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Fish for the future: fisheries development and food security for Kiribati in an era of global climate change

Brooke M. Campbell

University of Wollongong, brookec@uow.edu.au

Quentin A. Hanich

University of Wollongong, hanich@uow.edu.au

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Fish for the future: fisheries development and food security for Kiribati in an era of global climate change

Abstract

The report provides background information for subsequent fisheries projects in Kiribati that aim to build food security, improve artisanal livelihoods and strengthen community engagement in fisheries governance. It provides information on the current status of Kiribati fishery resources (oceanic and coastal), their current governance and future challenges. Fish and fisher alike pay little heed to maritime boundaries and bureaucratic distinctions. This report covers both sides of the oceanic/coastal boundary because of the I-Kiribati communities' interest in oceanic fisheries such as tuna and their heavy dependence on its fisheries resources for food security and economic development. The report focuses on two potential pilot sites for community-based fisheries management projects: North Tarawa and Butaritari.

Keywords

climate, fish, global, era, kiribati, security, food, development, fisheries, change, future

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Fish for the future: Fisheries development and food security for Kiribati in an era of global climate change



FISH FOR THE FUTURE: FISHERIES DEVELOPMENT AND FOOD SECURITY FOR KIRIBATI IN AN ERA OF GLOBAL CLIMATE CHANGE

Authors

Brooke Campbell and Quentin Hanich

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The Australian National Centre for Ocean Resources and Security (ANCORS) at the University of Wollongong is Australia's only multidisciplinary university-based centre dedicated to research, policy advice and education on ocean law and governance, marine resource management, and maritime security.

The ANCORS Fisheries Governance Programme uses the extensive experience and skills of ANCORS staff to research and develop practical solutions for ongoing fisheries management and development challenges. Our program works throughout the Asia-Pacific region and beyond, working closely with regional fora, governments and stakeholders. ANCORS staff and research fellows are engaged as expert advisors and counsels to government agencies, international fora and fisheries stakeholders. The Fisheries Governance Programme is led by Dr. Quentin Hanich. For enquiries, please call +61 2 4221 4883 or email: hanich@uow.edu.au

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EXECUTIVE SUMMARY

The Republic of Kiribati is a vast South Pacific island group with one of the largest exclusive economic zones (EEZs) in the world. Kiribati waters support a wealth of marine fisheries activities. These activities occur in oceanic, coastal and inshore environments and range from large, foreign, industrial-scale oceanic fishing operations to small-scale, domestic, inshore subsistence fisheries, aquaculture and recreational fisheries. Kiribati's most economically valuable fisheries are its tuna fisheries, and it has some of the richest tuna fishing grounds in the world.

Kiribati fishing, aquaculture, processing and trade activities provide a range of employment, income, revenue and educational benefits for I-Kiribati, as well as food security benefits through the consumption of Kiribati fisheries resources. Its oceanic fisheries provide most of the government revenue and economic livelihood benefits and its coastal fisheries provide valuable social and food security resource benefits.

Kiribati has developed a framework of domestic and international governance arrangements that are designed to sustainably manage its wealth of marine resources. Nevertheless, Kiribati faces a number of critical challenges with respect to the future of its fisheries and the benefits they provide to I-Kiribati. These challenges include: current and potential future declines in valued marine species due to unsustainable fishing practices; overpopulation pressures; and changes induced by global climate change. In the face of these resource declines, additional challenges include ensuring that sufficient fish protein continues to be available for a growing I-Kiribati population.

The changing nature of the fishing industry, both domestically and globally, has created new and unresolved social challenges for Kiribati. Maximizing and diversifying the economic benefits of its current fisheries resources to achieve greater financial benefit and stability is a challenge for Kiribati. All of these challenges are exacerbated by institutional weaknesses and a lack of adaptive capacity in the government sector responsible for fisheries management, development and conservation.

In 2012 and early 2013, consultations were held between the Kiribati Ministry of Fisheries and Marine Resources Development (MFMRD) and a community-based fisheries management (CBFM) project team to identify pilot trial sites and potential areas of focus for CBFM interventions. These consultations resulted in agreement that pilot trials should be held in North Tarawa and Butaritari. A site-scoping visit was subsequently undertaken in North Tarawa in 2013. The report concludes with an initial fisheries context summary for these pilot trials and recommends potential areas of focus to be developed in subsequent community fisheries projects.

INTRODUCTION

The Republic of Kiribati is a vast South Pacific island group composed of 33 coral atolls and reef islands spread over 3.5 million km² of ocean (Figure 1). These equatorial islands and atolls form one of the largest exclusive economic zones (EEZs) in the world and span the International Dateline. Kiribati is divided into the Gilbert, Line, and Phoenix Island groups. These islands have a combined land area of approximately 811 km². Two-thirds of these islands are occupied by a growing population of 103,500 I-Kiribati and the majority of this population resides in the capital of South Tarawa (Kiribati Census 2010). Kiribati's porous coralline geology means that its islands are predominantly flat and low-lying, have few freshwater reserves and are of generally poor agricultural quality. The country's terrestrial biodiversity is not particularly rich or endemic and what exists is threatened by human development and expansion activities across a limited land area.

