catch and effort data. Non-public domain data include other types of data where there is a high risk associated with alteration, loss or unauthorised access, or data that will be generated by programmes of the WCPFC which are still under development.¹⁹⁷

As a general rule all access to and dissemination of non-public domain data shall be authorised in accordance with the policies of confidentiality and security established

¹⁹² WCPFC, *DRAFT: Western and Central Pacific Fisheries Commission Tuna Fishery Yearbook 2004* Secretariat of the Pacific Community, 9 November 2005 2005 [cited 25 November 2005]; available from <http://www.spc.int/oceanfish/html/statistics/yearbook/download.htm>.

¹⁹³ As was discussed earlier in the present Chapter, this future role of the SPC-OFP as data-contractor will depend on the decision of the Commission, following the conclusion of the Independent Review of Scientific Structure and Function in 2009.

¹⁹⁴ WCPFC-SPC memorandum of understanding, Annex I Agreement for the Provision of Scientific Services to the Commission and Assistance to Members by the Secretariat of the Pacific Community, 1 January – 31 December 2007.

¹⁹⁵ WCPFC, *Decision on Rules and Procedures for the Protection of, Access to, and Dissemination of, Data Compiled by the Commission (WCPFC Data Rules and Procedures)* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 14.

¹⁹⁶ See Appendix 13 (*Ibid.*, Appendix 2.)

¹⁹⁷ Examples of WCPFC Non-public domain data are: Operational level catch and effort data; Records of vessel unloading; Transshipment consignments by species; VMS vessel position, direction and speed; Boarding and inspection reports; Certified observer personnel; Certified inspector personnel; Catch documentation scheme; Port State inspection reports; Violations and infringements, detailed; Economic data; Fisheries intelligence-sharing information; and Part 2 of the Annual Report by WCPFC Members to the Commission.

in the WCPFC Information Security Policy.¹⁹⁸ The WCPFC Secretariat is required to log and report to the Commission, all access and dissemination of non-public domain data. The information to be logged and reported to the Commission, include the name and affiliation of the person, the type of data accessed or disseminated, the purpose for which the data were requested, the date when the data were requested, the date the data were released and authorisations that may have been required.¹⁹⁹

The WCPFC has adopted a similar request procedure to that in other tuna RFMOs, to enable access to non-public domain data held by the Commission for research purposes.²⁰⁰ The condition for access to non-public domain data is that the WCPFC member “that originally provide that data authorises the Commission to release them.”²⁰¹ Essentially this will mean that non-public domain data held by the Commission is locked up, until the source of that data provides approval for its release for specific purposes. In practice, a formal request must also be received by the Commission from the applicant, and a confidentiality agreement would normally be signed.²⁰² Often such access will be for certain specific fisheries data, and access to that data will be conditional and includes restrictions against subsequent release to others. Such conditions ensure that the confidentiality of that data is maintained. There may also be a requirement that an account of the results obtained from the use of the data be presented for approval of the WCPFC Secretariat or appropriate States, prior to publication or release of the results.²⁰³

WCPFC arrangements to facilitate sharing and exchange of data between WCPFC members

There are many reasons why WCPFC members may want to share and exchange data on tuna fisheries between themselves. The main reason is that tuna stocks are shared resources between all WCPFC members, and so the responsibility and duty to conserve and manage these stocks is also one that is shared. Sharing of data and information

¹⁹⁸ The WCPFC Information Security Policy is an internal procedure document for the WCPFC Secretariat that has been developed to effect the WCPFC Secretariats responsibility to maintain the confidentiality and security of data compiled and held by the Commission.

¹⁹⁹ WCPFC, *Decision on Rules and Procedures for the Protection of, Access to, and Dissemination of, Data Compiled by the Commission (WCPFC Data Rules and Procedures)* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 16-17.

²⁰⁰ Ibid., para 30-31.

²⁰¹ Ibid., para 30.

²⁰² Ibid.

²⁰³ These conditions are included in a sample confidentiality agreement that is attached as Ibid., Annex 2 of Appendix 3.

covering the range of tuna stocks is essential, to ensure that efforts to conserve and manage these tuna stocks are informed by the best available information.

As was discussed in Chapter 3, of the other tuna RFMOs it is only *Inter-American Tropical Tuna Commission* (IATTC) and *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT) Secretariats that hold non-public domain data on behalf of their members. *International Commission for the Conservation of Atlantic Tunas* (ICCAT) and *Indian Ocean Tuna Commission* (IOTC) Secretariats receive catch and effort data reports from their members in the format that can be publicly disseminated. CCSBT has established a process whereby contracting Parties agree, through the CCSBT Data Exchange Working Group, on the data that each contracting Party are to submit for scientific analyses. Such data are then available for sharing with other CCSBT members through the secure data exchange facility on the CCSBT website.²⁰⁴ In IATTC, the majority of scientific analyses and other types of verification analyses are undertaken in-house by IATTC Secretariat staff. In terms of formal arrangements for IATTC members to access data held by the IATTC Secretariat, it appears that IATTC members would need to request access through the formal request mechanism and would be subject to approval.

As was discussed in Chapter 6, similar arrangements to those in IATTC have been the norm for access to data held by SPC-OFP. These dissemination arrangements, which require the authorisation of the relevant source/s of the data before they can be accessed, reflect that data have been submitted to SPC-OFP voluntarily for the purpose of bettering scientific information and knowledge on tuna fisheries. Also discussed in Chapter 6, were the arrangements that Pacific Island States are establishing pursuant to the *Niue Treaty on Cooperation in Fisheries Surveillance and Law Enforcement in the South Pacific Region*, that facilitate the sharing of data on tuna fisheries including VMS data.²⁰⁵ These arrangements demonstrate that Pacific Island States have recognised that there are benefits to be gained from arrangements that facilitate the sharing of data on tuna fisheries. These benefits include, but are not limited to, improved monitoring of fishing activities in EEZ areas and fisheries enforcement. For example, adjacent Pacific Island States might want to exchange data on tuna fisheries so that each State can check

²⁰⁴ *Research: CCSBT Commission for the Conservation of Southern Bluefin Tuna*, [website] (CCSBT, [cited 2 February 2008]); available from <http://www.ccsbt.org/docs/research.html>.

²⁰⁵ *Niue Treaty on Cooperation in Fisheries Surveillance and Law Enforcement in the South Pacific Region* of 9 July 1992, 32 *ILM* (1993) 136, entered into force 20 May 1993 (Niue Treaty,)

on the completeness and accuracy of reporting by vessels fishing in their EEZs or unloading in their ports.

As was noted previously the WCPF Convention clearly states that data should be shared, whilst maintaining confidentiality of that data as appropriate. For example, WCPFC members are obliged, in fulfilling their duty to cooperate in order to conserve and manage highly migratory fish stocks in their entirety, to “collect *and share*, in a timely manner, complete and accurate data concerning fishing activities” (emphasis added).²⁰⁶ Furthermore it is a function of the Commission to adopt standards for *inter alia* “the timely exchange and reporting of data on fisheries for highly migratory fish stocks in the Convention Area in accordance with Annex I of the [UN Fish Stocks] Agreement, which shall form an integral part of this Convention.”²⁰⁷ The UN Fish Stocks Agreement Annex I, Article 7(1) also emphasises the obligation for data to be shared between WCPFC members.²⁰⁸

Noting the potential benefits, and the WCPF Convention obligations, from WCPFC sharing data on tuna fisheries, the WCPFC Data Rules and Procedures have taken a more ‘open’ approach to how WCPFC members might access WCPFC data. In particular, the WCPFC Data Rules and Procedures interpret the requirement to maintain the confidentiality of data on tuna fisheries to mean that non-public domain data can not be released publicly, but can be accessed under certain terms and conditions. To this end, the WCPFC Data Rules and Procedures provide that under certain circumstances

²⁰⁶ WCPF Convention, Article 5(i) “In order to conserve and manage highly migratory fish stocks in the Convention Area in their entirety, the members of the Commission shall, in giving effect to their duty to cooperate in accordance with the 1982 Convention, the Agreement and this Convention: ...collect and share, in a timely manner, complete and accurate data concerning fishing activities on, *inter alia*, vessel position, catch of target and non-target species and fishing effort, as well as information from national and international research programmes;” Relevant international obligations are UN Fish Stocks Agreement, Article 5(j) and Article 14(1a).

²⁰⁷ WCPF Convention, Article 10(1d) “Without prejudice to the sovereign rights of coastal States for the purpose of exploring and exploiting, conserving and managing highly migratory fish stocks within areas under national jurisdiction, the functions of the Commission shall be to: adopt standards for collection, verification and for the timely exchange and reporting of data on fisheries for highly migratory fish stocks in the Convention Area in accordance with Annex I of the Agreement, which shall form an integral part of this Convention;” Relevant international obligations are UN Fish Stocks Agreement, Article 10(f)

²⁰⁸ UN Fish Stocks Agreement, Annex I Article 7(1): Data collected by flag States must be shared with other flag States and relevant coastal States through appropriate subregional or regional fisheries management organizations or arrangements. Such organizations or arrangements shall compile and make them available in a timely manner and in an agreed format to all interested States under the terms and conditions established by the organization or arrangement, while maintaining confidentiality of non-aggregated data, and should, to the extent feasible, develop database systems which provide efficient access to data. Also UN Fish Stocks Agreement, Annex I Article 1(1) states that “Confidentiality of non-aggregated data shall be maintained.”

WCPFC members can access non-public domain data held by the Commission. Data must still be formally requested by the WCPFC member, in accordance with the framework that is set out as Appendix 3 to the WCPFC Data Rules and Procedures.²⁰⁹ However, the condition that is placed on the WCPFC member accessing such data is that the WCPFC member is responsible for maintaining the confidentiality of such data in accordance with information security standards and policies that the Commission may adopt for the WCPFC Secretariat.²¹⁰

The circumstances where WCPFC members may access non-public domain data are to serve the purposes of the Convention. Such purposes include the following data: “(a) covering vessels flying their flag in the WCPFC Convention Area; (b) covering any vessels fishing in waters under their jurisdiction; (c) covering vessels applying to fish in their national waters, unloading in their ports or transshipping fish within waters under their jurisdiction.”²¹¹ For Pacific Island States this means that data compiled by the Commission will be available: to Pacific Island States as coastal States covering any vessel fishing within its EEZ or applying to fish within its EEZ; to Pacific Island States as flag States covering fishing activities of vessels flying its flag in the Convention Area; and to Pacific Island States as Port States covering vessels seeking to unload in port or tranship in its EEZ.

However it should be noted that the WCPFC Data Rules and Procedures are currently silent on access to data for the purpose of compliance and enforcement on the high seas. The WCPFC Data Rules and Procedures do specify that these data will be made available subject to separate rules and procedures for the access and dissemination of such data, that the Commission will adopt for these purposes.²¹² Access by WCPFC members to VMS data for scientific purposes, will be also be subject to separate rules and procedures that the Commission will adopt.²¹³ It is anticipated that further progress towards finalization of these additional WCPFC rules and procedures will commence in

²⁰⁹ WCPFC, *Decision on Rules and Procedures for the Protection of, Access to, and Dissemination of, Data Compiled by the Commission (WCPFC Data Rules and Procedures)* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 22, 25. Also see Appendix 13 herein.

²¹⁰ Ibid., para 21.

²¹¹ Ibid., para 19. Data may also be released to a WCPFC member for the purpose of scientific and other research, if the WCPFC member that originally provided that data authorises the Commission to release them.

²¹² Ibid., para 23.

²¹³ Ibid., para 24.

2008.²¹⁴ It is likely that as the WCPFC Regional Observer Programme, Commission Vessel Monitoring System (VMS) and WCPFC High Seas Boarding and Inspection Scheme are implemented the Commission, that WCPFC members will have greater certainty of the types of data that WCPFC members will need to share and to access in order to facilitate the effective implementation of the WCPF Convention. Also experience with data access arrangements that are currently permitted pursuant to the WCPFC Data Rules and Procedures might further improve levels of comfort in finalizing arrangements to facilitate access to WCPFC data for compliance and enforcement on the high seas. Some of the other outstanding challenges that relate to the WCPFC Data Rules and Procedures will now be considered.

Issues for Pacific Island States

Some Pacific Island States have expressed concern that the majority of fine-scale data that are available to the WCPFC for scientific purposes has been and is currently being collected by the efforts of Pacific Island States and other SPC members working with SPC-OFP.²¹⁵ The issue is one of fairness, because small-island developing States are using their limited resources to collect quality data on tuna fisheries that are occurring in their EEZs. Furthermore the efforts of Pacific Island States are collecting data that covers the fishing activities of vessels that many flag States that are not currently providing operational-level catch and effort data to the Commission. This appears to be inconsistent with the WCPF Convention, particularly that Pacific Island States are bearing a disproportionate burden of conservation action.²¹⁶ Additionally the concern relates to the fact that in spite of this disproportionate burden of conservation action, pursuant to the WCPFC Data Rules and Procedures these same flag States that are unable to provide data to the Commission could access these data.

Noting these concerns, paragraph 28 of the WCPFC Data Rules and Procedures state that if a WCPFC members “has not fulfilled its obligations to provide data to the

²¹⁴ WCPFC, *Summary Record of the Fourth Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 3-7 December 2007* (Tumon, Guam, USA: 2007), para 236. The Commission decided that the Ad Hoc Task Group [Data] should “be resumed to develop the separate rules and procedures for the protection of, access to and dissemination of non-public domain data for the purpose of compliance and enforcement activities on the high seas, as well as to consider the other data security and exchange issues noted by the VMS working group (TCC3 Summary Report, para 215).” However the work of the Ad Hoc Task Group [Data] will be conducted electronically, to minimise the current workload on the TCC.

²¹⁵ Authors personal observations and FFA Secretariat, *FFA Brief for the fourth regular session of the WCPFC, Tumon, Guam, USA 3 - 7 December* (Honiara: 2007).

²¹⁶ WCPF Convention, Article 30(2c).

Commission for two consecutive years shall not be granted access to Non-Public Domain data until all such matters are rectified.”²¹⁷ However as was noted in Chapter 7, it is understood that for some Pacific Island States they will only provide data on tuna fisheries to SPC-OFP and not to the WCPFC, until these concerns are adequately addressed. However, it is possible as the Technical and Compliance Committee begins to fulfil its role in checking on WCPFC member compliance with WCPFC decisions, particularly the Decision on Scientific Data to be provided to the Commission, that the implementation of paragraph 28 might be clearer and this matter might be resolved satisfactorily.²¹⁸

Another related issue is the ability of all Pacific Island States to be able to maintain non-public domain data in accordance with the requirements of the WCPFC Information Security Policy. This is an important issue for Pacific Island States, because pursuant to the WCPFC Data Rules and Procedures the WCPFC member that accesses the data is “responsible for ensuring the confidentiality and security of the Non-Public Domain data according to the risk classification and in a manner consistent with security standards established by the Commission for the WCPFC Secretariat.”²¹⁹ As was discussed in Chapter 6, Pacific Island States tend to have minimal levels of security for data on tuna fisheries within the national Fisheries Department. It was noted that in most, if not all, Pacific Island States there will be a locked room that houses raw datasheets, the computer terminal to access the FFA VMS, the computer terminal for accessing TUFMAN database software, and computer terminals and databases require password access. Also at the time of writing, confidentiality agreements were not normally commonplace as part of contracts for national fishery officers in Pacific Island States.

It should be noted that it is developing coastal States, a category which include Pacific Island States, which probably have the greatest need of all WCPFC members to be able to access WCPFC data pursuant to the WCPFC Data Rules and Procedures. Particularly, as was noted in Chapter 5, because as developing coastal States they have

²¹⁷ WCPFC, *Decision on Rules and Procedures for the Protection of, Access to, and Dissemination of, Data Compiled by the Commission (WCPFC Data Rules and Procedures)* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 28.

²¹⁸ Equally it is possible that this matter might come to a head, and paragraph 28 of the WCPFC Data Rules and Procedures might require further expansion to allay these genuine concerns of inequity.