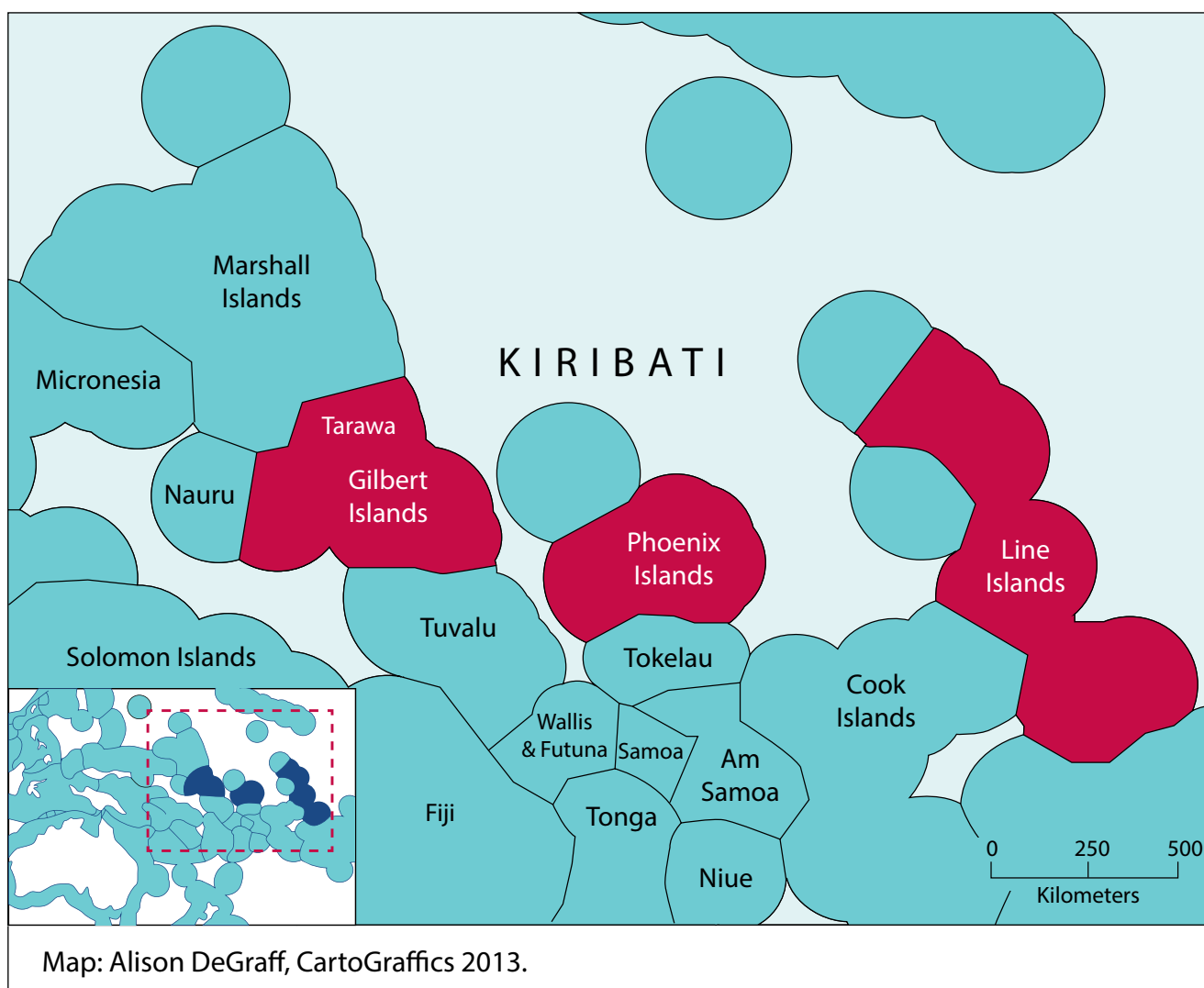


Figure 1. Map of Kiribati and surrounding Pacific Islands showing EEZs (Kiribati EEZs darkened) and the capital island of Tarawa.

In contrast, Kiribati has a highly diverse, rich and productive marine and coastal ecosystem that supports hundreds of coral species, 500 species of fish, 20 marine mammal species and 2 IUCN Red-listed turtle species (UCSD 2007; Fishbase 2011; MELAD 2013). These aquatic resources support industrial, artisanal, subsistence, bait and game capture fisheries. They also support marine aquaculture activities and a UNESCO World Heritage Site in the Phoenix Islands.

Kiribati foreign and domestic fisheries take place in the country's lagoon, coastal and oceanic environments. They provide a critical source of revenue, income, employment, food and livelihood benefits. The value of these fisheries to Kiribati was roughly estimated to exceed A\$130 million in 2010 (MFMRD 2011). Oceanic tuna are Kiribati's most economically valuable aquatic commodity. The landed value of all tuna caught within the Kiribati EEZ has averaged approximately A\$ 430 million per year over the past five years (FFA 2012a), of which Kiribati received A\$ 30 to A\$ 50 million in fishing access fees every year. These access fees contribute roughly half of Kiribati's total government revenue and approximately 25% of its gross domestic product (GDP) (WCPFC 2011; Banks 2012). With an annual national GDP of approximately A\$165 million in 2010 (UN Data 2013), Kiribati fisheries are evidently of indispensable economic benefit to the entire country.

Fisheries also play a critical supporting role for domestic food security. Kiribati is a low-income food-deficit country (LIFDC) with a significant trade deficit amid limited export options and rising import costs. The most recent national household income and expenditure survey (HIES) in 2006 estimates that nearly half of the I-Kiribati annual average household income of A\$ 8,700 is spent on food (KNSO 2006). While commercial oceanic tuna resources provide most of Kiribati's national annual formal sector revenue, its domestic lagoon and coastal fisheries supply the current domestic food security demand for fish protein and provide a valuable and relatively affordable local source of animal protein for I-Kiribati.

However, a growing population, particularly in urban centers such as South Tarawa; rising international prices for fishery products; effects of climate change; and a lack of alternative livelihood options, means that marine and coastal ecosystems in Kiribati are becoming increasingly over-exploited in order to sustain growing usage needs. Kiribati is a Small Island Developing State (SIDS) characterized by a remote location; limited financial, infrastructure, institutional and environmental resources; a vulnerability to both human-induced and ecological disasters; and a heavy reliance on external aid (UN-OHRLLS 2013). Kiribati's internationally recognized social, economic and environmental challenges are ongoing and the associated pressures on the benefits derived from its fisheries resources are likely to increase in the future.

Kiribati waters support a wealth of marine fisheries activities. These activities range from large, foreign, industrial-scale oceanic fishing operations to small-scale, domestic, inshore subsistence fisheries, as well as aquaculture, an aquarium trade, and recreational fisheries. Kiribati has no freshwater fisheries. Kiribati's oceanic, coastal, and aquaculture sectors each generate benefits for I-Kiribati. These may be in the form of government revenues; they may provide direct livelihood benefits such as employment, income and revenue; they may provide subsistence food security, or they may provide some combination of the above. This section reviews and summarizes the status of Kiribati fisheries resources in the context of their contribution to these benefits.

Oceanic fisheries

Kiribati's most economically valuable fisheries are its tuna fisheries, and it has some of the richest tuna fishing grounds in the world. The country's large EEZ supports a large oceanic tuna catch by foreign vessels fishing under access agreements. Industrial-scale commercial fishing activities in Kiribati are currently exclusively oceanic and are conducted almost entirely by foreign interests. These large-scale purse seine, longline, and pole and line fisheries target four Pacific tuna species: albacore (*Thunnus alalunga*), skipjack (*Katsuwonus pelamis*), yellowfin (*Thunnus albacares*), and bigeye (*Thunnus obesus*) (Table 1). Over the past five years, Kiribati waters have yielded an average of 320,730 metric tonnes (t) of tuna per year (FFA 2013). Catch trends are strongly influenced by El Niño Southern Oscillation (ENSO) events, with higher catches in El Niño years.

Kiribati does not have a locally based, industrial-scale, commercial, oceanic fishing fleet but it has negotiated numerous multilateral and bilateral access agreements for the right to catch fish in its waters (See Section 4.4). As a result of these numerous agreements and arrangements, hundreds of foreign purse seine and longline vessels fish offshore¹ in Kiribati waters every year (Table 2). Kiribati has recently flagged (i.e. registered) a number of foreign-owned or joint-ventured large-scale

commercial fishing vessels from foreign ports to fish within its EEZ and beyond. There are 14 large-scale fishing vessels currently flagged to Kiribati. However, the number of operating vessels is uncertain as most of these vessels are foreign-owned and operate out of foreign ports.

Purse seine fishing vessels are the cornerstone of Kiribati's oceanic tuna fisheries and provide over 60% of fishing access fee revenue. Purse seine vessels tend to concentrate their harvest activities in the Gilbert and Phoenix Islands and primarily target skipjack (Table 1). Skipjack tuna is Kiribati's most economically valuable species and represents approximately 70% to 85% of purse seine and pole and line catch (MFMRD 2011). Kiribati also licenses a significant foreign longline fleet. This fleet primarily targets bigeye and catches yellowfin, albacore and other oceanic species. Longline catches concentrate mostly in the Line Islands. Additional non-target species are caught in oceanic tuna fisheries as bycatch; this includes but is not limited to juvenile bigeye and yellowfin in fish aggregating device (FAD)-associated purse seine fisheries.

Tuna catch composition varies between fishing nations and fishing strategies. For example, the EU purse seine fleet is more dependent on FAD-associated bigeye tuna (18%) than other fleets (MARE 2012). Conversely, the Korean purse seine fleet has historically set on free-swimming schools more than FADs. As a party to the Nauru Agreement (PNA), Kiribati purse seine catches from unassociated (i.e. non-FAD) free schools of skipjack tuna are certified as sustainably fished by the Marine Stewardship Council as of 2011 (MSC 2013). The percentage breakdown of tuna catch in Kiribati waters by tuna species and by fleet type is provided in Figure 2 (a-f) and Figure 3 (a-f).

Almost all recorded tuna production attributed to Kiribati in regional statistical records comes from foreign-owned purse seine vessels that target skipjack, yellowfin and bigeye tuna. This is caught within the Kiribati EEZ, on the high seas and across the broader Western Central Pacific Ocean (WCPO). Both the total annual catch by Kiribati-registered fishing vessels and the number of Kiribati-registered purse seine

vessels have increased dramatically since 2007. Offshore tuna caught by Kiribati-registered purse seine vessels increased from about 5,400 t in 2007 to around 62,000 t in 2012 (FFA 2013). This is due in part to the considerable influx of foreign-owned vessels registering under the Kiribati flag in recent years. In 2012, the total catch attributed to the entire Kiribati national fleet was 75,946 t (FFA 2013). However, these Kiribati-flagged vessels operate largely out of foreign ports and generally do not offload their catch in Kiribati (MFMRD 2011). This returns little value to Kiribati beyond registration fees, license fees, some employment and limited revenue from dividends in a few joint-ventured fishing vessels.

Non-target species are an increasing component of both the longline and purse seine fleet catch composition (WCPFC 2011, 2012). This increase in bycatch has been recorded by onboard observers. The absolute values of these increasing trends are unreliable, but this is due in part to relatively low observer coverage on foreign fleet vessels and to the lack of qualified observer debriefers to ensure data quality control (ROK 2011). Commonly caught non-target, non-tuna species include: marlin (*Istiophoridae*); rays; sharks such as oceanic whitetip shark (*Carcharhinus longimanus*) and silky shark (*Carcharhinus falciformis*); and other finfish such as rainbow runner (*Elagatis bipinnulata*), wahoo (*Acanthocybium solandri*) and common dolphinfish (*Coryphaena hippurus*) (WCPFC 2011). Turtle, seabird and marine mammal bycatch are not discussed in any known reports.

It is not clear how much bycatch, if any, is discarded in Kiribati. Observations made in local markets indicate that much of it, in particular juvenile tuna bycatch, is retained for sale in Kiribati's domestic markets. Conservation and management measures (CMMs) for the WCPO region appear to reinforce this practice. Beyond 12 nm from shore, WCPFC CMMs dictate full catch retention for tuna bycatch, mitigation measures for turtle bycatch, and full utilization of sharks for which live release is not possible (WCPFC 2008, 2010; Banks 2012). Landings of sharks caught outside of 12 nm are prohibited in Kiribati (WCPFC 2010; Banks 2012) and there is a full ban on retaining, transshipping, storing, or landing oceanic whitetip sharks in

WCPFC managed areas, which includes Kiribati (Banks 2012; WCPFC 2012). However, Kiribati has struggled at times to implement these requirements with respect to the CMMs on sharks (Banks 2012).

Species	Purse seine	Longline	Pole and line
Target species	Tuna: Skipjack, yellowfin, bigeye	Tuna: Bigeye, yellowfin, albacore	Tuna: Skipjack
Non-target species	Juvenile bigeye and yellowfin tuna, billfish, shark, rainbow runner, dolphinfish	Billfish, wahoo, opahs, dolphinfish, shark	Not given, likely bigeye tuna
Species catch composition (%)	Skipjack (82%) Yellowfin (13%) Bigeye (4%) Bycatch rate not given	Bigeye (56%) Yellowfin (30%) Albacore (14%) 'Non-tuna' bycatch ($\leq 25\%$)	Not given
Tuna catch in t			
Total	Purse seine	Longline	Pole and line
Total offshore catch in Kiribati EEZ			
In 2010:	230,245	211,629	5,461
In 2011:	210,482	192,904	4,450
Kiribati flagged catch in Kiribati EEZ			
In 2010:	21,275	8,075	73
In 2011:	26,799	13,310	362
Foreign catch in Kiribati EEZ			
In 2010:	246,657	237,572	9,058
In 2011:	183,683	179,595	4,088
DWFN catch in Kiribati EEZ			
In 2010:	187,766	182,352	5,387
In 2011:	143,569	139,481	4,088
FSMA reported catch in Kiribati EEZ			
In 2010:	40,171	40,171	0
In 2011:	40,114	40,114	0
Kiribati flagged offshore catch in WCPO			
In 2010:	38,947	25,747	73
In 2011:	60,003	46,514	362
Location of catch			
Flagged catch by WCPO location (%)	Kiribati EEZ (30) High Seas (30) PNG (30) FSM (9) Solomon Islands (<1) Nauru (<1)	Both inside and outside Kiribati EEZ	Both inside and outside Kiribati EEZ
Total catch within Kiribati EEZ by Island group (%) (2007)			
<i>Gilbert</i>	79	26	100
<i>Line</i>	9	35	–
<i>Phoenix</i>	11	39	–
Primary catch landing location (2007)	Thailand Latin America American Samoa Japan	–	Japan

Source: Compiled from WCPFC 2011; Banks 2012; FFA 2012a.
 *Note: There are discrepancies between sources with respect to reported landings as well as the proportional composition of tuna species within a total catch. However, broad data trends remain the same.

Table 1. Kiribati offshore tuna catch statistics in 2010/2011 by gear type in t*. Data do not include bycatch or discards. The list of non-target species in this table is not exhaustive.

Vessel statistics	Purse seine	Longline	Pole and line
Offshore vessels authorized in Kiribati EEZ			
Total number of registered offshore vessels	171 (2007) 195 (2011)	160 (2007) 256 (2011)	6 (2007) 4 (2011)
Vessel length (m)	62-107	24-53	44
Flagged to Kiribati			
Foreign-owned or joint-ventured vessels (#)	9	4	1
Nationalities of vessel owner	Japan, Republic of Korea, Spain	Taiwan	Japan
DWFN			
Number of foreign-owned vessels (#)	106	252	3
Nationalities of vessel owner and number of vessels (#)	USA (37) Japan (35) Republic of Korea (28) Taiwan (26) Ecuador (7) Spain/EU (4) New Zealand (3) El Salvador (2) China (1)	Republic of Korea (112) China (75) Taiwan (48) Japan (9) Vanuatu (8) Fiji (0)	Japan (3)
FSM arrangement			
FSMA vessels (#)	46	–	–
Nationality of vessel owner and number of vessels (#)	Vanuatu (17) PNG (11) Marshall Islands (11) FSM (6) Tuvalu (1)		
US treaty			
US treaty vessels (#)	37	–	–
Source: Gillett 2009; Banks 2012; WCPFC 2012.			

Table 2. Offshore fishing vessel statistics for Kiribati. Statistics are for 2011 unless otherwise stated. Kiribati also registered 19 reefer carriers and 8 bunkering vessels with the WCPFC in 2011.