²¹⁹ WCPFC, *Decision on Rules and Procedures for the Protection of, Access to, and Dissemination of, Data Compiled by the Commission (WCPFC Data Rules and Procedures)* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 21.

limited resources for the conduct of fisheries monitoring, control and surveillance in their EEZs. Therefore to ensure that Pacific Island States can access data pursuant to the WCPFC Data Rules and Procedures, it is incumbent on the Commission to provide assistance to Pacific Island States and other developing States so that they can effectively meet the requirements of the WCPFC Information Security Policy. Article 30 makes it clear that assistance to developing States, particularly small-island developing States such as Pacific Island States is required.

The final outstanding issue for matters of data sharing and exchange relates to the arrangements to ensure that data is available covering the full range of the tuna stocks and the fisheries that target them. Chapter 5 pointed out that the Pacific Ocean is divided into two halves: the eastern Pacific Ocean (EPO) and the western and central Pacific Ocean. It has been discussed previously, the *Inter American Tropical Tuna Commission* IATTC is the tuna RFMO that is responsible for the conservation and management of tuna stocks in the EPO. The WCPF Convention recognizes the importance of WCPFC cooperating with IATTC.²²⁰ Furthermore, in order to obtain “the best available scientific and other fisheries-related information to further the attainment of the objective of the Convention and to minimize duplication with respect to their work.”²²¹ The Commission has taken two steps to fulfil this obligation.

First, in December 2006 the WCPFC concluded a memorandum of understanding with IATTC: *Memorandum of Understanding between the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean and the Inter American Tropical Tuna Commission* (WCPFC-IATTC memorandum of understanding).²²² In respect of data exchange, the WCPFC-IATTC memorandum of understanding states the following:

The WCPFC and the IATTC agree to establish and maintain consultation, cooperation and collaboration in respect of matters of common interest to the

²²⁰ WCPF Convention, Article 22(4): “The Commission shall cooperate with the Inter-American Tropical Tuna Commission to ensure that the objective set out in article 2 of this Convention is reached. To that end, the Commission shall initiate consultation with the Inter-American Tropical Tuna Commission with a view to reaching agreement on a consistent set of conservation and management measures, including measures relating to monitoring, control and surveillance, for fish stocks that occur in the Convention Areas of both organizations.”

²²¹ Ibid., Article 22(5).

²²² Memorandum of Understanding between the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean and the Inter American Tropical Tuna Commission, of 15 December 2006 (WCPFC-IATTC memorandum of understanding,). A copy of the WCPFC-IATTC memorandum of understanding can be found attached to WCPFC Secretariat, *Cooperation with other organisations, WCPFC4-2007/18 (Rev 1)* (Pohnpei, Federated States of Micronesia: Western and Central Pacific Fisheries Commission, 2007), Attachment D.

two organizations, including, but not limited to, the following areas: i. exchange of data and information, in a manner consistent with the information-sharing policies of each Commission;²²³

Also to facilitate cooperation and collaboration between WCPFC and IATTC, pursuant to the WCPFC-IATTC memorandum of understanding, a consultative meeting between the Secretariats to be known as the WCPFC-IATTC Consultative Meeting was established.²²⁴ There have been two consultative meetings to date.²²⁵ At the consultative meetings matters of data sharing and exchange have been discussed, but discussions between the two Secretariats have been preliminary, and formal arrangements for exchange of data between the two tuna RFMOs are still to be agreed.²²⁶

The second way that the WCPFC has sought to address the requirements for sharing and exchange of data between the WCPFC and other tuna RFMOs has been through the WCPFC Data Rules and Procedures. Paragraph 29 of the WCPFC Data Rules and Procedures elaborates a specific condition for the sharing and exchange between WCPFC and another tuna RFMO. This condition is that a data exchange agreement that is concluded with another tuna RFMO “must include requirements that the other RFMO provides equivalent data on a reciprocal basis and maintains the data provided to them in a manner consistent with the security standards established by the Commission.”²²⁷

Appendix 4 of the WCPFC Data Rules and Procedures specifies types of data that the WCPFC can exchange with other tuna RFMOs.²²⁸ Operational level data on tuna fisheries (catch and effort, observer, unloading, transshipment and port inspection data) may be disseminated if the other tuna RFMO can provide equivalent data on a

²²³ WCPFC-IATTC memorandum of understanding, para 1(i).

²²⁴ Ibid., para 2 The purpose of the Consultative Meeting will be to review and enhance the cooperation between the WCPFC and the IATTC. The Consultative Meetings shall be open to all interested members of both Commissions and be supported by appropriate staff of both Commissions.

²²⁵ The first WCPFC-IATTC Consultative Meeting was held in Cancun, Mexico on Sunday 24 June 2007, immediately prior to the 74th IATTC Session. The second WCPFC-IATTC Consultative Meeting was held on 3rd December 2007, during the 4th WCPFC Session.

²²⁶ Reasons for preliminary discussions included that it was probably better for the WCPFC to adopt the WCPFC Data Rules and Procedures and finalise the Information Security Policy first. At the second consultation, discussions for cooperation between the two tuna RFMOs were negatively impacted by the discussions in WCPFC4 with respect to applications for Cooperating Non-Member applications of two Latin American States (Ecuador and El Salvador).

²²⁷ WCPFC, *Decision on Rules and Procedures for the Protection of, Access to, and Dissemination of, Data Compiled by the Commission (WCPFC Data Rules and Procedures)* (As refined and adopted at Fourth Regular Session of the Commission, Tumon, Guam, USA, 2-7 December 2007), para 29.

²²⁸ See Appendix 13 herein, Ibid., Appendix 4 - Data that may be disseminated to other regional fisheries management organisations.

reciprocal basis and the data is maintained in accordance with the WCPFC Information Security Policy.²²⁹ Aggregated catch and effort data, and observer data can also be exchanged with another tuna RFMO. Also monitoring, control and surveillance and enforcement data, such as transshipment verification reports that have the potential to fish in one tuna RFMO Convention Area but offload in another.²³⁰ These specifications and conditions must be incorporated into any future data exchange agreement between WCPFC and IATTC. In spite of this, the lack of a data exchange agreement with IATTC has not presently constrained access to data for tuna stock assessments in the WCPFC. As was noted in Chapter 6, the 'Agreement on the Exchange of Tuna Fisheries Data between IATTC and SPC' ensures that SPC-OFP is still able to access data from the IATTC, that are required for scientific analyses which SPC-OFP undertakes on behalf of the WCPFC Secretariat.²³¹

Conclusion

This Chapter completes the analysis of WCPFC practices to improve the quality of fisheries data that will support scientific analyses of impacts of western and central Pacific Ocean tuna fisheries on tuna stocks and the marine ecosystem. The analyses have shown the current transitional arrangements for data compilation in the WCPFC that utilize the services of SPC-OFP as database-contractor to be consistent with the WCPF Convention obligations, as well as international legal requirements and practices in other tuna RFMOs. The current transitional arrangements are also of benefit to Pacific Island States, particularly in ensuring that the assistance that SPC-OFP provides to Pacific Island States is continued. The outcome of the Independent Review of Scientific Structure and Function that is to be undertaken in 2008-2009 will be very important to shaping future data practices in the WCPFC and by Pacific Island States.

The analyses of verification mechanisms has shown that the WCPFC is currently in various stages of development of the four elements that have been identified as recommended international best practice for an integrated monitoring, control and

²²⁹ Ibid., Appendix 4 - Data that may be disseminated to other regional fisheries management organisations, para 1.

²³⁰ Ibid., Appendix 4 - Data that may be disseminated to other regional fisheries management organisations, para 3.

²³¹ T. Lawson, Principal Fisheries Scientist (Statistics), SPC, Personal Communication by Email, 16 February 2004. A copy of the 'Agreement on the Exchange of Tuna Fisheries Data between IATTC and SPC' was obtained by email from SPC-OFP. It is reproduced herein as Appendix 5.

surveillance system for verification of data on tuna fisheries. The WCPFC has adopted and commenced implementing frameworks for the Commission VMS and Regional Observer Programme. The WCPFC is also in the process of negotiating the frameworks for port State minimum standards, transshipment verification procedures and possibly transshipment regulations, as well as a trade and catch documentation schemes. It will be important for the WCPFC to ensure that these potential verification mechanisms have the ability to work together to form the basis of an integrated package that allows for verification of fisheries data to ensure accuracy and completeness. The WCPFC Technical and Compliance Committee has an important role in the development, implementation and review of these monitoring, control and surveillance tools that will ensure the verification of fisheries data in such an integrated way.²³² Furthermore the WCPFC is required to ensure that this integrated package of monitoring, control and surveillance is comprehensive but at the same time is not disproportionately burdensome on Pacific Island States. For Pacific Island States as coastal States and port States, such a monitoring, control and surveillance package should be complementary to monitoring, control and surveillance efforts by Pacific Island State for their areas under national jurisdiction.

The WCPFC Data Rules and Procedures have been a work in progress and appear to be breaking ground compared to other tuna RFMOs in implementation of the UN Fish Stocks Agreement provisions relating to sharing and exchange of data through tuna RFMOs. The WCPFC Data Rules and Procedures were only recently adopted by the Commission, and are still to be formally implemented. Additionally, as was found in Chapter 7, the WCPFC currently holds very little in the way of its own data that could be exchanged pursuant to the WCPFC Data Rules and Procedures.²³³ The reasons for this include first, that for varying reasons many WCPFC members are still to implement the WCPFC decision for the provision of scientific data to the Commission. Second, the WCPFC is still in the early stages of implementing the Commission VMS and Regional Observer Programme that will generate additionally WCPFC data. Third, the frameworks for WCPFC programmes, such as a WCPFC transshipment and port

²³² WCPFC Convention, Article 14(2). Functions of the TCC: “in carrying out its functions, the committee shall... (d) consider and investigate such other matters as may be referred to it by the Commission, including developing and reviewing measures to provide for the verification and validation of fisheries data.”

²³³ Chapter 7 found that almost all the data that are currently being used for tuna stock assessments in the WCPFC are data that were previously held by SPC-OFP.

State scheme, which could be used by WCPFC members to generate further WCPFC data, are still being negotiated. The full and effective implementation of WCPFC data practices in accordance with international legal requirements and international recommended best practice standards will be essential to the WCPFC achieving the long-term conservation and sustainable use of western and central Pacific tuna fisheries.

Chapter 9. Discussion and Conclusions

Fisheries data is essential to support scientific analyses of impacts of tuna fishing, which underpin scientific advice for ensuring the effective long-term conservation and sustainable use of tuna fisheries. The introductory chapter to this thesis highlighted the sustainability concerns for tuna fisheries globally, and the importance of western and central Pacific Ocean tuna fisheries internationally and to Pacific Island States.¹ The chapters that followed analysed fisheries data requirements under international law, examined approaches in tuna regional fisheries management organisations (RFMOs) to implement these requirements, and assessed the effectiveness of data practices to implement these requirements for tuna fisheries in the western and central Pacific Ocean.

This Chapter will synthesise the findings of the previous chapters and ultimately this thesis. The primary intent of this analysis is to ascertain future prospects for sustainable tuna fisheries in the western and central Pacific Ocean arising from the fisheries data practices that have been established to date in the *Commission on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPFC). Pacific Island States are economically dependent on these tuna resources and effective long-term conservation and sustainable use of tuna fisheries must be achieved.

The discussions herein will comprise five parts. First, the outcomes of the analysis of the international legal framework for fisheries data will be recalled. Also discussed, will be pertinent trends in international best practice for tuna (RFMOs) which contribute to the best quality data being available to underpin efforts to conserve and manage tuna fisheries. These findings of international legal requirements and international best practices for fisheries data, provide a basis from which the progresses to date in the WCPFC to establish data practices can be assessed. The second part will comprise the assessment of progress to date in the establishment of WCPFC data

¹ The term Pacific Island States refers to the following fourteen independent countries: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

practices, and identification of gaps in these data practices. An important consideration for this assessment will be the unique features of western and central Pacific Ocean tuna fisheries which differentiates the WCPFC from other tuna RFMOs. Third, an assessment will be made of the performance of Pacific Island States, as WCPFC members, to meet requirements to collect and provide fisheries data to the WCPFC. Fourth, an evaluation will be made of the overall availability of fisheries data to support scientific analyses to assess impacts of tuna fishing on tuna stocks and the ecosystem. It is these scientific analyses which will underpin Commission decisions to effect the long-term conservation and sustainable use of tuna fisheries in the western and central Pacific Ocean. The final section sets out the conclusions to the thesis.

9.1 International legal requirements and standards to ensure best fisheries data are available for conservation and management of tuna stocks

Conservation and management of tunas and billfishes requires an international cooperative effort because these species are highly mobile and shared resources. The role of tuna RFMOs is to facilitate cooperation among all States, which have an interest in tuna fisheries, to ensure that tuna fisheries are effectively conserved and managed. To ensure that the best scientific advice on the impacts of tuna fishing is provided to the relevant tuna RFMO, international law specifies: (a) the types of fisheries data that tuna RFMOs are required to collect; and (b) the arrangements that are required for the handling of that data.

Scientific advice on the impacts of tuna fishing has associated uncertainties. Some of the uncertainty is inherent, because fishing operations for tuna fisheries are complex, tuna species are highly mobile and marine oceanic ecosystems are vast and poorly understood. Other uncertainties occur because of incomplete coverage by fisheries data of fishing operations, inaccuracies in fisheries data, as well as anomalies and bias in reporting of fisheries data. States have a responsibility to make concerted efforts to improve the completeness and accuracy of data on tuna fisheries that is subsequently made available to tuna RFMOs. This is particularly the case when fish stocks and other elements of the ecosystem are showing signs of being significantly impacted by fishing, that is overfishing is occurring or the fish stock is overfished. Globally, catches of principal market tunas have increased ten-fold since 1950 and are continuing to increase yet further. In contrast, scientific advice recommends that there

should be no further increase in catches for the majority of principal market tuna stocks, bluefin tuna stocks, and billfish stocks across the world.² Consequently, for many tuna fisheries there is a greater need for quality fisheries data, so that tuna RFMOs can be better informed on a timely basis of any further impacts of fishing or improvements in stock status. Good quality data leads to sound scientific advice, which is key to the effective conservation and management action by tuna RFMOs.

The principal international legal instrument for fisheries data practices is the *Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks* (UN Fish Stocks Agreement), particularly its Annex I titled *Standard requirements for the collection and sharing of data*. In accordance with a sustainable and responsible approach to fisheries management, four groups of data on tuna fisheries are required by tuna RFMOs. Data should cover catch and effort of fisheries; the characteristics of the fisheries and fishing gear; the target fish stocks and surrounding ecosystem, and their response to fishing; and species that are not targeted but may be impacted on by the fisheries, or that are dependent on or found in association with target fish species. Tuna RFMOs have established effective arrangements to ensure the collection and provision of data on tuna fisheries. Generally, the approach of tuna RFMOs has been to adopt requirements that specify the types of fisheries data that Commission members must annually provide to the tuna RFMO. Some tuna RFMOs have also established monitoring and research programmes that enables collection of additional data to support stock assessments, as well as catch and effort data on target tuna and billfish species, and data on non-target, dependent and associated species.

Best practice in tuna RFMOs includes the establishment of integrated data verification schemes and a trend towards near-real time monitoring of catches for species that are overfished. These best practices have been developed to respond to continuing deterioration of tunas and billfishes stocks across the world. Consequently it is essential, first that tuna RFMOs receive the best quality fisheries data to support scientific advice and second that tuna RFMOs apply a precautionary approach to fisheries conservation and management decision-making.

² Notable exceptions are skipjack tuna in the western and central Pacific Ocean, and albacore stocks in the south Atlantic and south Pacific.

9.2 Report card for the WCPFC relative to international legal requirements and international standards

There are five tuna RFMOs that together cover the global range of the four principal market tunas by weight (yellowfin *Thunnus albacares*, albacore *T. alalunga*, bigeye *T. obesus* and skipjack *Katsuwonus pelamis*) and the three bluefin tuna species (Atlantic bluefin *T. thunnus*, Pacific bluefin *T. orientalis* and Southern bluefin *T. maccoyii*). The WCPFC is the youngest of the tuna RFMOs and has a membership roster in the mid-range of other tuna RFMOs. At the time of writing, the most recent catches of principal market tunas in the western and central Pacific Ocean were approximately 50% of total global catches. The success of the WCPFC in effectively conserving and managing tuna and billfish stocks will have implications for the present and future supply of tuna and billfish to global markets. The constituting treaty for the WCPFC, the *Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean* (WCPF Convention), was adopted in 2000 and it was negotiated based on principles of sustainable and responsible fisheries management as set out in UN Fish Stocks Agreement. The objective of the Convention is “to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the western and central Pacific Ocean”.³ As a result, conservation and management concerns of the WCPFC, including fisheries data practices, will be more comprehensive than just an emphasis on target tunas and billfishes, and will also include the impacts of fishing on the marine ecosystem. This is of course, consistent with international legal requirements outlined in the previous section of this Chapter.