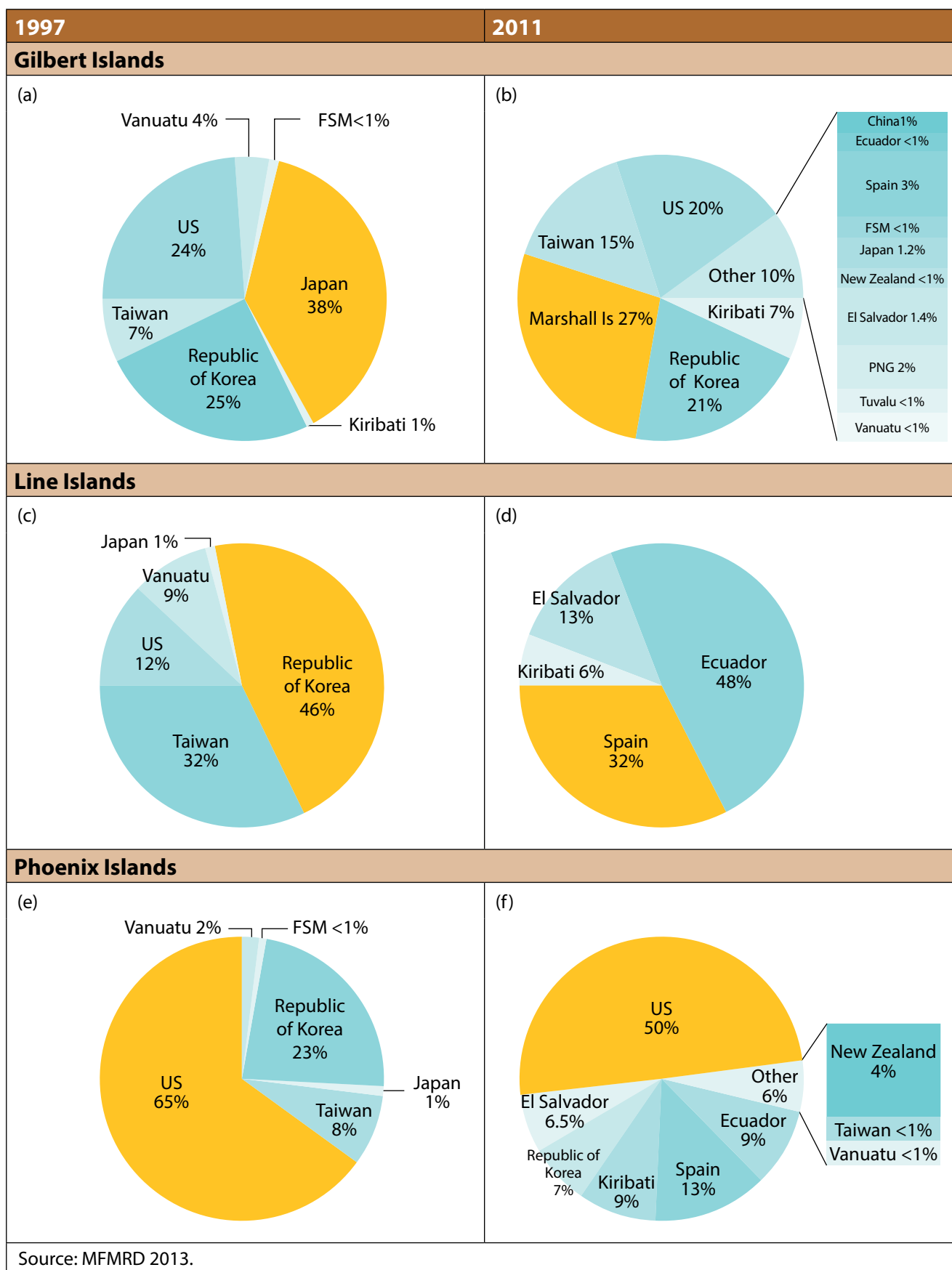


Figure 2. (a-f). Catch of tuna by purse seine fleet in Kiribati island groups in 1997 and 2011, proportionally represented by percentage of total annual tonnage.

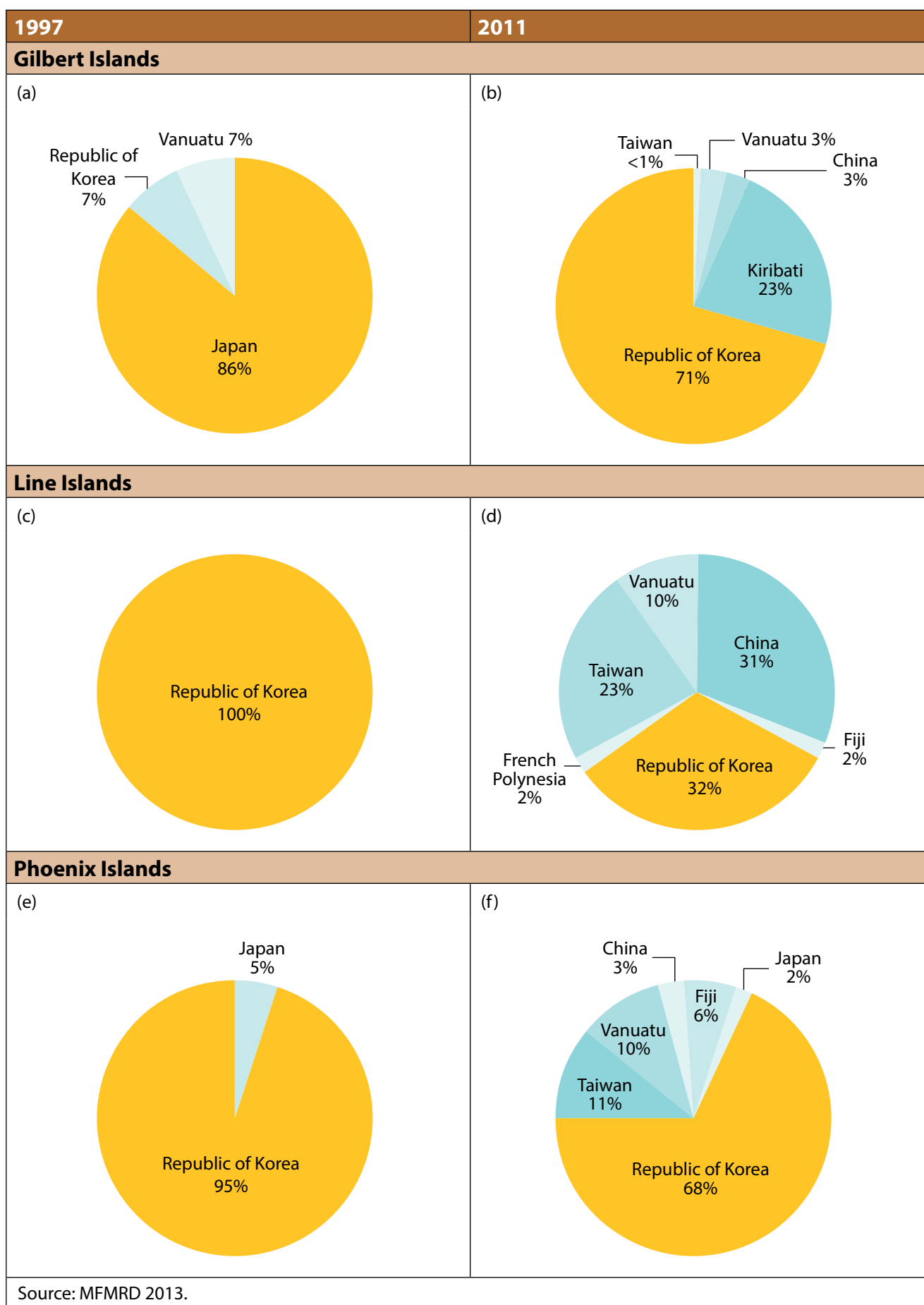


Figure 3. (a-f). Catch of tuna by longline fleet in Kiribati Island groups in 1997 and 2011, proportionally represented by percentage of total annual tonnage.

In order to develop and increase the value of its oceanic tuna fisheries, Kiribati is party to the Nauru Agreement. The parties to the Nauru Agreement (PNA) control the most productive waters for tuna and include: Tuvalu, Kiribati, Nauru, PNG, Solomon Islands, Federated States of Micronesia, Palau and the Marshall Islands. The PNA have made progress in improving benefits through their implementation of the innovative vessel day scheme (VDS) and various other subregional conservation measures. Access fees have risen strongly since the introduction of the VDS, with significant increases in the fees now being charged by Kiribati. Kiribati has amended all of its bilateral access arrangements except for the EU Fisheries Partnership Agreement (FPA) in order to implement the PNA VDS. Kiribati was allocated 6,028 vessel days for 2013 under the VDS.

Kiribati is one of the main tuna transshipment locations in the WCPO (Banks 2012). Foreign fleet catches of oceanic tuna taken within the Kiribati EEZ are usually not offloaded in Kiribati. Instead, tuna are stored in refrigerated seawater tanks prior to transshipment onto carriers (Banks 2012). Kiribati-licensed purse seine vessels typically transship their catch at designated ports in Betio, Tarawa (80%), London, Kiritimati (20%) and occasionally other Pacific country designated ports (Banks 2012). All transshipments are subject to port sampling procedures; port sampling is reportedly high because transshipment revenues are based on quantities shipped (Banks 2012). In 2009, 176 of 209 vessels transshipping in Kiribati waters were sampled; collected data are sent to the Secretariat of the Pacific Community (SPC) for processing and analysis (ROK 2011).