As a young tuna RFMO, the WCPFC must learn from the experiences of other tuna RFMOs. Equally, with a constituting treaty founded in UN Fish Stocks Agreement, for the first time, the practices in the WCPFC could be cited as a demonstration of international best practice that other more established tuna RFMOs should follow. However, care must be taken before directly translating the experiences of one tuna RFMO to the WCPFC or *vice versa* because of the unique characteristics of tuna fisheries that occur in the western and central Pacific Ocean as distinct to other regions of the world. For instance, approximately 25% of the global catches of principle market tunas, or approximately 60% of the catches in the western and central

³ WCPF Convention, Article 3.

Pacific Ocean, are harvested in coastal State waters, particularly by surface tuna fisheries. These catches are taken in Pacific Island State waters, as well as in the waters of other coastal States such as Indonesia, Philippines, Japan, Korea, Chinese Taipei and others. The different jurisdictional areas where tuna in the western and central Pacific Ocean are fished, creates some further complexity for decision-making in the WCPFC. Nevertheless these coastal States have a responsibility and vested interest in ensuring the success of the conservation and management efforts in the WCPFC, because of the direct implications for the future of their own coastal tuna fisheries and the resource for which they have stewardship. These characteristics of the WCPFC are unlike other tuna RFMOs where a far greater proportion of the catches of principal market tunas and billfishes is harvested in areas beyond national jurisdiction.

Assessment of progress by the WCPFC to implement fisheries data practices

The WCPFC has adopted decisions that specify the fisheries data that WCPFC members are to provide to the WCPFC. These decisions are largely based on pre-existing standards of practices for the provision of fisheries data by Pacific Island States, and other States, to the *Oceanic Fisheries Programme of the Secretariat of the Pacific Community* (SPC-OFP). Based on these fisheries data, SPC-OFP has for some time undertaken scientific analyses of the impacts of tuna fishing in the western and central Pacific Ocean. The WCPFC decisions should not undermine pre-existing standards and practices in the western and central Pacific Ocean and should strive to ensure a higher standard. For example, operational-level catch and effort data must be provided to the WCPFC by WCPFC members, unless the member is a developing State constrained by resources or legal requirements. Additionally, if the coverage of operational-level catch and effort data is less than 100%, fine-scale aggregated catch and effort data must also be provided. The WCPFC requirements for fisheries data that WCPFC members are to provide to the WCPFC, adequately meet the requirements under international law, WCPF Convention obligations and standards of best practice in tuna RFMOs. A future challenge for the WCPFC will be ensuring full implementation of these WCPFC fisheries data requirements, and some progress is expected in 2008 towards this. However to ensure full compliance with these decisions, additional efforts will be required by the Technical and Compliance Committee of the WCPFC to follow-up on implementation of these requirements by individual Commission members.

This thesis **recommends** that to improve the quality of fisheries data provided by WCPFC members, the WCPFC would need to adopt a process to regularly assess individual WCPFC members' data provision to the WCPFC. This process could also be tailored to identify specific challenges being faced by developing States, so that in accordance with Article 30 of the WCPF Convention, assistance might be directed to assist these States in overcoming their challenges. Similar approaches have been effectively practiced by *Commission for the Conservation of Southern Bluefin Tuna* (CCSBT) and *International Commission for the Conservation of Atlantic Tunas* (ICCAT).

In respect of arrangements to compile data on tuna fisheries, the current database arrangements in the WCPFC are adequate. The WCPFC database directly utilizes the successful pre-existing database arrangements that were established for Pacific Island States in SPC-OFP. The status of this database arrangement in the WCPFC is described as “transitional” through contractual provision of database services from SPC-OFP. The prospects for long-term provision of these services by SPC-OFP to the WCPFC will be independently reviewed through 2008 and 2009. The current benefits of these transitional database arrangements include the maintenance of existing regional standards for quality of data on tuna fisheries. Also noting that SPC-OFP is contracted as the scientific services provider, data collected by the Commission are directly available for use in scientific analyses on impacts of tuna fishing. Additionally there is significantly less financial cost to the Commission from utilizing existing arrangements compared to the costs of establishing a database capability within the WCPFC Secretariat. Through the use of pre-existing arrangements the assistance that SPC-OFP provided to Pacific Island States prior to the establishment of the WCPFC has been able to be maintained. Consistent with WCPF Convention Article 30, these forms of assistance have further expanded, as appropriate, to include assistance to other developing States with meeting WCPFC obligations such as reporting requirements to the WCPFC.

In terms of other types of data on tuna fisheries that are needed to support stock assessment, the WCPFC has not had to start from scratch. The WCPFC has been able to utilize pre-existing fisheries data and information relating to impacts of fishing on tuna and billfish stocks. These data were previously collected by Pacific Islands States, collaborating with other States through the Standing Committee on Tuna and Billfish,

and the fisheries data were compiled and maintained by SPC-OFP. Also the pre-existing scientific research collaborations through the Standing Committee on Tuna and Billfish and with SPC-OFP have continued into the WCPFC, and are now maintained in the WCPFC Scientific Committee. For example, the completion of the first phase and almost immediate commencement of the second phase of the Pacific tuna tagging project, arguably is as a result of the positive collaboration in scientific research that was established in arrangements involving Pacific Island States prior to the WCPFC.

The WCPFC has made initial progresses towards the establishment of an integrated data verification scheme. Decisions have been taken by the WCPFC to establish a Commission Vessel Monitoring System and Regional Observer Programme. However, initial implementation will be reliant on utilizing the existing arrangements of Pacific Island States and others in the western and central Pacific Ocean. Full implementation to achieve scientific objectives, including improving the availability of data on non-target, dependent and associated species, will require expanded implementation of these programmes across the western and central Pacific Ocean. The progress in the WCPFC towards development of a documentation scheme and a port monitoring scheme are still underway, but appear to be heading towards international best practice in tuna RFMOs. There is some level of existing standards and practices in Pacific Island States that should be considered and not undermined by future arrangements developed by the WCPFC.

This thesis **recommends** that the WCPFC continue progress to develop and implement an integrated data verification scheme for the WCPFC. In accordance with best practices in tuna RFMOs, this scheme would need to comprise four elements: a WCPFC Regional Observer Programme; Commission Vessel Monitoring System; catch documentation scheme; and port monitoring scheme. As progress is made to implement these four elements in the WCPFC, the coverage and accuracy of fisheries data available to the WCPFC will improve considerably.

WCPFC arrangements for dissemination of fisheries data and information, include the requirement to ensure that confidentiality of data on tuna fisheries is maintained. These dissemination arrangements closely follow those that were pre-existing for Pacific Island States data held by SPC-OFP. Additionally the WCPFC arrangements for data and information dissemination are in accordance with practices in other tuna RFMOs, and so meet international best practice for tuna RFMOs.

At the time of writing, the arrangements for the exchange of data on tuna fisheries between WCPFC members had only recently been finalized: the *Rules and Procedures for the Protection of, Access to and Dissemination of, Data Compiled by the Commission* (WCPFC Data Rules and Procedures) were adopted by the WCPFC in 2007. These arrangements were intended to meet the data sharing requirements of UN Fish Stocks Agreement and WCPF Convention. The WCPFC Data Rules and Procedures enable a WCPFC member to have access to fisheries data that are held by the WCPFC in specific circumstances: A WCPFC member can have access to fisheries data held by the WCPFC which covers (a) fishing activities that occur in its waters under national jurisdiction; (b) fishing activities of fishing vessels that unload in its waters under national jurisdiction or in its ports; and (c) fishing activities of vessels that fly their flag. It is a condition that in accessing data held by the WCPFC that the WCPFC will maintain the confidentiality and security of the data appropriately (in accordance with the WCPFC Information Security Policy). One gap in the WCPFC Data Rules and Procedures is the finalization of rules and procedures for sharing of fisheries data that could be used for compliance purposes on the high seas, for example Commission VMS data. Another gap is the delays in implementation of WCPFC decisions that specify the data that WCPFC members are to provide to the Commission. Until these gaps are addressed, the effecting of the WCPFC Data Rules and Procedures, that is access of WCPFC members to data held by the WCPFC, could be constrained.

A further gap in WCPFC arrangements for fisheries data is the lack of a current agreement for data exchange between WCPFC and *Inter-American Tropical Tuna Commission* (IATTC). It is important that the WCPFC and IATTC share fisheries data for three reasons. First, through sharing of fisheries data a complete picture of tuna fishing activities in the Pacific Ocean can be derived. Second, through sharing of fisheries data the activities of tuna fishing vessels that operate in both halves of the Pacific Ocean can be verified. Third, under some scientific hypotheses some tuna and billfish species, for example bigeye tuna or albacore tuna, have stock distributions that traverse the western and central Pacific Ocean and eastern Pacific Ocean. It is fortunate that in the meantime, the pre-existing exchange arrangements between SPC-OFP and IATTC are able to be used in scientific analyses of the impacts of tuna fishing in the western and central Pacific Ocean and, where appropriate, across the entire Pacific Ocean. However, the data that are exchanged between SPC-OFP and IATTC, are not likely to be available to the WCPFC for purposes other than scientific analyses. For

instance, the fisheries data from IATTC are probably not able to be used by the WCPFC to verify the fishing activities of tuna fishing vessels that operate in both halves of the Pacific Ocean.

This thesis **recommends** that the WCPFC as a matter of priority, undertake to finalise the arrangements for a data exchange agreement between WCPFC and IATTC.

9.3 Report card for Pacific Island States as WCPFC members

Pacific Island States in spite of their limited size and resources have made concerted efforts to gather quality data and information on tuna fisheries for the betterment of conservation and management of tuna stocks in the western and central Pacific Ocean. These efforts have been largely cooperative, and have received support from regional institutions such as the *Pacific Islands Forum Fisheries Agency* (FFA), and *Oceanic Fisheries Programme of the Secretariat of the Pacific Community* (SPC-OFP), as well as the Standing Committee on Tuna and Billfish (now superseded by the WCPFC Scientific Committee). Many of the arrangements for data on tuna fisheries in Pacific Island States were in place before the WCPFC was established. These arrangements continue to assist Pacific Island States, as WCPFC members, to meet their obligations for data on tuna fisheries to the WCPFC. For example, Pacific Island States have pre-existing arrangement, supported by SPC-OFP and FFA, which ensure the collection and compilation of data covering tuna fishing activities that occur in waters under their national jurisdiction. Second, Pacific Island States have established arrangements to verify the landings of catches in most of their ports and also occurring at-sea, through port-sampling and observer programmes. Pacific Islands States also have the means to verify the fishing activities or movements of fishing vessels in their exclusive economic zones, through the FFA VMS, and some Pacific Island States also have national VMS. These data verification arrangements in Pacific Island States are also supported by FFA and SPC-OFP. These data collection, compilation and verification arrangements ensure that Pacific Island States have good coverage of fisheries data relating to fishing activities licensed in their exclusive economic zones, and can meet the WCPFC requirements for WCPFC members to provide fisheries data to the WCPFC.

As a result of these efforts by Pacific Island States, and in spite of their hardship, Pacific Island States are doing well in meeting their obligations to provide fisheries data to the WCPFC. As was discussed in Chapters 5 and 7, Pacific Island States are doing

considerably better than most other coastal States in the western and central Pacific Ocean. Pacific Island States for example, are doing far better than other developing coastal States such as Indonesia and the Philippines, as well as other developed coastal States in Asia. The challenges to collect fisheries data in Indonesia and the Philippines are significant due to the multi-gear multi-species fisheries, vast artisanal fisheries with thousands of landing points. It is essential that the coverage of fisheries data is improved because approximately 25% of the catches of principal market tunas are taken by these two developing coastal States. The previous thesis recommendation that a process be established to regularly assess individual WCPFC members' data provision to the WCPFC would also assist with this problem.

It was noted in the previous section that significant progress has been made by the WCPFC, over its first five years, to establish practices for data on tuna fisheries. These progresses have been made largely through the WCPFC utilizing and building upon the existing arrangements and standards for data on tuna fisheries of Pacific Island States. This circumstance of the WCPFC utilizing arrangements in Pacific Island States is a complex one for Pacific Island States. First, the WCPF Convention Article 30(2c) obliges the Commission to ensure that conservation and management measures adopted for highly migratory fish stocks in the Convention Area, do not transfer, directly or indirectly, a disproportionate burden of conservation action onto developing State parties and territories and possessions.⁴ It is fair to say that Pacific Island States have accepted some level of this burden, as otherwise the Commission would not have been able to take the decisions it has on fisheries data practices. Nevertheless, in accordance with the WCPF Convention, the Commission has a responsibility to make urgent efforts to ensure that other WCPFC members take on their share of the load in implementing arrangements for fisheries data. By load, this includes *inter alia* sharing of costs and responsibility in ensuring implementing arrangements for fisheries data.

Second, Pacific Island States have a vested interest in the success of WCPFC arrangements for effective management and long-term conservation of tuna fisheries in the western and central Pacific Ocean. Due to their vested interest, Pacific Island States have a responsibility to take a lead role in the Commission, as they are coastal States and small-island developing States with so much to lose if the Commission should fail. However, as was discussed in Chapter 7 many Pacific Island States are yet to formally

⁴ Ibid., Article 30(2c).

release data held on their behalf by SPC-OFP to the WCPFC. However until Pacific Island States are fully meeting their obligations to provide data on tuna fisheries, it will remain difficult for Pacific Island States to point out the non-compliance of other WCPFC members with these and potentially other Commission decisions. Equally, until Pacific Island States are fully meeting the requirements to provide data to the Commission covering fishing activities in their waters, it will difficult for them to argue that there is an urgent need to rectify gaps in the coverage of fisheries data for high seas areas, in accordance with WCPF Convention Article 8.

Third, many of the arrangements that the WCPFC has established for data on tuna fisheries, once fully implemented, have the potential to complement efforts by coastal States to monitor fishing activities in their waters. This is a further reason for Pacific Island States to take responsibility to ensure that the WCPFC practices for data on tuna fisheries are promptly and effectively implemented. The prompt and effective implementation of WCPFC data practices would benefit Pacific Island States in four ways. Firstly, the WCPFC Data Rules and Procedures should enable a Pacific Island State to have access to fisheries data held by the WCPFC which covers (a) fishing activities that occur in its waters under national jurisdiction; (b) fishing activities of fishing vessels that unload in its waters under national jurisdiction or in its ports; and (c) fishing activities of vessels that fly its flag. Secondly, the Commission vessel monitoring system could enable Pacific Island States, as well as other coastal States, to monitor the activities of all fishing vessels immediately adjacent to their exclusive economic zones. Thirdly, the development of future data verification arrangements, such as documentation schemes and port monitoring schemes have the potential for imposing a significant burden on Pacific Island States, as well as other coastal States, because of a significant proportion of fishing activities and unloading activities that currently occur in coastal State waters. However, the finalization of these arrangements in the WCPFC would greatly improve the completeness and accuracy of fisheries data that is available to the WCPFC to support scientific analyses of impacts of tuna fishing. Pacific Island States should therefore consider the potential burdens against the potential benefits of these verification schemes.

Fourthly, as was noted previously, Pacific Island States data practices and rely on assistance and support that is provided by FFA and SPC-OFP. Thus, the outcomes of the WCPFC Independent Review of Scientific Structure and Function that is being carried out in 2008 and 2009 will have a direct consequence on the abilities of Pacific

Island States to meet data requirements as WCPFC members. In the short-term, current WCPFC arrangements for data on tuna fisheries will be dependent on the maintained funding support to these two institutions. Equally, the outcomes of the Independent Review could have direct consequence on the long-term arrangements for WCPFC fisheries data practices, particularly those that rely on SPC-OFP.