Purse seine vessels that transship in Tarawa originate from Republic of Korea, Taiwan, China, New Zealand, USA and Japan. In 2010, two-thirds of all purse seine transshipments were carried out by Republic of Korea. Purse seine vessels that transship in Kiritimati include the EU (Spain), Ecuador and El Salvador. Between 160 and 400 purse seine transshipments take place in Kiribati annually (Banks 2012). For example, 68 foreign vessels and 2 Kiribati-registered vessels transshipped 94,168 t of tuna in 2010 to reefer carriers at sea or in port (MFMRD 2013a). This represented approximately 41% of the total reported catch

of tuna in Kiribati waters in 2010 (FFA 2012a). Only about 10% of longline transshipments occur in port; the remainder occurs at sea (Banks 2012). Longliners generally transship at sea and deliver to Asian ports or neighboring Pacific Island ports such as Pago Pago in American Samoa and Suva in Fiji (Banks 2012). However, in 2013, longliners began landing small quantities of tuna at Kiribati Fishing Limited (KFL) in Betio, South Tarawa for loining prior to export. Landed quantities have not yet been sufficient or consistent enough to operate the plant at full capacity. The Betio processing plant is currently operational about once a week and would require around 15 t of suitable quality fish per day to run at full capacity (personal communication from Mr. Lee, 2013). Japanese pole and line tuna catch is delivered directly to port in Japan.

In addition to government revenue benefits from licensing and registration fees and some joint venture dividends, oceanic tuna fisheries provide several livelihood benefits for I-Kiribati. Artisanal and subsistence fishers catch significant amounts of oceanic tuna for local markets and immediate consumption. This level of catch is likely to increase due to overfishing pressures in Tarawa lagoon and other inshore fisheries. There are also good employment opportunities for I-Kiribati in maritime and fishery positions. Access agreements currently dictate I-Kiribati crewing requirements and I-Kiribati crew have developed a strong regional reputation, particularly amongst Japanese fleets.

Lagoon and coastal fisheries

In practice, Kiribati designates a 'coastal' or 'nearshore' fishery as one which takes place within 3 nm of the low-water baseline on shore. However, activities within the territorial sea limit of 12 nm may also be considered 'coastal' as these waters are prohibited to distant water fishing vessels. Inshore coastal fisheries take place within Kiribati lagoons. These 'small-scale' fisheries provide I-Kiribati with a combination of livelihood and subsistence benefits. Coastal fisheries provide few government revenue benefits. Many of the same marine species are caught in fisheries that support livelihood gains and those that primarily support subsistence consumption activities. Tuna play a key role in both types of fisheries.

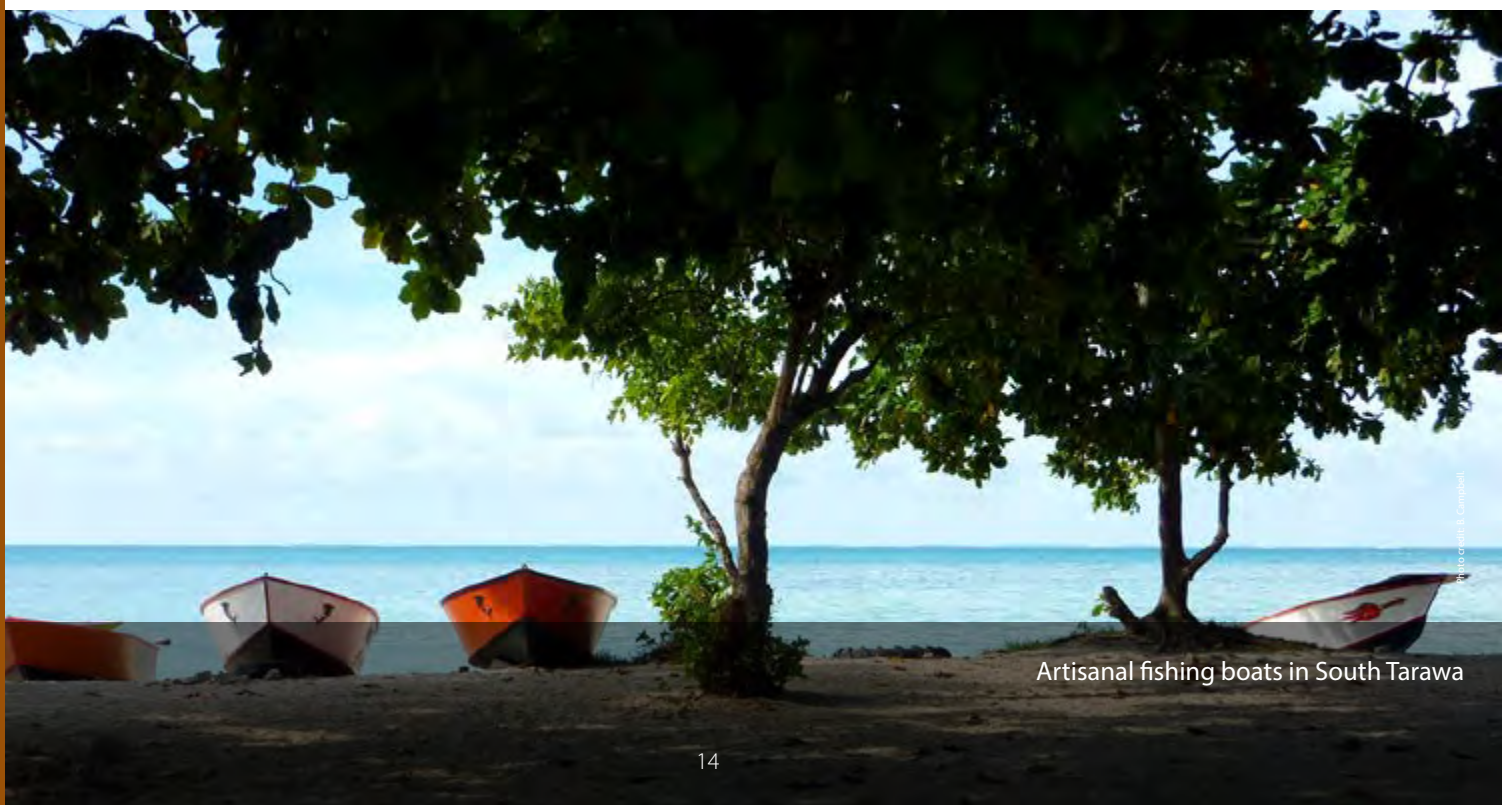
Overpopulation pressures in South Tarawa are threatening the sustainability of immediately adjacent lagoon and coastal fisheries. This pressure could also impact rural outer island communities if they become motivated to increase their commercial fishing activities to supply urban markets. This increase in fishing activity could increase the risk of local overfishing and reduce the availability of fresh fish for local consumption. Nevertheless, it is forecast that Kiribati coastal fisheries could support the future food security needs of all communities throughout the country (Bell et al. 2009). However, the same forecast cautions that Kiribati will need to address significant distribution and management challenges if it is to avoid shortfalls in urban centers such as South Tarawa. The following section summarizes coastal fisheries activities in Kiribati according to the given fishery's primary benefit to I-Kiribati.

Livelihood-based coastal fisheries

Livelihood-based coastal fisheries are those that primarily provide I-Kiribati with employment, income and revenue benefits. These fisheries may be foreign export-driven, domestically-retained or a combination of both. In the most recent national population census, over half of all surveyed households and around 60% of rural households were engaged in some kind of fishing activity (Kiribati Census 2010). These cash-based livelihood fisheries are included where possible in formal economy GDP estimates (SPC 2013a). However, the accuracy,

completeness, timeliness and reliability of coastal fisheries catch and value statistics is generally poor, despite efforts made by the Ministry of Fisheries and Marine Resources Development (MFMRD) Coastal Fisheries Branch to conduct artisanal fishing surveys. With this uncertainty in mind, the most recently published combined production and value of both commercial and subsistence coastal capture fisheries was estimated to be around 21,100 t in the mid-2000s, with a landed value of approximately A\$56 million (Gillett 2009).

It is estimated that approximately 30 to 40% of coastal fisheries catch is destined for small-scale commercial and artisanal livelihood purposes rather than for subsistence. However, the proportion of coastal catch focused on livelihood benefits has increased in recent years due to an increase in ice production in the outer islands, an improved availability of cold-storage facilities for local sales and shipments to Tarawa, and an increase in the inter-island finfish trade (Gillett 2009). As of 2009, there are 14 islands with fish cold-storage facilities in Kiribati (Gillett 2009). However not all of these fish centers are currently operational, which is the case in North Tarawa as of late 2010. The four closest islands to Tarawa: Abaiang, Maiana, Kuria and Abemama, all have working ice plants (ROK 2011).



Artisanal fishing boats in South Tarawa

Small-scale commercial and artisanal capture fisheries activities by species

The small-scale commercial and artisanal fleet operates within 12 nm in boats under 7 m in length (MFMRD 2011). Sail-powered vessels have gradually been replaced by vessels with 30 to 40 horsepower outboard motors (MFMRD 2011; ROK 2011). Boats of this length or less do not need a license to operate but must have permission from the local island council to sell their catch at local markets. The most recent number of active vessels in this length class registered by the SPC tuna fisheries database management system (TUFMAN) was 4,766 in 2008 (WCPFC 2011). To be able to afford a boat, an artisanal vessel-owner may have been employed by government, received an overseas remittance from family, returned from an overseas contract, or held a maritime job (MFMRD 2011).

While tuna trolling is a primary activity, the small-scale commercial and artisanal fleet also fishes within inshore lagoons using: bottom and mid-water hand-lines, pole and line, spears, traps, netting, and diving. The total number of fishers actively engaged in full- or part-time small-scale commercial and artisanal fisheries is unclear but it is likely that this number is considerable relative to the total size of the population.

Artisanal and small-scale commercial production, excluding subsistence catch, was estimated to be approximately 7,400 t in the mid-2000s (Gillett 2009). This catch was valued at around A\$22 million, with an approximate market unit value of A\$2.97 per kilogram (kg) of fish sold (Gillett 2009). Other more recent market value estimates place the average value of small-scale catch in the Tarawa markets at around A\$3.08/kg; but these values are known to fluctuate depending on scarcity (MFMRD 2013b; MRAG 2013). Unlike in Kiribati commercial oceanic fisheries, coastal and lagoon-based catches are landed in Kiribati and then either sold domestically or exported abroad. Domestic small-scale and artisanal catches have been steadily increasing over time but further fleet expansion has been constrained by a lack of efficient transportation options for fish from outer islands to the large markets in South Tarawa (MFMRD 2011).

Many of the same coastal species are wild caught or farmed for both livelihood and subsistence purposes. The following section reviews the available information for key coastal and lagoon-based species that are caught or farmed in Kiribati. The biological and management status of key species is summarized in Table 3.

Tuna

Tuna are a key species in Kiribati coastal fisheries both in terms of livelihood and subsistence benefits. They are sold fresh and whole directly to local consumers by woman vendors particularly around South Tarawa. Kiribati's artisanal trolling fleet catches and locally lands substantial quantities of skipjack, yellowfin, and bigeye tuna every year despite the lack of organized landing sites for tuna (Banks 2012). The proportion of skipjack and yellowfin in the catch varies between islands, while bigeye is not typically targeted (Figure 4). From 1993 to 2003 the total average annual catch of tuna in the Gilbert Islands was 2,821 t (SPC 2013b).



Selling artisanal tuna on the roadside in South Tarawa

An FFA-commissioned survey in 2008 found that there were 126 active full-time commercial tuna trolling craft (of 5 to 7 m length) and 88 part-time vessels operating out of South Tarawa, the primary location for this activity (Gillett 2009). More recent unpublished data records 150 active small fishing vessels in Betio but there are additional small craft known to operate out of the area (SPC 2013b). In 2010, 200 Kiribati trolling vessels sold an estimated average of 126 t of tuna and related pelagic species per month (Banks 2012).

A 2010 artisanal tuna troll survey reported yields of 8,438 t of skipjack, 4,528 t of yellowfin and no catch of bigeye (WCPFC 2011). The absence of any bigeye catch is likely due in part to the difficulty in visually distinguishing between juvenile bigeye and yellowfin, as bigeye are known to be sold in Bairiki markets (SPC 2013b). The market price of tuna in 2008 was A\$2.65/kg and Kiribati artisanal tuna sales were therefore about A\$4 million per year (Gillett 2009). The average sale price of tuna has since risen to between A\$2.80 and A\$3/kg in Tarawa markets, but it may reach as low as A\$1/kg in the outer islands (ROK 2011).

Following the training and posting of new MFMRD Fisheries Division Fisheries Assistants (FAs) in 2009, artisanal production statistics for tuna have been significantly and dramatically revised. However, reported artisanal catch values still differ considerably between sources. For example, the Kiribati artisanal tuna catch reported to the WCPFC for 2010 was 35,495 t of skipjack and 29,173 t of yellowfin from a few islands in the Gilbert group, excluding South Tarawa (WCPFC 2012). Reported values in 2012 were about 10,000 t lower, and were nearly 60% yellowfin (WCPFC 2012). In contrast, the SPC annual catch estimate for artisanal tuna in South Tarawa, which has the largest artisanal fleet and is likely to have expanded the most in recent years, is 5,475 t (SPC 2013b). This significant discrepancy in reported artisanal catch highlights the need to establish more robust statistical monitoring programs for artisanal fisheries activities in Kiribati. In this regard, establishing a small-scale fishing vessel register in South Tarawa together with a monitoring program to record the average number of vessel trips per day and average catch per trip would be of significant benefit to fisheries managers, particularly if data are also collected during El Niño and La Niña conditions.

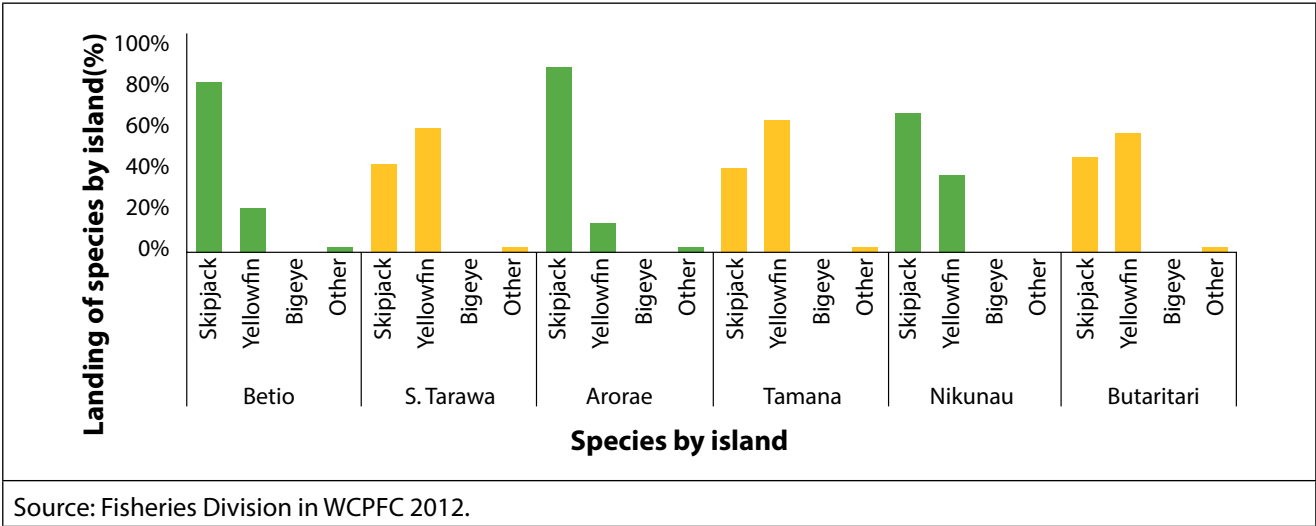


Figure 4. Artisanal landings by species from selected islands in select years in the Gilbert group between 2009 and 2012. This figure is expressed as a percentage to show the relative proportions of catch composition rather than potentially incomplete time series data.