9.4 Future prospects for long-term conservation and sustainable use of tuna fisheries in the western and central Pacific Ocean, based on available data

The WCPFC has adopted decisions to require WCPFC members to provide the four types of data that are necessary to underpin scientific advice on the impact of tuna fisheries on tuna and billfish stocks and the marine ecosystem. The current availability of fisheries data to the WCPFC is adequate to support scientific analyses to assess the impact of tuna fishing on target tuna and billfish stocks as well as the marine ecosystem. However, there is scope for individual WCPFC members to improve the coverage and accuracy of data that they currently provide to the WCPFC. Additionally, the future developments of WCPFC data verification schemes should further improve the availability and quality of data that can support scientific advice on impacts of tuna fisheries to the WCPFC.

The WCPFC arrangements for data on tuna fisheries have been established utilising the pre-existing arrangements for data on tuna fisheries for Pacific Island States. Had the WCPFC not utilised these pre-existing data arrangements, the status of principal market tuna stocks in the western and central Pacific Ocean is unlikely to be as well understood as it was at the time this thesis was written. For example, the pre-existing data holdings in SPC-OFP database, even those that cover distant-water fleets, have been collected largely through arrangements established for Pacific Island States. Regional cooperation to address problems of common interest is sensible and an efficient use of resources, particularly in regard to tuna fisheries conservation and management because of the regional distribution of the stocks and the regional nature of the fisheries that target them.

Therefore, if fisheries data was the only constraint for the effective conservation and management of tuna and billfish fisheries in the western and central Pacific Ocean, then the WCPFC is currently in a good position. Furthermore, as WCPFC arrangements for data on tuna fisheries are further implemented, the coverage and accuracy of data on

tuna fisheries that are available to the WCPFC are likely to improve further. Putting aside all other considerations, the effective long-term conservation and sustainable use could be achieved for western and central Pacific Ocean tuna fisheries.

However, in reality decision-making by a tuna Commission is complex. Tuna RFMOs have a proven record of failure, with ever-increasing total global catches of principal market tunas and worsening stock status of target tunas and billfishes. Often scientific advice might recommend the need for reductions in fishing mortality to be taken. However a plethora of political, socio-economic and biological considerations may affect the final form of conservation and management measures that are adopted by a tuna Commission. Additionally in the WCPFC, a diverse range of views across the twenty five WCPFC members in the Commission will complicate progress towards agreement for a consensus decision on conservation and management measures to respond to scientific advice. In any case, the achievement of long-term conservation and sustainable use of tuna fisheries in the western and central Pacific Ocean will ultimately depend on sufficient political will by all WCPFC members to heed scientific advice, and take effective conservation and management action. Such actions should be in accordance with the precautionary approach to fisheries management.

The analyses herein have shown that the progresses in the WCPFC for establishment of arrangements for data on tuna fisheries have been largely reliant on efforts of Pacific Island States. It appears that future successes of the WCPFC in ensuring long-term conservation and sustainable use of tuna fisheries will also be incumbent on Pacific Island States and other coastal States. After all, it is the coastal States of the western and central Pacific Ocean who have the most at risk, should the WCPFC fail to achieve effective long-term conservation and sustainable use of tuna fisheries. Coastal States, including Pacific Island States, must continue to take responsibility for ensuring the sustainability of western and central Pacific Ocean tuna fisheries so as to ensure the continued availability of their coastal fisheries for future generations.

Finally, it is probably too early in the life of the WCPFC to ascertain whether the WCPFC will have positive lessons that can be passed on to other tuna RFMOs. In any case, noting the unique institutional arrangements of SPC-OFP and FFA, the WCPFC data practices may not directly transfer to other tuna RFMOs. Nevertheless in the future, areas of performance in the WCPFC might suggest that other tuna RFMOs should be raising the bar for their data practices. Outcomes from each tuna RFMOs

individual performance review, together with continued discussions at the global level through the Joint Tuna RFMO process, are intended to ensure that all tuna RFMOs are pressured to meet standards of international best practice. Equally, if the WCPFC is found to be not meeting international best practice standards, the Joint Tuna RFMO processes could place further pressure on WCPFC to make the grade.

Conclusion

To recapitulate, four groups of data on tuna fisheries are required by tuna RFMOs to underpin effective conservation and management of tuna and billfish stocks. Data should cover catch and effort of fisheries; the characteristics of the fisheries and fishing gear; target fish stocks and surrounding ecosystem and their response to fishing; and species that are not targeted but may be impacted on by the fisheries, or that are dependent on or found in association with tuna or billfish stocks. To ensure that the data that underpins conservation and management decisions are complete and accurate, arrangements need to be established in tuna RFMOs to verify data on tuna fisheries. Integrated data verification tools including near-real time monitoring of catches may also be required in tuna RFMOs particularly to more closely monitor impacts of fishing on tuna or billfish stocks that are overfished.

The WCPFC has established arrangements for data on tuna fisheries that meet international legal obligations and international best practice in tuna RFMOs. In particular, the WCPFC has taken decisions to require WCPFC members provide fisheries covering the four groups required. Progress has also been made by the WCPFC in establishing and implementing data verification arrangements that ensure data on tuna fisheries are complete and accurate. The WCPFC has arrangements for compilation and dissemination of data on tuna fisheries that are proven in maintaining confidentiality of data. The significant progress in the WCPFC over its first five years, have been largely by utilising and building upon existing arrangements and standards for data on tuna fisheries in Pacific Island States. There are still some gaps in the implementation of data requirements by WCPFC members, and progress can still be made to further improve quality of data, notably more complete coverage and improved accuracy. Accordingly, this thesis recommends that the WCPFC establish a process to

regularly assess individual WCPFC members' data provision to the WCPFC and continue progress to establish an integrated WCPFC verification scheme.

Pacific Island States in spite of their considerable hardships are doing well in meeting obligations for data on tuna fisheries to the WCPFC. Indeed, Pacific Island States are doing considerably better than most other coastal States in the WCPFC. Additionally through the WCPFC utilising the pre-existing arrangements for data on tuna fisheries, Pacific Island States have made significant contributions to the establishment of WCPFC fisheries data practices. Pacific Island States, like other coastal States, have a vested interest in ensuring the long-term conservation and sustainable use of tuna fisheries in their exclusive economic zones. Consequently, it is important that Pacific Island States continue to drive the establishment and implementation of effective fisheries data practices in the WCPFC. Pacific Island States should ensure that they fully implement WCPFC decisions, so that other WCPFC members can be called on to improve their implementation. Effective WCPFC fisheries data practices will ensure that quality fisheries data underpins the scientific advice that conservation and management decisions taken by the Commission will be based upon. The outcomes from the Independent Review of Scientific Structure and Function will be significant for Pacific Island States and for WCPFC data practices.

If fisheries data was the only constraint for effective conservation and management of tuna and billfish fisheries in the western and central Pacific Ocean, the WCPFC is currently in a good position. Furthermore, as WCPFC fisheries data practices are further implemented the coverage and accuracy of data on tuna fisheries that are available to the WCPFC are likely to improve further. However, in reality decision-making by a tuna Commission is complex and tuna RFMOs have a proven record of failure, with ever-increasing total global catches of principal market tunas and worsening stock status of target tuna and billfish stocks globally. For the WCPFC to achieve long-term conservation and sustainable use of western and central Pacific Ocean tuna fisheries, it will be contingent on coastal States, particularly Pacific Island States, to continue to take responsibility for leading the establishment and implementation of effective WCPFC fisheries data practices. The Joint Tuna RFMO processes could also be used to maintain pressure for the WCPFC to adopt best practice standards for tuna RFMOs.

Bibliography

I. GENERAL REFERENCES	402
I.1 BOOKS, MONOGRAPHS AND BOOK CHAPTERS.....	402
I.2 JOURNAL ARTICLES	406
I.3 CONFERENCE, MEETING AND WORKSHOP PAPERS.....	408
I.4 OTHER GENERAL REFERENCES.....	410
II. LAWS, POLICIES, GUIDELINES AND RESOLUTIONS	413
II.1 INTERNATIONAL INSTRUMENTS	413
II.2 REGIONAL TREATIES, RESOLUTIONS, RECOMMENDATIONS	414
II.3 SUB-REGIONAL – AMONGST OR WITH PACIFIC ISLAND STATES.	417
III. INTERNATIONAL AND REGIONAL ORGANISATION REPORTS	418
III.1 UNITED NATIONS RELATED-REPORTS	418
III.2 FOOD AND AGRICULTURE ORGANISATION (FAO) REPORTS.....	418
III.3 HIGH SEAS TASK FORCE REPORT	420
III.4 JOINT TUNA RFMO REPORTS.....	420
III.5 INTER-AMERICAN TROPICAL TUNA COMMISSION (IATTC) REPORTS.....	420
III.6 INTERNATIONAL COMMISSION FOR THE CONSERVATION OF ATLANTIC TUNAS (ICCAT) REPORTS.....	420
III.7 INDIAN OCEAN TUNA COMMISSION (IOTC) REPORTS.....	420
III.8 COMMISSION FOR THE CONSERVATION OF SOUTHERN BLUEFIN TUNA (CCSBT) REPORTS	421
III.9 COMMISSION FOR THE CONSERVATION AND MANAGEMENT OF HIGHLY MIGRATORY FISH STOCKS IN THE WESTERN AND CENTRAL PACIFIC OCEAN (WCPFC)-RELATED REPORTS	421
III.10 SECRETARIAT OF THE PACIFIC COMMUNITY (SPC) REPORTS..	422
III.11 PACIFIC ISLANDS FORUM FISHERIES AGENCY REPORTS	423
III.12 SPC/FFA DATA COLLECTION COMMITTEE REPORTS.....	424
III.13 PACIFIC ISLANDS FORUM SECRETARIAT REPORTS.....	424

I. General References

I.1 Books, Monographs and Book Chapters

- Altringham, J. D., and R. E. Shadwick. "Chapter 8: Swimming and Muscle Function." In *Tuna: Physiology, Ecology and Evolution*, edited by B. A. Block and E. D. Stevens, 313-344. (San Diego, California: Academic Press, 2001).
- Alverson, D. L., and K. Dunlop, *Status of World Marine Fish Stocks, FRI-UW-1998* (Seattle, Washington: Fisheries Research Institute, University of Washington, 1998), 29p.
- Berrill, M. *The Plundered Seas - can the world's fish be saved?*, (San Francisco: Sierra Club Books, 1997), 208p.
- Birnie, P., and A. Boyle. *International Law and the Environment*. 1 ed, (New York, United States: Oxford University Press, 1992), 563p.
- Birnie, P., and A. Boyle. *International Law and the Environment*. 2 ed, (New York, United States: Oxford University Press, 2002), 798p.
- Block, B. A., and E. D. Stevens, eds. *Tuna: Physiology, Ecology and Evolution*. Edited by W. S. Hoar, D. J. Randall and A. P. Farrell. Vol. 19, Fish Physiology Series, (San Diego, California: Academic Press, 2001).
- Brill, R. W., and P. G. Bushnell. "Chapter 3: The Cardiovascular System of Tunas." In *Tuna: Physiology, Ecology and Evolution*, edited by B. A. Block and E. D. Stevens, 79-120. (San Diego, California: Academic Press, 2001).
- Caddy, J. F., and R. Mahon. *Reference Points for Fisheries Management, FAO Fisheries Technical Paper 347*, (Rome: FAO, 1995), 83p.
- Collette, B. B. "Chapter 1: The Tunas: II. Adaptations and Systematics of the Mackerels and Tunas." In *The Physiological Ecology of Tunas*, edited by G. D. Sharp and A. E. Dizon, 7-39. (New York: Academic Press, 1978).
- Collette, B. B., and C. E. Nauen, *FAO Species Catalogue: Vol 2. Scombrids of the World. An annotated and illustrated catalogue of tunas, mackerels, bonitos and related species known to date, FAO Fish. Synop. (125) Vol. 2* (Rome: FAO, 1983), 137p.
- Collette, B. B., C. Reeb, and B. A. Block. "Chapter 1: Systematics of the Tunas and Mackerels (scombridae)." In *Tuna: Physiology, Ecology and Evolution*, edited by B. A. Block and E. D. Stevens, 1-33. (San Diego, California: Academic Press, 2001).
- Cushing, D. H. *The Provident Sea*, (Cambridge: Cambridge University Press, 1988).
- Doulman, D. J. "15. Fisheries Cooperation: The Case of the Nauru Group." In *Tuna Issues and Perspective in the Pacific Island Region*, edited by D. J. Doulman, 257-277. (Honolulu: East-West Center, 1987).
- English, L. P. *Improving Data Warehouse and Business Information Quality: Methods for Reducing Costs and Increasing Profits*, (New York: John Wiley & Sons, Inc., 1999), 518p.
- Evans, D. W., *Status and trends reporting in fisheries: A review of progress and approaches to reporting the state of world fisheries, FAO Fisheries Circular 967* (Rome: FAO, 2001), 74p.
- Evans, D., and R. Grainger. "5. Gathering Data for Resource Monitoring and Fisheries Management." In *Handbook of Fish Biology and Fisheries*, edited by P. J. B. Hart and J. D. Reynolds, 84-102. (Oxford, United Kingdom: Blackwell Science Ltd, 2002).

- Fonteneau, A. *Atlas of Tropical Tuna Fisheries*, (Paris: ORSTOM, 1998).
- Gillett, R., M. McCoy, L. Rodwell, and J. Tamate, *Tuna: A Key Economic Resource in the Pacific Islands*, ed. A. D. Bank (Manila, Philippines: Asian Development Bank, 2001), 96p.
- Gillett, R., and A. Langley, *Tuna for Tomorrow? Some of the Science Behind an Important Fishery in the Pacific Islands* (Noumea: Asian Development Bank and Secretariat of the Pacific Community, 2007), 36p.
- Gillett, R., *A short history of industrial fishing in the Pacific Islands* (Bangkok: Asia-Pacific Fishery Commission, FAO Regional Office for Asia and the Pacific, 2007), 14p.
- Grotius, H. *The Freedom of the Seas*, (New York: Oxford University Press, 1916).
- Graham, J. B., and K. A. Dickson. "Chapter 4: Anatomical and Physiological Specializations for Endothermy." In *Tuna: Physiology, Ecology and Evolution*, edited by B. A. Block and E. D. Stevens, 121-165. (San Diego, California: Academic Press, 2001).
- Gunn, J., and B. A. Block. "Chapter 5: Advances in Acoustic, Archival and Satellite Tagging of Tunas." In *Tuna: Physiology, Ecology and Evolution*, edited by B. A. Block and E. D. Stevens, 167-224. (San Diego, California: Academic Press, 2001).
- Hayashi, M. "Chapter 4: The Straddling and Highly Migratory Fish Stocks Agreement." In *Developments in International Fisheries Law*, edited by E. Hey, 55-83. (The Hague, The Netherlands: Kluwer Law International, 1999).
- Hey, E. *The Regime for the Exploitation of Transboundary Marine Fisheries Resources: The United Nations Law of the Sea Convention Cooperation between States*, (Dordrecht, The Netherlands: Martinus Nijhoff Publishers, 1989), 306p.
- Hey, E. "Chapter 1: Global Fisheries Instruments Adopted in the Post-UNCLOS III Period." In *Developments in International Fisheries Law*, edited by E. Hey, 3-10. (The Hague, Netherlands: Kluwer Law International, 1999).
- Hey, E. "Chapter 2: The Fisheries Provisions of the LOS Convention." In *Developments in International Fisheries Law*, edited by E. Hey, 13-29. (The Hague, The Netherlands: Kluwer Law International, 1999).
- Hilborn, R., and C. J. Walters. *Quantitative Fisheries Stock Assessment: Choice, Dynamics and Uncertainty*, (New York: Chapman and Hall, 1992), 570p.
- Holden, P., M. Bale, and S. Holden, *Swimming Against the Tide? An Assessment of the Private Sector in the Pacific.*, ed. A. D. Bank (Manila, Philippines: Asian Development Bank, 2004), 178p.
- Jennings, S., M. J. Kaiser, and J. D. Reynolds. *Marine Fisheries Ecology*, (Oxford: Blackwell Science Ltd, 2001).
- Jordan, C. F., and C. Miller. "Chapter 3: Scientific Uncertainty as a Constraint to Environmental Problem Solving: Large-Scale Ecosystems." In *Scientific Uncertainty and Environmental Problem Solving*, edited by J. Lemons, 91-117. (Massachusetts, USA: Blackwell Science Inc, 1996).
- Joseph, J., and J. W. Greenough. *International Management of Tuna, Porpoise and Billfish - Biological, Legal and Political Aspects*, (Seattle: University of Washington Press, 1979).
- Joseph, J., W. Klawe, and P. Murphy. *Tuna and Billfish - fish without a country*. 2nd ed, (La Jolla, California: Inter-American Tropical Tuna Commission, 1980), 42p.