Shark

Reef and lagoon-associated shark species were traditionally fished for food in some parts of Kiribati but have more recently been the focus of a growing dried shark fin export trade to Asia. The fisheries division notes that 2.5 t of dried shark fin were exported from coastal fisheries in 2006 (Preston 2008). Using estimated wet/dry weight conversion ratios, this roughly equates to 118 to 152 t of shark. Thirteen companies were licensed to export either shark fin or *bêche-de-mer* in the same year (Preston 2008). Shark fin exports peaked in 2009 at 50 dry weight t and dropped to a reported 18 t in 2010 (KNSO 2013). Field surveys have confirmed that shark stock levels are low in some areas where harvesting is known to be heavy (Preston 2008). This practice involves a number of shark species such as the nurse shark (*Ginglymostoma ferrugineum*) (ROK 2011) but few additional details are available about the nature and extent of this fishing activity. The council of elders in Butaritari has recently declared its support for a full ban on the practice of shark finning in their territorial waters (personal communication from Ben Namakin, 2013), and the Government of Kiribati is now considering the development of supporting national legislation.

Deepwater snapper

Fishing trials for deepwater snapper began in the early 1990s in various locations throughout Kiribati. These have demonstrated the technical feasibility of catching species such as ruby snappers (*Etelis* spp.), rosy snappers (*Pristipomoides* spp.) and groupers (*Serranidae*). Deepwater snapper exports have occurred in Kiritimati in the past, but the fishery was constrained by a lack of viable transportation options from outer islands to markets in Honolulu and elsewhere. Kiribati may have the potential to support a small, high-value deepwater snapper fishery in the future. Significantly, these species do not carry ciguatera poison (Preston 2008). The relatively low estimated maximum sustained yield (MSY) of between 73 and 219 t per year and the slow growth and reproductive rates of many deep-slope species means that the expansion of such an activity would need to be carefully considered (ROK 2011). The feasibility of a deep-slope coastal fishery is currently being examined in a study by private interests in South Tarawa.

Milkfish (*Chanos chanos*)

Milkfish is a traditionally important coastal food fish species in Kiribati, particularly in the atolls. It is caught by local fishermen in Kiritimati for both small-scale commercial and subsistence benefits and it is farmed for both livelihood and subsistence benefits. It is caught by gillnetting, often during fish drives. Milkfish are routinely caught by fisheries division Kiritimati branch staff who gillnet for milkfish in conservation zones and then either sell their catch to the State-owned Central Pacific Producers Limited (CPPL) or to the general public (Preston 2008). Income from these sales is lodged as government revenue. Milkfish is both locally consumed and exported to Honolulu (Preston 2008). Heavy fishing pressure, destructive fishing practices, environmental degradation and the blockage of spawning runs by causeway construction have led to population declines and reduced coastal catches of milkfish over the years (Preston 2008).

Additional coastal pelagic species

Additional coastal pelagic species caught by trolling, pole-fishing, netting, jigging, and deepwater line fishing include trevallies and scads (*Carangidae*), dogtooth tuna (*Gymnosarda unicolor*), wahoo (*Acanthocybium solandri*) and rainbow runner. Other exploited coastal species include herrings and sprats (*Clupeidae*) and the castor oil fish (*Ruvettus pretiosus*) (Preston 2008).

Bêche-de-mer (*Holothuria* spp.)

Sea cucumber is one of Kiribati's major export earnings next to seaweed and coconut-based copra. It is harvested and dried out to produce *bêche-de-mer* or *trepang*, a popular product in Chinese markets. Harvesting has occurred for decades but data collection for this species began only in the late 1990s (KNSCMP 2013). Sea cucumbers do not have any significance as a cultural or traditional food in Kiribati (ROK 2011; KNSCMP 2013). There are around a dozen species in Kiribati, most of which are of medium to low economic value. Two species, the black teatfish (*H. nobilis*) and the white teatfish (*H. fuscogilva*) are of high value. Another high-value species, the sandfish (*H. scabra*) does not occur naturally in Kiribati and has been introduced. Artisanal dive fisheries for sea cucumber exist in Kiritimati, as well as in some islands in the Gilbert group (ROK 2011). The *bêche-de-mer* fishery has expanded considerably in recent years and

is under significant pressure from overfishing with some fisheries effectively 'fished out'. Recent assessments in Kiritimati, Tabiteuea, North Tarawa, Abemama, Onotoa and Nonouti indicate that species densities are very low. A wild stock enhancement hatchery has been established in Tarawa, but this has yet to be proven effective. Both a management regulation and a national species management plan have been prepared with assistance from the SPC and are currently being reviewed by the cabinet.

Thirteen companies were licensed to export both bêche-de-mer and shark fin from the Gilbert Islands in 2006 (Preston 2008). Govan (In Press) found that there are currently fewer than ten export licenses. Production reached its peak in 2007 at 268.5 t (KNSCMP 2013). The Kiribati National Statistics Office (KNSO) reports that A\$448,000 worth of bêche-de-mer was exported from Kiribati in 2010 (KNSO 2013). Reported production in 2010 was nearly 98 t and this declined to 63 t in 2012 (KNSCMP 2013). Production quantities of more valuable teatfish species have been declining since the mid-2000s and the current species composition of production is now more than 50% lollyfish (*H. atra*), a comparatively low-value species. The average price for sea cucumber is US\$25/kg and the introduced sandfish can fetch prices of up to US\$300/kg (KNSCMP 2013).

Blacklip pearl oyster (*Pinctada margaritifera*)

In the past, black lip pearl oysters were harvested from the wild for export as well as for local shellcraft. Kiribati pearls do not meet the standard for the current global market. Pearl oysters have traditionally been used for tuna-fishing lures and demand continues to exist for this purpose. Past overharvesting has resulted in very low harvests. Fisheries division surveys in Abaiang, Butaritari and Kiritimati in the 1990s demonstrated the exhaustion of local stocks, some of which have collapsed and not recovered since overfishing in the 1980s.

Ark shell (*Anadara maculosa* or *A. holoserica*)

Also known as blood cockle or *te bun*, ark shell fisheries have a traditional importance on several atolls, including Tarawa, both for food and for handicrafts. In the early 1990s when harvestable quantities were high, commercial harvesters collected about 1000 t of clams annually around Tarawa.

However, overexploitation of the resource in sandy lagoons and seagrass beds from both commercial and subsistence harvesting has led to collection levels of less one-tenth of their former size, as well as speculation that the fishery has almost collapsed. The MFMRD estimates that less than 1 t is produced annually from islands such as Abaiang and Abemama and that the South Tarawa ark shell fishery has functionally collapsed (MFMRD 2013b). However, creel surveys and interviews conducted by Fay et al. (2007) indicate that *anadara* fishing for income and subsistence was still being carried out with reasonable frequency until at least the mid-2000s. This study indicates that women in South Tarawa had an average harvest of 10 kg per trip, with an average of 3 trips per week for subsistence purposes. This catch can reportedly fetch about A\$150 per fortnight when sold in Bairiki, South Tarawa markets (Fay et al. 2007). Some transplant activities from outer islands have taken place in an effort to reestablish the clam stocks in Tarawa but this activity has not been successful (Awira et al. 2008; Preston 2008). A species management plan for Tarawa is currently in development with assistance from the SPC.

Giant clam (*Tridacna* spp.)