- Kaye, S. M. *International Fisheries Management, International Environmental Law & Policy Series*, (The Hague, The Netherlands: Kluwer Law International, 2001), 606p.
- Kent, G. *The Politics of Pacific Island Fisheries*. A Westview replica ed, (Colorado, United States of America: Westview Press, 1980), 191p.
- King, M. G. *Fisheries Biology, Assessment and Management*. 2nd ed, (Oxford, United Kingdom: Blackwell Publishing, 2007), 382p.
- Lack, M., *With an eye to the future: addressing failures in the global management of bigeye tuna* (Sydney, Australia: Traffic International and WWF Australia, 2007), 61p.
- Lack, M., *Catching On? Trade-related Measures as a Fisheries Management Tool* (Sydney: TRAFFIC International, 2007), 50p.
- Langley, A., P. Williams, and J. Hampton, *The Western and Central Pacific Tuna Fishery: 2005 overview and status of stocks, Tuna Fisheries Assessment Report No.7* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2006), 70p.
- Lewis, A. D. "Population Genetics, Ecology and Systematics of Indo-Australian Scombrid Fishes, with particular reference to skipjack tuna (*Katsuwonus pelamis*).". Doctor of Philosophy, Australian National University, 1981.
- Lewis, A. D., *Review of tuna fisheries and the tuna fishery statistical system in the Philippines* (Noumea, New Caledonia: SPC-OFP, 2004), 61p.
- Lodge, M. W., D. Anderson, T. Løbach, G. Munro, K. Sainsbury, and A. Willock, Recommended Best Practices for Regional Fisheries Management Organizations. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations (London, United Kingdom: The Royal Institute of International Affairs, Chatham House, 2007), 142p.
- Longhurst, A. *Ecological Geography of the Sea*, (San Diego, California: Academic Press, 1998), 402p.
- Lugten, G. L., *A Review of Measures Taken By Regional Marine Fishery Bodies to Address Contemporary Fishery Issues*, *FAO Fisheries Circular 940* (Rome: FAO, 1999), 97p.
- Majkowski, J., *Global fishery resources of tuna and tuna-like species*, *FAO Fisheries Technical Paper No 483* (Rome: FAO, 2007), 54p.
- Miyake, M. P., N. Miyabe, and H. Nakano, *Historical trends of tuna catches in the world*, *FAO Fisheries Technical Paper No.467* (Rome: Food and Agriculture Organisation of the United Nations, 2004), 74p.
- Nakamura, I., *FAO Species Catalogue: Vol 5. Billfishes of the World. An annotated and illustrated catalogue of marlins, sailfishes, spearfishes and swordfishes known to date*, *FAO Fish. Synop. (125) Vol. 5* (Rome: FAO, 1985), 65p.
- Nandan, S. N. "Chapter 1: An Introduction to the 1982 United Nations Convention on the Law of the Sea." In *Order for the Oceans at the Turn of the Century*, edited by D. Vidas and W. Østreng, 9-13. (The Hague, The Netherlands: Kluwer Law International, 1999).
- National Research Council, *Improving the Collection, Management, and Use of Marine Fisheries Data* (Washington, D.C.: National Academy Press, 2000), 222p.
- National Research Council, *Improving the Use of the "Best Scientific Information Available" Standard in Fisheries Management* (Washington, D.C.: National Academy Press, 2004), 106p.

- Pitcher, T. J. "Series Forward." In *Reinventing Fisheries Management*, edited by T. J. Pitcher, P. J. B. Hart and D. Pauly, xxiii -xxiv. (Dordrecht, The Netherlands: Kluwer Academic Publishers, 1998).
- Quinn, T. J. I., and R. B. Deriso. *Quantitative Fish Dynamics, Biological Resource Management Series*, (New York: Oxford University Press, 1999).
- Rayfuse, R., and M. Wilder. "Chapter 7: Sustainability, uncertainty and global fisheries." In *Ecology, Uncertainty and Policy: Managing Ecosystems for Sustainability*, edited by J. W. Handmer, T. W. Norton and S. R. Dovers, 138-166. (Essex, England: Pearson Education Limited, 2001).
- Scialabba, N. E.-H. "Chapter 22: FAO and Small Island Developing States: Challenges and Emerging Issues in Agriculture and Fisheries." In *Economic Vulnerability and Resilience of Small States*, edited by L. Bruguglio and E. J. Kisanga, 391-416. (Malta: Islands and Small States Institute of the University of Malta & Commonwealth Secretariat, 2004).
- Sharp, G. D., and A. E. Dizon, eds. *The Physiological Ecology of Tunas*, Proceedings of the Tuna Physiological Workshop held at the National Marine Fisheries Service Southwest Fisheries Center at La Jolla, California Jan 10-15 1977, (New York: Academic Press, 1978).
- Skillman, R. A. "Pacific Billfishes and the Assessment Process." In *Getting Ahead of the Curve. Conserving the Pacific Ocean's Tunas, Swordfish, Billfishes and Sharks*, edited by K. Hinman, 31-34. (Leesburg, Virginia: National Coalition for Marine Conservation, 2000).
- Smith, T. D. "Chapter 4: A History of Fisheries and their Science and Management." In *Handbook of Fish Biology and Fisheries*, edited by P. J. B. Hart and J. D. Reynolds, 61-83. (Oxford, United Kingdom: Blackwell Science Ltd, 2002).
- Sparre, P., and P. J. B. Hart. "Chapter 13: Choosing the Best Model for Fisheries Assessment." In *Handbook of Fish Biology and Fisheries*, edited by P. J. B. Hart and J. D. Reynolds, 270-290. (Oxford, United Kingdom: Blackwell Science Ltd, 2002).
- Sparre, P., and S. C. Venema, *Introduction to tropical fish stock assessment. Part 1. Manual*, FAO Fisheries Technical Paper 306.1 Rev 2 (Rome: FAO, 1998), 407p.
- Swan, J., and B. P. Satia, *Contribution of the Committee on Fisheries to Global Fisheries Governance 1977-1997*, 938 (Rome: FAO, 1999), 46p.
- Swan, J., *Regional fishery bodies and governance: issues, actions and future directions*. FAO Fisheries Circular 959 (Rome: FAO, 2000), 46p.
- Swan, J., *Summary Information on the Role of International Fishery Organizations or Arrangements and Other Bodies Concerned with the Conservation and Management of Living Aquatic Resources*, FAO Fisheries Circular 985 (Rome: FAO, 2003).
- Tarte, S., *'Small Islands; Big Fish': The International Politics of Tuna Management in the Western and Central Pacific* (Suva, Fiji: The University of the South Pacific, 2001), 20p.
- Tsamenyi, M., and K. Mfodwo. "South Pacific Island States and the New Regime of Fisheries Issues of Law, Economy and Diplomacy." In *The Law of the Sea in the Asian Pacific Region - developments and prospects*, edited by J. Crawford and D. R. Rothwell, 121-155. (Dordrecht, The Netherlands: Kluwer Academic Publishers, 1995).
- Tsamenyi, M., and L. Manarangi-Trott. "Chapter 10: Role of Regional Organizations in Meeting LOS Convention Challenges: The Western and Central Pacific Experience." In *Oceans Management in the 21st Century*, edited by D. R. Rothwell and A. Oude Elferink. (The Hague: Kluwer Law Academic Press, 2004).

- Ward, P., N. Tsirbas, and R. Kearney. *Getting Science into Regional Fisheries Management - A Global View*, (Canberra, Australia: Bureau of Research Sciences, 1998), 94p.
- Watson, R., D. Pauly, V. Christensen, R. Froese, A. Longhurst, T. Platt, S. Sathyendranath, K. Sherman, J. O'Reilly, and P. Celone. "Chapter 16. Mapping Fisheries onto Marine Ecosystems for Regional, Oceanic and Global Integrations." In *Large Marine Ecosystems of the World*, edited by G. Hempel and K. Sherman: Elsevier, 2003).
- Westneat, M. W., and S. A. Wainwright. "Chapter 7: Mechanical Design for Swimming : Muscle, Tendon and Bone." In *Tuna: Physiology, Ecology and Evolution*, edited by B. A. Block and E. D. Stevens, 271-311. (San Diego, California: Academic Press, 2001).

I.2 Journal Articles

- Aqorau, T. "Tuna Fisheries Management in the Western and Central Pacific Ocean: A Critical Analysis of the Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean and Its Implications for the Pacific Islands States." *The International Journal of Marine and Coastal Law* 16, no. 3 (2001): 379-431.
- Aqorau, T. "Illegal Fishing and Fisheries Law Enforcement in Small Island Developing States: The Pacific Islands Experience." *The International Journal of Marine and Coastal Law* 15, no. 1 (2000): 37-63.
- Aqorau, T., and A. Bergin. "The Federated States of Micronesia Arrangement for Regional Fisheries Access." *The International Journal of Marine and Coastal Law* 12, no. 1 (1997): 37-80.
- Aqorau, T., and A. Bergin. "Ocean governance in the Western Pacific purse seine fishery - the Palau Arrangement." *Marine Policy* 21, no. 2 (1997): 173-186.
- Aqorau, T., and A. Bergin. "The UN Fish Stocks Agreement-A New Era for International Cooperation to Conserve Tuna in the Central and Western Pacific." *Ocean Development and International Law* 29, no. 1 (1998): 21-42.
- Barclay, K., and I. Cartwright. "Governance of tuna industries: The key to economic viability and sustainability in the Western and Central Pacific Ocean." *Marine Policy* 31 (2007): 348-358.
- Caddy, J. F., J. Csirke, S. M. Garcia, and R. J. R. Grainger. "How Pervasive is "Fishing Down Marine Food Webs"?" *Science* 282 (1998): 1383a.
- Cochrane, K. L. "Complexity in fisheries and limitations in the increasing complexity of fisheries management." *ICES Journal of Marine Science* 56 (1999): 917-926.
- Cullet, P., and A. P. Kameri-Mbote. "Dolphin Bycatches in Tuna Fisheries: A Smokescreen Hiding the Real Issues?" *Ocean Development and International Law* 27 (1996): 333-348.
- Dubinsky, W. "Management of world fisheries: Implication of extended fisheries jurisdiction: edited by Edward Miles University of Washington Press, Seattle, WA, 1989." *Marine Policy* 15, no. 4 (1991): 297-300.
- Fournier, D. A., J. Hampton, and J. R. Sibert. "MULTIFAN-CL: a length-based, age-structured model for fisheries stock assessment, with application to South Pacific albacore, *Thunnus alalunga*." *Canadian Journal of Fisheries and Aquatic Sciences* 55 (1998): 2105-2116.

- Garcia, S. M., D. J. Staples, and J. Chesson. "The FAO Guidelines for the development and use of indicators for sustainable development of marine capture fisheries and an Australian example of their application." *Ocean and Coastal Management* 43 (2000): 537-556.
- Hannesson, R. "The exclusive economic zone and economic development in Pacific Island Countries." *Marine Policy* (Article in press) (2008).
- Hayashi, M. "The 1995 Agreement on the conservation and management of staddling and highly migratory fish stocks: significance for the Law of the Sea Convention." *Ocean and Coastal Management* 29, no. 1-3 (1995): 51-69.
- Hedley, C. "The 1998 Agreement on the International Dolphin Conservation Program: Recent Developments in the Tuna-Dolphin Controversy in the Eastern Pacific Ocean." *Ocean Development and International Law* 32 (2001): 71-92.
- Hilborn, R., and J. Sibert. "Is international management of tuna necessary?" *Marine Policy* (1988): 31-39.
- Hilborn, R. "Letter to the editor: International management of tuna." *Marine Policy* (1989): 166.
- Joseph, J. "The management of highly migratory species - some important concepts." *Marine Policy* (1977): 275-288.
- Juda, L. "The 1995 United Nations Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks: A Critique." *Ocean Development and International Law* 28, no. 2 (1997): 147-166.
- Juda, L. "Rio Plus Ten: The Evolution of International Marine Fisheries Governance." *Ocean Development and International Law* 33 (2002): 109-144.
- Kawaley, I. "Implications of Exclusive Economic Zone Management and Regional Cooperation Between South Pacific Small Midocean Island Commonwealth Territories." *Ocean Development and International Law* 30 (1999): 333-377.
- Kleiber, P., M. G. Hinton, and Y. Uozumi. "Stock assessment of blue marlin (*Makaira nigricans*) in the Pacific using MULTIFAN-CL." *Marine and Freshwater Research* 54 (2003): 349-360.
- Lodge, M. W. "The development of the Palau Arrangement for the management of the western Pacific purse seine fishery." *Marine Policy* 22, no. 1 (1998): 1-28.
- Mace, G. M., and E. Hudson, J. "Attitudes toward Sustainability and Extinction." *Conservation Biology* 13, no. 2 (1999): 242-246.
- Mizukami, C. "Fisheries problems in the South Pacific region." *Marine Policy* 15, no. 2 (1991): 111-121.
- Pauly, D., V. Christensen, J. Dalsgaard, R. Froese, and F. Torres Jr. "Fishing Down Marine Food Webs." *Science* 279 (1998): 860-863.
- Pauly, D. "Longhurst Areas - Ecological Geography of the Sea." *Trends in Ecology and Evolution* 14, no. 3 (1999): 118.
- Pauly, D., J. Alder, E. Bennett, V. Christensen, P. Tyedmers, and R. Watson. "The Future for Fisheries." *Science* 302 (2003): 1359-1361.
- Ram-Bidesi, V., and M. Tsamenyi. "Implications of the tuna management regime for domestic industry development in the Pacific Islands States." *Marine Policy* 28 (2004): 383-392.

- Reid, C. "Tuna Resource Management: Economic Implications and trade-offs in achieving maximum sustainable yield for bigeye and yellowfin tuna in the Western and Central Pacific Ocean." *Pacific Economic Bulletin*, 21, no. 3 (2006): 31-45.
- Serdy, A. "One fin, two fins, red fins, bluefins: some problems of nomenclature and taxonomy affecting legal instruments governing tuna and other highly migratory species." *Marine Policy* 28 (2004): 235-247.
- Sibert, J., and J. Hampton. "Mobility of tropical tunas and the implications for fisheries management." *Marine Policy* 27 (2003): 87-95.
- Sissenwine, M. P., and A. A. Rosenberg. "Marine Fisheries at a Critical Juncture." *Fisheries* 18, no. 10 (1993): 6-14.
- Tarte, S. "Negotiating a Tuna Management Regime for the Western and Central Pacific: the MHLRC Process 1994-1999." *The Journal of Pacific History* 34, no. 3 (1999): 273-280.
- Uozumi, Y. "Historical perspectives of global billfish stock assessment." *Marine and Freshwater Research* 54 (2003): 555-565.
- Ward, P., B. Kearney, and N. Tsirbas. "Science arrangements for the regional management of tuna fisheries." *Marine Policy* 24 (2000): 93-108.
- Ward, P., J. M. Porter, and S. Elscot. "Broadbill swordfish: status of established fisheries and lessons for developing fisheries." *Fish and Fisheries* 1 (2000): 317-336.
- Watson, R., and D. Pauly. "Systematic distortions in world fisheries catch trends." *Nature* 414 (2001): 534-536.
- Watson, R., A. Kitchingman, A. Gelchu, and D. Pauly. "Mapping global fisheries: sharpening our focus." *Fish and Fisheries* 5 (2004): 168-177.

I.3 Conference, Meeting and Workshop Papers

I.3.1 International Conferences, Meetings and Workshops

- FAO. "Reference Points for Fisheries Management: their potential application to straddling and highly migratory resources. [A.CONF.164/INF/9, dated 26 January 1994]." Paper presented at the United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks, New York, 14-31 March 1994.
- Garcia, S. M., and R. Grainger. "Fisheries Management and Sustainability: A new perspective of an old problem?" In *World Fisheries Congress: 2nd - Developing and sustaining world fisheries: the state of science and management*, edited by D. A. Hancock, D. C. Smith, A. Grant and J. P. Beumer, 631-654, (Brisbane, Queensland: CSIRO, Australia, 1996).
- Lodge, M. W. "Harmonised minimum conditions for foreign fishing access." Paper presented at the Fisheries access in West Africa. Proceedings of two workshops held in Senegal and Mauritania 2001.
- Majkowski, J. "Tuna and Tuna-like Species: Global Status of Fishery Resources - Executive Summary." In *Joint Meeting of Tuna RFMOs, January 22-26*, Appendix 5, (Kobe, Japan, 2007).

"Mauritius Strategy for the further Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States: A/Conf.207/CRP.7 - advance unedited version as agreed in informal consultations.". Paper presented at the International Meeting to Review the Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States, Port Louis, Mauritius, 10-14 January 2005.

I.3.2 Regional Conferences, Meetings and Workshops from the Pacific

- Anon. "Report of the Nineteenth North Pacific Albacore Workshop. November 25 - December 2 2004, ed. M. Stocker, 3 (Nanaimo, B.C. Canada: Fisheries and Oceans Canada, Pacific Biological Station, 2005), WCPFC -SC1 GN IP-3" In *Paper presented to 1st Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission, 8-19 August 2005: Noumea, New Caledonia*, (Kolonias, Federated States of Micronesia; WCPFC, 2005), 127p.
- de Leiva Moreno, I., and J. Majkowski. "Status of Tuna Stocks." In *Paper presented to the 17th Standing Committee on Tuna and Billfish, Majuro, Marshall Islands 9-18 August 2004*, SCTB17 Working Paper INF-SA-2., (Noumea, New Caledonia: Secretariat of the Pacific Community, 2004), 61p.
- Lawson, T. "Observer Coverage Rates and Reliability of CPUE Estimates for Offshore Longliners in Tropical Waters of the Western and Central Pacific Ocean (SCTB17 WP SWG-4)." In *Paper presented to the 17th Standing Committee on Tuna and Billfish, Majuro, Marshall Islands 9-18 August 2004*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2004), 13p.
- Manarangi-Trott, L. "Legal Aspects Governing Fisheries Data (SCTB17 Working Paper SWG-8)." In *17th Meeting of the Standing Committee on Tuna and Billfish (SCTB17) 8-18 August*, (Majuro, Marshall Islands, 2004).
- Molony, B. "Estimates of the mortality of non-target species with an initial focus on seabirds, turtles and sharks (WCPFC-SC1 Working Paper EB WP-1)" In *Paper presented to 1st Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission, 8-19 August 2005: Noumea, New Caledonia*, (Kolonias, Federated States of Micronesia; WCPFC, 2005), 84p.
- Reid, C., S. Sauni, and L. Clark. "Economic and Management Implications of Stock Assessments on Key Tuna Stocks in the WCPO WCPFC-SC3-SA SWG/WP-8." In *Paper presented at the Third Regular Session of the WCPFC Scientific Committee, 13-24 August, Honolulu, Hawaii* (Kolonias, Federated States of Micronesia; WCPFC, 2007).
- Rodwell, L. "FFA Initiatives related to the Palau Arrangement, purse seine management and the management of bigeye fishing mortality in the WCPO (SCTB17 Working Paper FTWG-6)." In *Paper presented to the 17th Standing Committee on Tuna and Billfish, Majuro, Marshall Islands 9-18 August 2004*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2004), 5p.
- Williams, P., and C. Reid. "Overview of the Western and Central Pacific Ocean (WCPO) Tuna Fisheries - 2003." In *Paper presented to the 17th Standing Committee on Tuna and Billfish, Majuro, Marshall Islands 9-18 August 2004*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2004), 34p.

Williams, P., and C. Reid. "Overview of the tuna fisheries in the Western and Central Pacific Ocean (WCPO), including economic conditions - 2007." In *Paper presented to the 3rd Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission, 13-24 August: Honolulu, Hawaii*, (Kolonias, Federated States of Micronesia: WCPFC, 2007), 43p.

I.4 Other General References

I.4.1 Information sourced from international organization websites

- CCSBT Commission for the Conservation of Southern Bluefin Tuna*. [website]. CCSBT, [cited 15 January 2008]. Available from <http://www.ccsbt.org/docs/about.html>.
- Research: CCSBT Commission for the Conservation of Southern Bluefin Tuna*. [website]. CCSBT, [cited 2 February 2008]. Available from <http://www.ccsbt.org/docs/research.html>.
- Agreement to promote compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas*. [website]. FAO Legal Office Treaties, 2008 [cited 5 February 2008]. Available from <http://www.fao.org/legal/treaties/012s-e.htm>.
- Concern over situation of high-seas fish species: Strengthening fisheries management in international waters "a major challenge" - FAO report*. [website]. FAO Newsroom, [cited April 18 2007]. Available from <http://www.fao.org/newsroom/en/news/2007/1000505/index/html>.
- FAO Fisheries & Aquaculture - Ecosystem approach to fisheries management*. [website]. FAO Fishery Department, [cited February 20 2008]. Available from <http://www.fao.org/fishery/topic/13261>.
- FAO Fisheries and Aquaculture Information and Statistics Service. *Capture production 1950-2005. FISHSTAT Plus - Universal software for fishery statistical time series [online or CD-ROM]* (Version 2.3. 2000) Food and Agriculture Organization of the United Nations, Data: Capture Production 1950-2005 released March 2007 [cited January 1 2008]. Available from <http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp>.
- FAO. *Fisheries Programme: Fisheries Global Information System* FAO Fisheries Information, Data and Statistics Unit (FIDI), 15 Dec 2003 2004 [cited 29 June 2004]. Available from <http://www.fao.org/figis/servlet/static?dom=root&xml=index.xml>.
- FAO. *Fisheries and Aquaculture Collection: Global Tuna Nominal Catches 1950-2002* FAO Fisheries Department, 3 October 2002 2004 [cited 29 June 2004]. Available from http://www.fao.org/figis/servlet/static?dom=collection&xml=tuna-nomcatch.xml&xp_detail=med.
- FAO. *FAO Governing Bodies: FAO Council* [Website]. 2008 2008 [cited 29 February 2008]. Available from http://www.fao.org/unfao/govbodies/CouncilFinal_en.htm.
- FAO. *FAO Governing Bodies: FAO Members* [Website]. 2008 2008 [cited 29 February 2008]. Available from http://www.fao.org/unfao/govbodies/memberships_reg_en.htm.
- FAO Code of Conduct for Responsible Fisheries, of 31 October 1995,
- FAO Fisheries Department - Information, Data and Statistics Unit*. [website]. FAO Fishery Department, [cited April 10 2002]. Available from <http://www.fao.org/fi/struct/fidi.asp#FDESC>.

- FAO Fisheries Department - Mission Statement for the Fisheries Department of FAO. [website]. FAO Fishery Department, [cited June 4 2002]. Available from <http://www.fao.org/fi/struct/mission/english.asp>.
- FAO Fisheries Department. *Fishery Statistics: Reliability and Policy Implications* [website]. FAO Fisheries Department, 2002 [cited May 26 2003]. Available from http://www.fao.org/fi/statist/nature_china/30jan02.asp accessed 26 May 2003.
- FAO Statistical Areas - maps. [website]. FAO Fisheries Department, 2003 [cited 28 January 2004]. Available from Accessed from <<ftp://ftp.fao.org/fi/maps/default.htm>> on 28 January 2004.
- Taconet, M. *The World Fisheries Resource Monitoring System (FIRMS)* [Internet]. FAO, 2005 [cited 15/07/2005]. Available from http://www.oceansatlas.com/world_fisheries_and_aquaculture/html/resources/capture/wrm/default.htm.
- IATTC-Home. [website]. IATTC, 26 December 2007 [cited 15 Jan 2008]. Available from <http://www.iattc.org/HomeENG.htm>.
- IATTC_Data. [website]. IATTC, 05 September 2007 [cited 29 January 2008]. Available from <http://www.iattc.org/DataENG.htm>.
- IATTC-Monthly longline catches of bigeye tuna. [website]. IATTC, [cited 23 February 2008]. Available from <http://www.iattc.org/IATTCLonglineCatches2007ENG.htm>
- About ICCAT. [website]. ICCAT, 17 January 2007 [cited 15 January 2008]. Available from <http://www.iccat.int/introduction.htm>.
- ICCAT - Assessments - Access to ICCAT Statistical databases. [website]. ICCAT, [cited 29 January 2008]. Available from <http://www.iccat.int/accessingdb.htm>.
- ICCAT Contracting Parties. [website]. ICCAT, 10 October 2007 [cited 15 January 2008]. Available from <http://www.iccat.int/contracting.htm>.
- IOTC. *Guide for the preparation of National Reports to IOTC Scientific Committee* [website]. IOTC, June 6, 2007 [cited 5 February 2008]. Available from http://www.iotc.org/Common/Template_for_the_presentation_of_National_Reports.pdf.
- IOTC>about IOTC>structure of the commission. [website]. IOTC, July 23 2003 [cited 29 Jan 2008]. Available from <http://www.iotc.org/English/info/comstruct.php>.
- IOTC>meetings>working parties. [website]. IOTC, June 21 2007 [cited 29Jan 2008]. Available from <http://www.iotc.org/English/meetings/wp/allwp.php>.
- Regional Tuna Tagging Project - Indian Ocean. [website]. IOTC, [cited 3 February 2008]. Available from <http://www.rttp.io.org/en/>.
- Chronological list of Ratifications of the United Nations Convention on the Law of the Sea and the related Agreements. [website]. Oceans and Law of the Sea - Division for Ocean Affairs and the Law of the Sea, 26th October 2007 2008 [cited 25th January 2008]. Available from http://www.un.org/Depts/los/reference_files/chronological_lists_of_ratifications.htm

I.4.2 Information sourced from websites based in the Pacific Region

- Small Island Developing States (SIDS): List of Islands. 2005 [cited 29/09/2005 2005]. Available from <http://www.sidsnet.org/2.html>.

- SPC. *Selected Pacific Economies - A Statistical Summary SPESS: Table 1: Pacific Island countries—principal physical and economic features* Secretariat of the Pacific Community, 2001 [cited 25/11/2005 2:49 p.m. 2005]. Available from http://www.spc.int/statsen/English/Publications/Spess14/Download_Excel_Tables_E.htm.
- SPC-OFP. *Pacific Tuna Tagging Programme -Phase 2: Western and Central Pacific - Executive Summary* November 2007 2007 [cited March 16 2008]. Available from <http://www.spc.int/mrd/doc/tag2-nov2007.pdf>.
- SPC-OFP *Data Catalogue - Introduction*. [website]. [cited March 9 2008]. Available from <http://www.spc.int/oceanfish/Html/Statistics/DataCat/intro.htm>.
- SPC-OFP *Data Coverage*. [website]. [cited March 9 2008]. Available from <http://www.spc.int/oceanfish/Html/Statistics/Coverage/index.asp>.
- WCPFC [website]. WCPFC, [cited 15 Jan 2008]. Available from <http://www.wcpfc.int>.
- WCPFC-*Statistics and Data - Status of the Provision of Data to the Commission*. [website]. WCPFC, 23 November 2007 [cited 9 March 2008]. Available from <http://www.spc.int/oceanfish/html/wcpfc/statistics/StatProv.asp>.

I.4.3 Newspaper articles or media releases

- "Global fish stocks: Fishy Figures." *The Economist* 361, no. 8250 (2001): 99-100.
- Cleary, P. "Overfishing woe set to be repeated around the Pacific." *The Age*, November 4 2007.
- Darby, A. "Japan Tuna Scandal Starts to Bite." *Melbourne Age*, 24 October 2007.
- Greenpeace International. "Another tuna commission fails to protect the world's favourite fish - Greenpeace calls for retailer responsibility." 2007).
- Greenpeace International. "Greenpeace calls for Pacific tuna catch to be cut by half." 2007).
- Guidelines to Reduce Sea Turtle Mortality in Fishing Operations,
- Kourous, G. "New data show sizeable drop in numbers of wasted fish." *FAO newsroom*, 14th September 2004.
- McCurry, J. "Japan agrees to cut bluefin tuna catch after admitting overfishing." *The Guardian*, October 17 2006.

I.4.4 Other reports

- Anon. *An Ocean Blueprint for the 21st Century: Final Report of the US Commission on Ocean Policy - Pre-Publication Copy*. (Washington, D.C.: U.S. Commission on Ocean Policy, 2004), 610p.
- AusAID Australian Government, *Valuing Pacific fish: A framework for fisheries-related development assistance in the Pacific* (Canberra: Commonwealth of Australia, 2007), 48p.

II. Laws, Policies, Guidelines and Resolutions

II.1 International Instruments

II.1.1 Binding Treaties

- 1958, Convention on the Fishing and the Conservation of the Living Resources of the High Seas, done at Geneva on 29 April 1958, entered into force 20 March 1966, 559 *UNTS* 285.
- 1992, United Nations Convention on the Law of the Sea of 10 December 1982, entered into force from 16 November 1994 (1982) 21 *ILM* 1261.
- 1993, Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas of 24 November 1993, entered into force from 24 April 2003 (1994) 33 *ILM* 968.
- 1995, Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, of 4 December 1995, entered into force from 11 December 2001 (1995) 34 *ILM* 1542.

II.1.2 Non-binding instruments

- 1992, "Rio Declaration on Environment and Development." In *Annex I, Report of the United Nations Conference on Environment and Development 3-14 June, A/CONF.151/26* (Vol. I). (Rio de Janeiro, 1992).
- 1992, "Chapter 17: Protection of the Oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources." In *Report of the United Nations Conference on Environment and Development 3-14 June, A/CONF.151/26* (Vol. II). (Rio de Janeiro, 1992).
- 1992, Declaration of Cancún, adopted at the International Conference on Responsible Fishing, Cancún, Mexico, May 6-8 1992. Accessed from Ocean Law <<http://www.oceanlaw.net/texts/cancun.htm>> on 14 January 2004.
- 1995, FAO Code of Conduct for Responsible Fisheries of 31 October 1995. Reprinted in (1995) *International Organizations and the Law of the Sea Documentary Yearbook* p.700., adopted by the FAO Conference on 31 October 1995.
- 1999, International Plan of Action for reducing incidental catch of seabirds in longline fisheries, adopted by the FAO Conference in 1999.
- 1999, International Plan of Action for the conservation and management of sharks, adopted by the FAO Conference in 1999.
- 2001, International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing, adopted by the FAO Conference in 2001.
- 2003, Strategy for Improving Information on Status and Trends of Capture Fisheries, adopted by the FAO Conference in 2003.

II.1.3 International Guidelines

- FAO Fishery Resources Division and Fishery Policy and Planning Division. *Fisheries Management*. Vol. 4, *FAO Technical Guideline for Responsible Fisheries*, (Rome: FAO, 1997).
- FAO, *Guidelines for the routine collection of capture fishery data*. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998, *FAO Fisheries Technical Paper* 382 (Rome: FAO, 1999), 113p.
- FAO Fisheries Department. *Implementation of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing*. Vol. 9, *FAO Technical Guideline for Responsible Fisheries*, (Rome: FAO, 2002).
- FAO Fisheries Department. *Fisheries Management: The ecosystem approach to fisheries*. Vol. 4 Suppl. 2, *FAO Technical Guideline for Responsible Fisheries*, (Rome: FAO, 2003).
- FAO. "Guidelines to reduce sea turtle mortality in fishing operations." In *Report of the Technical Consultation on Sea Turtles Conservation and Fisheries*, Bangkok, Thailand 29 November - 2 December 2004, 5p. (Rome: FAO, 2005).

II.2 Regional Treaties, Resolutions, Recommendations

II.2.1 Commission for the Conservation of Southern Bluefin Tuna (CCSBT)

- Convention for the Conservation of Southern Bluefin Tuna of 10 May 1993, Accessed from http://www.ccsbt.org/docs/pdf/about_the_commission/convention.pdf
- 2004, *Resolution on amendment of the Resolution on "Illegal, Unregulated and Unreported (IUU) and Establishment of a CCSBT Record of Fishing Vessels over 24 meters Authorised to Fish for Southern Bluefin Tuna"* adopted at the CCSBT11 19-22 October 2004.

II.2.2 Inter-American Tropical Tuna Commission (IATTC)

- Convention for the Establishment of an Inter-American Tropical Tuna Commission, of 31 May 1949, 80 UNTS 4.
- Convention for the Strengthening of the Inter-American Tropical Tuna Commission Established by the 1949 Convention between the United States of America and the Republic of Costa Rica of 14 November 2003, Accessed 24 January 2004 from <http://www.iatcc.org/IATTCdocumentationENG.htm>
- 1999, *IATTC Resolution on Fish Aggregating Devices (Resolution C-99-07)*.
- 2000, *IATTC Resolution on a Regional Vessel Register (Resolution C-00-06)*.
- 2002, *IATTC Resolution on the Capacity of the Tuna Fleet Operating in the Eastern Pacific Ocean (Revised): (IATTC Resolution C-02-03)*.
- 2003, *Resolution on IATTC Bigeye Tuna Statistical Document Program (Resolution C-03-01)*.
- 2003, *Resolution on At-Sea Reporting (Resolution C-03-04)*.
- 2003, *Resolution on Data Provision (Resolution C-03-05)*.
- 2003, *IATTC Resolution on the Establishment of a List of Longline Fishing Vessels over 24 Meters (LSTLFVs) Authorised to Operate in the Eastern Pacific Ocean (IATTC Resolution C-03-07)*.

- 2004, *Resolution on the Establishment of a Vessel Monitoring System (VMS) (Resolution C-04-06).*
- 2006, *Resolution for a program on the Conservation of Tuna in the Eastern Pacific Ocean for 2007 (Resolution C-06-02).*
- 2006, *Resolution on Establishing a Program for Transshipments by Large-Scale Fishing Vessels (Resolution C-06-04).*

II.2.3 International Commission for the Conservation of Atlantic Tunas (ICCAT)

- International Convention for the Conservation of Atlantic Tuna of 14 May 1966,
UN/LEG/SER.B/16, 483-491.
- 2002, *ICCAT Recommendation by ICCAT concerning the establishment of an ICCAT record of vessels over 24 meters authorised to operate in the Convention Area (Recommendation 02-22).*
- 2003, *Recommendation by ICCAT concerning minimum standards for the establishment of a vessel monitoring system in the ICCAT Convention Area (Recommendation 03-14).*
- 2003, *Resolution by ICCAT on Improvements in Data Collection and Quality Assurance (Resolution 03-21).*
- 2003, *Recommendation by ICCAT for bigeye tuna trade restrictive measures on Georgia (Recommendation 03-18).*
- 2004, *Recommendation by ICCAT on a Multi-year Conservation and Management Program for Bigeye tuna (Recommendation 04-01).*
- 2005, *Recommendation by ICCAT on Compliance with Statistical Declaration Obligations (Recommendation 05-09).*
- 2006, *Recommendation by ICCAT to establish a multi-annual recovery plan for bluefin tuna in the eastern Atlantic and Mediterranean (Recommendation 06-05).*
- 2006, *Recommendation by ICCAT establishing a programme for Transshipment (Recommendation 06-11).*
- 2007, *Recommendation by ICCAT concerning data exchange format and protocol in relation to the vessel monitoring system (VMS) for the bluefin tuna fishery in the ICCAT Convention Area (Recommendation 07-08).*
- 2007, *Recommendation by ICCAT on an ICCAT Bluefin Tuna Catch Documentation Program (Recommendation 07-10).*

II.2.4 Indian Ocean Tuna Commission (IOTC)

- Agreement for the Establishment of the Indian Ocean Tuna Commission of 25 November 1993,
Accessed from <http://www.iotc.org/about/>
- 2001, *Resolution on Mandatory Statistical Requirements for IOTC Members (Resolution 01/05).*
- 2001, *Resolution concerning the IOTC bigeye statistical document programme (Resolution 01/06).*
- 2001, *Recommendation concerning the National Observer Programmes for Tuna Fishing in the Indian Ocean (Recommendation 01/01).*

- 2003, *Resolution concerning the amendment of the forms of the IOTC Statistical Documents (Resolution 03/03).*
- 2006, *Resolution on establishing a programme for transshipment by large-scale fishing vessels (Resolution 06/02).*
- 2006, *Resolution on establishing a vessel monitoring system programme (Resolution 06/03).*
- 2007, *Resolution Concerning the Establishment of an IOTC Record of Vessels Authorised to Operated in the IOTC Area (Resolution 07/02).*

II.2.5 Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPFC)

- Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean of 5 September 2000, [2000] *ATNIF* No.11
- 2004, *Conservation and Management Measure on Record of Fishing Vessels and Authorization to Fish (CMM 2004-01).*
- 2004, *Conservation and Management Measure on Cooperating Non-Member (CMM 2004-02).*
- 2005, *Resolution on non-target fish species (Resolution 2005-03).*
- 2005, *Conservation and Management Measure for south Pacific Albacore (CMM 2005-02).*
- 2005, *Decision on Template for Annual Report to the Commission - Part 1 Information on Fisheries, Research and Statistics.*
- 2005, *Resolution on non-target fish species (Resolution 2005-03).*
- 2005, *Conservation and Management Measure for Bigeye and Yellowfin (CMM 2005-01).*
- 2005, *Conservation and Management Measure for south Pacific albacore (CMM 2005-02).*
- 2005, *Conservation and Management Measure for north Pacific albacore (CMM 2005-03).*
- 2005, *Resolution to Mitigate the Impact of Fishing For Highly Migratory Fish Species on Sea Turtles (Resolution 2005-04).*
- 2005, Memorandum of Understanding between the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean and the Secretariat of the Pacific Community, of 20 December 2005.
- 2006, *Conservation and Management Measure for Bigeye and Yellowfin (CMM 2006-01).*
- 2006, *Conservation and Management Measure to mitigate impacts of fishing for highly migratory fish stocks on seabirds (CMM 2006-02).*
- 2006, *Conservation and Management Measure for swordfish in the south-west Pacific (CMM 2006-03).*
- 2006, *Conservation and Management Measure for striped marlin in the southwest Pacific (CMM 2006-04).*
- 2006, *Conservation and Management Measure for Sharks in the Western and Central Pacific Ocean (CMM 2006-05).*
- 2006, *Conservation and Management Measure for Commission VMS (CMM 2006-06).*

- 2006, *Decision on Template for Annual Report to the Commission - Part 2 Management and Compliance*.
- 2006, Memorandum of Understanding between the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean and the Inter American Tropical Tuna Commission, of 15 December 2006.
- 2007, *Conservation and Management Measure for the Regional Observer Programme (CMM 2007-01)*.
- 2007, *Conservation and Management Measure for Commission Vessel Monitoring System (CMM 2007-02)*.
- 2007, *Decision on Scientific Data to be Provided to the Commission*.
- 2007, *Decision on Rules and Procedures for the Protection of, Access to, and Dissemination of, Data Compiled by the Commission (WCPFC Data Rules and Procedures)*.

II.3 Sub-regional – amongst or with Pacific Island States

- 1947, Agreement establishing the South Pacific Commission, of 6 February 1947, ATS (1948) 15, in force 29 July 1948. The most recent version of the Canberra Agreement of August 1984 available on SPC website: <http://www.spc.int/mrd/asides/canberra.htm>.
- 1979, South Pacific Forum Fisheries Agency Convention, of 10 July 1979, 1579 UNTS 307, in force 9 August 1979.
- 1982, Nauru Agreement Concerning Cooperation in the Management of Fisheries of Common Interest of 11 February 1982, entered into force 4 December 1982, reprinted in Doullman, David J., ed. *Tuna Issues and Perspectives in the Pacific Islands Region*, (Honolulu: East-West Center, 1987). p 273-277.
- 1992, Palau Arrangement for the Management of the Western Pacific Purse Seine Fishery, *reprinted in* Forum Fisheries Agency Report No. 92/114.
- 1993, Niue Treaty on Cooperation in Fisheries Surveillance and Law Enforcement in the South Pacific Region of 9 July 1992, 32 ILM (1993) 136 entered into force 20 May 1993.
- 1993, Treaty on Fisheries Between the Government of Certain Pacific Islands States and the Government of the United States of America and its subsidiary agreements, of 15 June 1993, Revised Edition of the Multilateral Treaty on Fisheries incorporating all amendments agreed between the United States and the Pacific Island Parties up to 15 June 1993, as published by FFA, Honiara, 1994.
- 1993, Agreement among Pacific Island States concerning the implementation and administration of the Treaty on Fisheries between the Governments of Certain Pacific Island States and the Government of the United States of America, Revised Edition of the Multilateral Treaty on Fisheries incorporating all amendments agreed between the United States and the Pacific Island Parties up to 15 June 1993, as published by FFA, Honiara, 1994.
- 1994, Federated States of Micronesia Arrangement for Regional Fisheries Access of 30 November 1994, Entered into force 23 September 1995, *reprinted in* Forum Fisheries Agency Report No. 95/1.
- 2002, Pacific Islands Regional Ocean Policy, Adopted by Pacific Island Forum Leaders in 2002, accessed from <http://www.spc.int/piocan/forum/New/welcome.htm> on 3 March 2008.

2005, The Harmonised Minimum Terms and Conditions for Foreign Fishing Vessel Access, as amended by FFC59 (6-10 June 2005), FFA Report #05/20.

2007, Memorandum of Understanding between the Pacific Islands Forum Fisheries Agency and the Secretariat of the Pacific Community concerning Collaboration in the Development, Conservation and Management of the Tuna and related Resources of the Western and Central Pacific, of 18 November 2007, accessed from http://www.spc.int/mrd/asides/Other_orgs/index.html on 9 March 2008.

III. International and Regional Organisation Reports

III.1 United Nations related-Reports

World Commission on Environment and Development. *Our common future: World Conference on Environment and Development 1987*, (New York: Oxford University Press, 1989).

Earth Summit: UN Conference on Environment and Development (1992). [Internet]. Department of Public Information, United Nations, 23 May 1997 [cited 14 January 2004]. Available from <http://www.un.org/geninfo/bp/enviro.html>.

United Nations, *Report of the Secretary General prepared for the Conference to Review the provisions of the 1995 Agreement for the Implementation of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*, UN Doc. A/CONF.210/2006/1 (2006).

United Nations, *Report of the Review Conference on the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks - Prepared by the President of the Conference*. (New York, 22-26 May: United Nations General Assembly A/Conf.210/2006/15, 2006).

United Nations, *Sixth round of Informal Consultations of State Parties to the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks* (New York, 23 - 24 April 2007), ICSP6/UNFSA/REP/INF.1 (New York: United Nations, 2007).

III.2 Food and Agriculture Organisation (FAO) Reports

FAO, *Report of the Ad-Hoc Consultation on Global Tuna Statistics. Colombo, Sri Lanka, 6-7 December 1985.*, FAO Fisheries Report 365 (Rome: FAO, 1985), 91p.

FAO, *Report of the fourteenth session of the Coordinating Working Party on Atlantic Fishery Statistics. Paris, 5-9 February 1990 and report of the second Ad-Hoc Consultation on Global Tuna Statistics. La Jolla, California, USA, 21-22 May 1987.*, FAO Fisheries Report 429 (Rome: FAO, 1990), 43p.

FAO, *Papers presented at the Technical Consultation on High Seas Fishing. Rome, 7-15 September 1992*, FAO Fisheries Report 484, Suppl. (Rome: FAO, 1992), 77p.

FAO, *Report of the Technical Consultation on High Seas Fishing. Rome, 7-15 September 1992*, FAO Fisheries Report 484 (Rome: FAO, 1992), 85p.

- FAO, *Report of the fifteenth session of the Coordinating Working Party on Atlantic Fishery Statistics*. Dartmouth, Nova Scotia, Canada, 8-14 July 1992, *FAO Fisheries Report 473* (Rome: FAO, 1992), 34p.
- FAO, *Report of the Ad hoc Consultation on the Role of Fishery Agencies in Relation to High Seas Fishery Statistics*. La Jolla, California, USA, 13-16 December 1993, *FAO Fisheries Report 500* (Rome: FAO, 1994), 167p.
- FAO Fisheries Department, *World review of highly migratory species and straddling stocks*, *FAO Fisheries Technical Paper No. 337* (Rome: FAO, 1994), 70p.
- FAO, *The Coordinating Working Party on Fishery Statistics; Its Origin, Role and Structure*, 903 (Rome: FAO, 1995), 14p.
- FAO, *Report of the sixteenth session of the Coordinating Working Party on Atlantic Fishery Statistics*. Madrid, Spain, 20-25 March 1995, *FAO Fisheries Report 521* (Rome: FAO, 1995), 50p.
- FAO, *Report of the seventeenth session of the Coordinating Working Party on Fishery Statistics*. Hobart, Tasmania, 3-7 March 1997, *FAO Fisheries Report 555* (Rome: FAO, 1997), 43p.
- FAO, *Report of the eighteenth session of the Coordinating Working Party on Fishery Statistics*. Luxembourg, Grand Duchy, 6-9 July 1999, *FAO Fisheries Report 608* (Rome: FAO, 1999), 62p.
- FAO Fisheries Department, *FAO Fisheries Department Information Strategy: Supporting Informed Decisions and Actions* (Rome: FAO, 2000), 18p.
- FAO, *Basic Texts of the Food and Agriculture Organization of the United Nations (Volumes I and II -2000 edition)* (Rome: FAO, 2001).
- FAO, *Report of the nineteenth session of the Coordinating Working Party on Fishery Statistics*. Nouméa, New Caledonia, 10-13 July 2001, *FAO Fisheries Report 656* (Rome: FAO, 2001), 91p.
- FAO, *Research Implications of Adopting the Precautionary Approach to Management of Tuna Fisheries*, *FAO Fisheries Circular 963* (Rome: FAO, 2001), 74p.
- FAO Fisheries Department, *The State of World Fisheries and Aquaculture 2002* (Rome: The Food and Agriculture Organisation of the United Nations, 2002).
- FAO, *Report of the twentieth session of the Coordinating Working Party on Fishery Statistics*. Victoria, Seychelles, 21–24 January 2003, *FAO Fisheries Report 709* (Rome: FAO, 2003), 65p.
- CWP Secretariat, *Report of the Coordinating Working Party on Fishery Statistics Intersessional Meeting of CWP Agencies*. Rome, Italy, 3–5 February 2004., Accessed from http://www.fao.org/fi/body/rfb/CWP/cwp_home.htm on Thursday, 3 June 2004 (Rome: FAO, 2004), 12p.
- FAO Fisheries Department, *The State of World Fisheries and Aquaculture 2004* (Rome: The Food and Agriculture Organisation of the United Nations, 2004).
- FAO, *CWP Handbook of Fishery Statistical Standards* (Rome: FAO, 2005).
- Committee on Fisheries, *Outcome on the International Meeting for the Ten-Year Review of the Barbados Programme of Action for the Sustainable Development of Small Island Developing States (Mauritius, 10-14 January 2005) and FAO Follow-Up*. COFI/2005/Inf.18 (Rome, Italy: FAO, 2005), 5p.

FAO Fisheries Department, *The State of World Fisheries and Aquaculture 2006* (Rome: The Food and Agriculture Organisation of the United Nations, 2006).

FAO, *Report of the twenty second session of the Coordinating Working Party on Fishery Statistics. Rome, Italy, 26 February - 2 March 2007* (Rome: FAO, 2007).

III.3 High Seas Task Force Report

High Seas Task Force, *Closing the net: Stopping illegal fishing on the high seas* (France: Governments of Australia, Canada, Chile, Namibia, New Zealand and the United Kingdom, WWF, IUCN and the Earth Institute at Columbia University, 2006).

III.4 Joint Tuna RFMO Reports

Report of the Joint Meeting of Tuna RFMOs, January 22-26, (Kobe, Japan: 2007).

Report of the Joint Tuna RFMO Working Group on Trade and Catch Documentation Schemes, 22-23 July 2007, (Raleigh, North Carolina, USA: 2007), 80p.

"Tuna in trouble - major problems for the world's tuna fisheries." In *Joint Tuna RFMO meeting, January 22-26 2007*, 22, (Kobe, Japan WWF International, 2007).

III.5 Inter-American Tropical Tuna Commission (IATTC) Reports

IATTC Secretariat. "The Fishery for Tunas and Billfishes in the Eastern Pacific Ocean in 2006." In *Paper presented to IATTC75, 25-29 June 2007*, 33, (La Jolla, California: Inter-American Tropical Tuna Commission, 2007).

III.6 International Commission for the Conservation of Atlantic Tunas (ICCAT) Reports

ICCAT. "ICCAT Report on Agency Programmes in Fisheries Statistics (CWP-22/ICCAT)." In *Coordinating Working Party on Fishery Statistics 22nd Session (26 February - 2 March)*, (Rome, Italy, 2007).

ICCAT. *Report of the 2005 Meeting of the Standing Committee on Research and Statistics (SCRS) 3-7 October 2005*. (Madrid, Spain: International Commission for the Conservation of Atlantic Tunas, 2005), 188p.

ICCAT. *Report of the Standing Committee on Research and Statistics (SCRS) 1-5 October 2007*. (Madrid, Spain: International Commission for the Conservation of Atlantic Tunas, 2007), 216p.

III.7 Indian Ocean Tuna Commission (IOTC) Reports

IOTC. *Report of the Eighth Session of the Scientific Committee, 7-11 November 2005*. (Victoria, Seychelles: Indian Ocean Tuna Commission, 2005), 82p.

IOTC. *Report of the Ninth Session of the Scientific Committee, 6-10 November 2006*. (Victoria, Seychelles: Indian Ocean Tuna Commission, 2006), 120p.

IOTC. *Report of the Ninth Annual Session of the Indian Ocean Tuna Commission, 13-18 May 2007*. (Grand Baie, Mauritius: Indian Ocean Tuna Commission, 2007), 60p.

III.8 Commission for the Conservation of Southern Bluefin Tuna (CCSBT) Reports

CCSBT. *Report of the Seventh Annual Meeting of the Commission, 18-21 April 2001*. (Sydney, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2001).

CCSBT. *Report of the Tenth Annual Meeting of the Commission, 7-10 October 2003*. (Christchurch, New Zealand: Commission for the Conservation of Southern Bluefin Tuna, 2003).

CCSBT. *Report of the Thirteenth Annual Meeting of the Commission, 10-13 October 2006*. (Miyazaki, Japan: Commission for the Conservation of Southern Bluefin Tuna, 2006).

CCSBT. "CCSBT Report on Intersessional Developments in Fisheries Statistics since CWP21 (March 2005) (CWP-22/CCSBT)." In *Coordinating Working Party on Fishery Statistics 22nd Session (26 February - 2 March)*, (Rome, Italy, 2007).

CCSBT. *Report of the Twelfth Meeting of the Scientific Committee, 10-14 September 2007*. (Hobart, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2007), 90p.

CCSBT. *Report of the Fourteenth Annual Meeting of the Commission, 16-19 October 2007*. (Canberra, Australia: Commission for the Conservation of Southern Bluefin Tuna, 2007), 142p.

III.9 Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPFC)-related Reports

Report of the Technical Consultation on the Collection and Exchange of Fisheries Data, Tuna Research and Stock Assessment, 15-19 July 1996, Noumea New Caledonia, (Noumea, New Caledonia: Oceanic Fisheries Programme, South Pacific Commission, 1996), 40p.

Review of Ecosystem-Bycatch Issues for the Western and Central Pacific Region. A paper prepared for Preparatory Conference Third Session, Manila, Philippines 18-22 November 2002, WCPFC/PrepCon/WP.9 (Florida, United States of America: MRAG Americas Inc., 2002), 60p.

Report of the Second Meeting of the Scientific Coordinating Group (SCG2): WCPFC/PrepCon/28, (Rarotonga, Cook Islands: 2003).

Working Group II: Scientific Structure and Provision of Interim Scientific Advice - Summary Report by the Chairman of Working Group II on its work during PrepConV: WCPFC/PrepCon/32, (Rarotonga, Cook Islands: 2003).

Final Report of Working Group II: WCPFC/PrepCon/45, WCPFC/PrepCon/41 (Pohnpei, Federated States of Micronesia: 2004).

WCPFC. *DRAFT: Western and Central Pacific Fisheries Commission Tuna Fishery Yearbook 2004* Secretariat of the Pacific Community, 9 November 2005 [cited 25 November 2005]. Available from <http://www.spc.int/oceanfish/html/statistics/yearbook/download.htm>.

WCPFC, *Report of the First Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 8-19 August 2005, WCPFC/Comm.2/22* (Noumea, New Caledonia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean., 2005), 207p.

- WCPFC, *Summary Record of the Second Regular Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 12-16 December: Pohnpei, Federated States of Micronesia* (Pohnpei, Federated States of Micronesia: 2005).
- Report of the Third Meeting of the Steering Committee of the Indonesia and Philippines Data Collection Project* (4, 8 August 2005, Manila Philippines), (Noumea, New Caledonia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean,, 2006), 5p.
- WCPFC, *Summary Report of the Second Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 8-19 August 2005, WCPFC3-2006/12* (Noumea, New Caledonia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean,, 2006), 207p.
- WCPFC, *Summary Record of the Third Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 11-15 December 2006, Apia Samoa* (Pohnpei, Federated States of Micronesia: Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 2006).
- WCPFC. *DRAFT: Western and Central Pacific Fisheries Commission Tuna Fishery Yearbook 2006* Western and Central Pacific Fisheries Commission, 2007 [cited 1 December 2008]. Available from <http://www.wcpfc.int/statistics/bulletins.htm>.
- WCPFC, *Summary Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 13-24 August 2007: Honolulu, Hawaii, WCPFC4/2007/9* (Pohnpei, Federated States of Micronesia: 2007), 270p.
- WCPFC, *Summary Record of the Fourth Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific: 3-7 December 2007* (Tumon, Guam, USA: 2007).
- WCPFC Secretariat, *Cooperation with other organisations, WCPFC4-2007/18 (Rev 1)* (Pohnpei, Federated States of Micronesia: Western and Central Pacific Fisheries Commission, 2007), 46p.
- WCPFC Secretariat. "Re: VMS Working Group." *WCPFC Circular*, February 4 2008, 2.

III.10 Secretariat of the Pacific Community (SPC) Reports

- Anon, *First Heads of Fisheries Meeting, Noumea New Caledonia 9 -13 August* (Noumea: Secretariat of the Pacific Community, 1999), 60p.
- Anon., *Review of the Oceanic Fisheries Programme - Joint Team Report, September 2001. Report of the findings of an independent review commissioned by the Secretariat of the Pacific Community using terms of reference drafted by the Secretariat of the Pacific Community*, (Noumea, New Caledonia: Secretariat of the Pacific Community, 2001), 109p.
- Lawson, T., P. Williams, C. Millar, and E. Schneiter. *Data Requirements of the SPC Oceanic Fisheries Programme and Status of Data, Oceanic Fisheries Programme Internal Report*

- 47, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2002), 51p.
- SPC-OFP, *Proposal for Monitoring the Catches of Highly Migratory Species in the Philippines and the Pacific Ocean waters of Indonesia*. (Noumea, New Caledonia: 2003), 46p.
- Secretariat of the Pacific Community, *Marine Resources Division Director's Report 2003, HoF4/WP1* (Noumea: Secretariat of the Pacific Community, 2004), 11p.
- Lawson, T., *Status of Data Collection, Compilation and Dissemination* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2003), 74p.
- Anon, *Outputs to the Third Heads of Fisheries Meeting, Noumea New Caledonia 8 -23 August* (Noumea: Secretariat of the Pacific Community, 2003), 9p.
- Lawson, T., *Data related tasks for the WCPFC Scientific Committee* (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2005), 26p.
- SPC, *Secretariat of the Pacific Community - Oceanic Fisheries Programme Strategic Plan 2006 - 2008 Version 1 - November 2005. As endorsed by the 34th SPC Committee of Representatives of Governments and Administrations in Palau on 19th November 2005* (Noumea: Secretariat of the Pacific Community, 2005), 12p.
- SPC, *SPC Corporate Plan 2003-05* (Noumea: Secretariat of the Pacific Community, 2005), 38p.
- SPC-OFP. "An update on the Implementation of the Regional Logsheet Forms in Western and Central Pacific Tuna Fisheries." In *Seventh Meeting of the Tuna Fishery Data Collection Committee (DCC7), 12-16 November*, 6, (Brisbane, Australia, 2007).
- SPC-OFP, *Scientific Data Available to the Western and Central Pacific Fisheries Commission, WCPFC-SC3-2007/ST-Information Paper 3* (Noumea, New Caledonia: 2007), 11p.
- SPC-OFP, *Ocean Fisheries Programme - Annual Report 2007 and Work Plan 2008* (Noumea, New Caledonia: Secretariat of the Pacific Community, 2008), 42p.

III.11 Pacific Islands Forum Fisheries Agency Reports

- FFA, *Record of Forum Fisheries Committee - Twenty-sixth Meeting, Port Moresby, Papua New Guinea, 1 - 5 May 1995* (Honiara: Pacific Islands Forum Fisheries Agency, 1995).
- FFA *Negotiation Brief for the Fifth Session of the Preparatory Conference (Rarotonga, Cook Islands. 29 September – 3 October 2003)*, FFA54/WP1 (Honiara: Pacific Islands Forum Fisheries Agency, 2003).
- Pacific Islands Forum Fisheries Agency, *FFA Strategic Plan 2005 - 2020: Responsible Fisheries and Sustainable Benefits - Strength through Co-operation* (Honiara, Solomon Islands: FFA, 2005), 9p.
- Pacific Islands Forum Fisheries Agency, *Record of Ministerial FFC - Inaugural Meeting, Majuro, Marshall Islands 9 June 2005* (in association with FFC58) (Honiara: Pacific Islands Forum Fisheries Agency, 2005).
- FFA. "Implementation of Ecosystem Approach to Fisheries Management (FFC61/WP 5)." Paper presented at the *Officials Forum Fisheries Committee Sixty-First Meeting (15-18 May 2006)*, Honiara, Solomon Islands 2006.

- FFA Secretariat, *FFA Brief for the second regular session of the WCPFC Technical and Compliance Committee, Brisbane, Australia 28 September - 3 October 2006 - Supplementary Brief, FFA 06/06 Suppl. 1* (Honiara: 2006).
- Pacific Islands Forum Fisheries Agency. *Value of WCPFC Tuna Fisheries - March 2007* [website and Microsoft Excel spreadsheet file]. 2007 [cited 24 December 2007].
- Pacific Islands Forum Fisheries Agency. Papers presented at the *19th Annual Treaty Consultation Meeting: Internal Meeting of the Pacific Island Parties 12-16 March, Port Vila, Vanuatu 2007*.
- FFA. "Status of VMS Data Sharing and Non-FFA Member Nations Participation." Paper presented at the *10th FFA MCS Working Group Meeting, 26-30 March, Honiara, Solomon Islands 2007*.
- FFA. *Value of WCPFC Tuna Fisheries - March 2007* [website and Microsoft Excel spreadsheet file]. 2007 [cited 24 December 2007]. Available from <http://www.ffa.int/node/862>.
- FFA. "FFA E-Ops Room." Paper presented at the *10th FFA MCS Working Group Meeting, 26-30 March, Honiara, Solomon Islands 2007*.
- FFA Secretariat, *FFA Brief for the fourth regular session of the WCPFC, Tumon, Guam, USA 3 - 7 December* (Honiara: 2007).
- FFA. "Niue Treaty." Paper presented at the *20th Annual Treaty Consultation Meeting: Internal Meeting of the Pacific Island Parties 3-4 March, Rarotonga, Cook Islands 2008*.

III.12 SPC/FFA Data Collection Committee Reports

- Report of the Ad Hoc Meeting on Tuna Fisheries Data Collection Forms, 11-14 December 1995, Brisbane, Australia*, (Noumea, New Caledonia and Honiara: Oceanic Fisheries Programme, South Pacific Commission and Forum Fisheries Agency, 1996), 54p.
- Report of the Fifth Meeting of the Tuna Fishery Data Collection Committee, 2-6 December 2002, Brisbane, Queensland, Australia*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2003), 138p.
- Report of the Sixth Meeting of the Tuna Fishery Data Collection Committee, 16-20 November 2004, Brisbane, Queensland, Australia*, (Noumea, New Caledonia: Oceanic Fisheries Programme, Secretariat of the Pacific Community, 2005), 174p.

III.13 Pacific Islands Forum Secretariat Reports

- Pacific Islands Forum Secretariat. "The Vava'u Declaration on Pacific Fisheries Resources "Our Fish, Our Future"." In *Forum Communique*, (Nuku'alofa, Kingdom of Tonga: 38th Pacific Islands Forum: 16-17 October, 2007).
- Pacific Islands Forum Secretariat. *Pacific Islands Forum Secretariat Member Countries Profiles* [website]. Pacific Islands Forum Secretariat, 2008 [cited 3 January 2008]. Available from <http://www.forumsec.org/pages.cfm/about-us/member-countries>.
- Pacific Islands Regional Ocean Policy, Adopted by Pacific Island Forum Leaders in 2002, accessed from <http://www.spc.int/piocean/forum/New/welcome.htm> on 3 March 2008

Appendix

APPENDIX 1: LOS CONVENTION ANNEX I: HIGHLY MIGRATORY SPECIES	429
APPENDIX 2: UN FISH STOCKS AGREEMENT ANNEX I: STANDARD REQUIREMENTS FOR THE COLLECTION AND SHARING OF DATA	431
APPENDIX 3: SUMMARY OF THE DEVELOPMENT OF TUNA FISHERIES GLOBALLY, AND DEVELOPMENT OF KEY INTERNATIONAL LEGAL AND INSTITUTIONAL ARRANGEMENTS FOR THE CONSERVATION AND MANAGEMENT OF TUNA AND BILLFISH STOCKS	437
APPENDIX 4: MEMORANDUM OF UNDERSTANDING BETWEEN THE PACIFIC ISLANDS FORUM FISHERIES AGENCY AND THE SECRETARIAT OF THE PACIFIC COMMUNITY CONCERNING COLLABORATION IN THE DEVELOPMENT, CONSERVATION AND MANAGEMENT OF THE TUNA AND RELATED RESOURCES OF THE WESTERN AND CENTRAL PACIFIC. (3 RD REVISION 2007).....	439
APPENDIX 5: THE AGREEMENT ON THE EXCHANGE OF TUNA FISHERIES DATA BETWEEN IATTC AND SPC-OFP, AS AT MARCH 2003.....	451
APPENDIX 6: WCPFC DECISION ON SCIENTIFIC DATA TO BE PROVIDED TO THE COMMISSION	453
APPENDIX 7: WCPFC DECISION ON ANNUAL REPORT TO THE COMMISSION.....	459
APPENDIX 8: DETAILED ANALYSIS OF THE WCPFC RESPONSE TO DATA REQUIREMENTS AS SET OUT IN UN FISH STOCKS AGREEMENT, ANNEX I.....	463
APPENDIX 9: INFORMATION PACKAGE AND TERMS OF REFERENCE FOR THE WCPFC INDEPENDENT REVIEW OF SCIENTIFIC STRUCTURE AND FUNCTION.....	473
APPENDIX 10: WCPFC CONSERVATION AND MANAGEMENT MEASURE FOR COMMISSION VESSEL MONITORING SYSTEM (CMM 2007-02)	477
APPENDIX 11: WCPFC CONSERVATION AND MANAGEMENT MEASURE FOR THE REGIONAL OBSERVER PROGRAMME (CMM 2007-01).....	481
APPENDIX 12: EXCERPT FROM CONVENTION FOR THE CONSERVATION AND MANAGEMENT OF HIGHLY MIGRATORY FISH STOCKS IN THE WESTERN AND CENTRAL PACIFIC OCEAN. ANNEX III: TERMS AND CONDITIONS FOR FISHING	491
APPENDIX 13: WCPFC RULES AND PROCEDURES FOR THE PROTECTION OF, ACCESS TO, AND DISSEMINATION OF, DATA COMPILED BY [REDACTED]	493

Please see print copy for Appendices pp429-503