The Government of Kiribati lists four giant clam species in Kiribati: *T. maxima*, *T. gigas*, *T. squamosa* and *Hippopus hippopus* (Preston 2008). *T. crocea* may also be present. All species are heavily fished and *T. gigas* is thought to be nearly locally extinct from some islands, including Abaiang (Awira et al. 2008; Preston 2008). Giant clams are harvested from the wild for food and farmed from imported spat for the aquarium trade (Preston 2008). There is currently one export license for giant clam in Kiribati (Govan, In Press). A species management plan is currently being developed.

Trochus (*Trochus niloticus*)

Trochus were translocated from Tarawa to Abaiang to colonize the reef system in mid-2000 but it is not known whether this operation was successful due the potentially unfavorable reef conditions for grazing gastropods (Awira et al. 2008). Trochus are largely caught for subsistence consumption in the outer islands but they may be exported between islands through personal arrangements, with the sale price varying by island (MFMRD 2013b).

Spiny lobster (*Panulirus* spp.)

A small-scale lobster fishery supplies the hospitality industry of hotels and guesthouses, particularly in Tarawa and Kiritimati. The species caught include *Panulirus penicillatus* and *P. versicolour*. These are caught by local divers who occasionally use scuba gear to catch lobster either by hand or by spear-fishing. Spiny lobster is one of the only species in Kiribati that currently has official management regulations in place. There are regulations on size and no-take restrictions on berried females, but the fisheries division is not always effective at enforcing these rules. The CPPL in Tarawa is an important buyer of lobster and exported several tonnes a year from Kiritimati to Honolulu, Hawaii in the mid-2000s (Preston 2008). Spiny lobster is also caught for subsistence purposes.

Turtle

Turtles are caught and consumed as a traditional food in Kiribati but there is no actual fishery for them (MFMRD 2013b). A number of nesting sites occur throughout the islands, including some uninhabited islets in North Tarawa. Noto Village in North Tarawa has been assigned Ramsar Convention status in part due to its importance as a turtle nesting site (MFMRD 2013b). Turtle species include: green (*Chelonia midas*), hawksbill (*Eretmochelys imbricata*), loggerhead (*Caretta caretta*), olive ridley (*Lepidochelys olivacea*) and occasionally leatherback (*Dermochelys coreacea*). Turtle are caught as bycatch in oceanic fisheries and WCPFC regulations exist to mitigate this (WCPFC 2008). The Ministry of the Environment, Lands and Agricultural Development (MELAD) currently has a turtle tagging program (MFMRD 2013b).

Other small-scale commercial and artisanal capture fishing activities

Coastal fisheries resources in Kiribati support other livelihood activities in addition to capture fisheries for food. These are described below by activity.

Bait fisheries

Information about wild-capture bait fisheries is not currently officially recorded in Kiribati but this activity is known to be widespread. Fishermen routinely fish for a variety of small finfish (such as the locally named *te tarebuti*) in the lagoons using monofilament nets. These fish are caught both for subsistence food and as

baitfish. There have been attempts and discussions over the years to start up a bait fishery in the Tarawa and Kiritimati lagoons to support the tuna industry but there has been no progress on this to date (Barclay and Cartwright 2008).

Live reef trade

Kiribati had a live reef food fish (LRFF) fishery from 1996 to 2004. Two separate companies with special export arrangements operated at various times in several locations (Preston 2008). These included at least four islands in the Gilbert Islands group – Butaritari, Tabiteuea, Nonouti and Onotoa, and three islands in the Line group – Tabuaeran, Teraina and Kiritimati. This small-scale commercial fishery targeted live reef fish such as coral trout (*Plectropomus leopardus*), groupers, some snappers and the Maori wrasse (*Cheilinus undulatus*). Fish were purchased by the operators from local fishers, captured directly, or both. They were held in floating cages until sufficient quantities (approximately 10 – 30 t) were accumulated to transport the fish via carrier vessel to supply the restaurant trade in Hong Kong. Exported quantities of live groupers increased from 2.1 t in 1998 to 48.4 t in 2004. A total of 8.7 t of wrasse was exported in 1998 and 10.5 t in 2004. The live reef trade in Kiribati ceased in 2004 and has not been reestablished due to a serious outbreak of ciguatera poisoning in Hong Kong caused by fish from Kiribati (Preston 2008).

Although this activity had the capacity to provide much-needed income to the outer islands, fishing methods for the live reef trade were characterized by destructive and irresponsible fishing methods. These included breaking corals to conceal fish traps and targeting spawning aggregations of vulnerable fish (Preston 2008). While the live reef fishery was active, local fishermen and communities on some islands became concerned enough about declines in target reef fish species that they voluntarily limited their own fishing effort to reduce fishing pressure (Government of Kiribati 2002). Despite sustainability concerns raised by local groups and by the fisheries division's surveys, there is an expectation that this fishery will eventually be revived. In May 2008, a new LRFF operation was being prepared in Kiritimati (Preston 2008), but the current status of this endeavor is not known.

Species	Stock assessment status	Action needed or taken
Oceanic tuna		A Tuna Development and Management Plan has been in development since 1999
Skipjack tuna <i>Ati, Atiwaro</i>	Underexploited, not overfishing, not overfished (WCPO-wide)	<ul style="list-style-type: none"> • Precautionary limits needed
Yellowfin tuna <i>Baiura, Baitaba, Ingimea</i>	Fully exploited, not overfishing, not overfished (WCPO-wide) Overfishing possible in Western WCPO	<ul style="list-style-type: none"> • Need to maintain or reduce fishing mortality • Need to reduce purse seine bycatch mortality on juveniles • WCPFC CMM 2012-01
Bigeye tuna <i>Matawarebwe/ Matabubura</i>	Overexploited, overfishing, not overfished (WCPO-wide)	<ul style="list-style-type: none"> • Need to reduce longline fishing mortality • Need to reduce purse seine bycatch mortality on juveniles • WCPFC CMM 2012-01
Coastal finfish		
Shark <i>Bakoa</i>	Stock levels of some species low in some areas Oceanic whitetip heavily overfished	<ul style="list-style-type: none"> • WCPFC CMM 2010-07 / WCPFC CMM 2011-04 / WCPFC CMM 2013-08 • Full ban on finning proposed in Butaritari, regulatory discussions at the national level
Bonefish* <i>Ikari</i>	Heavily depleted in coastal lagoons, particularly Tarawa	<ul style="list-style-type: none"> • Regulations exist; ban imposed on subsistence fishing in Kiritimati • Improved enforcement needed
Milkfish <i>Baeneawa</i>	Depleted, particularly in South Tarawa	<ul style="list-style-type: none"> • Species management plan needed • Prohibition on fish drives needs enforcing
Goatfish <i>Maebo and Tewe</i>	Depleted in Betio	<ul style="list-style-type: none"> • Reef fish management plan needed, some discussion on this
Spangled emperor <i>Morikai</i>	Depleted in Tarawa lagoon	<ul style="list-style-type: none"> • Reef fish management plan needed
Snapper (<i>Lutjanus</i> spp. and <i>Etelis</i> spp.) <i>Ikanibong, Buki-uaaki, Aratabaa</i>	Populations healthy in Abaiang, Abemama, Kuria, Kiritimati	<ul style="list-style-type: none"> • Reef fish management plan needed • Management plan for red snapper in development for Tarawa
Grouper (<i>Epinephelus</i> spp.) <i>Kauoto</i> (and others)	3 species listed as endangered in the KNBSAP	<ul style="list-style-type: none"> • Reef fish management plan needed
Flame angel <i>Bakaurantaake</i>	Heavily exploited for aquarium trade in Kiritimati, harvest declines	<ul style="list-style-type: none"> • Controls are being considered, SPC is assisting with management plan

Species	Stock assessment status	Action needed or taken
Coastal invertebrates		
Bêche-de-mer <i>Romamma</i> (and others)	Significant overfishing is occurring Surveyed stock levels very low on many islands	<ul style="list-style-type: none"> Limits and controls proposed National species management plan and regulations in review by Cabinet Commercial fishing not recommended on Abaiang
Ark shell <i>Bun</i>	Heavily exploited Stocks functionally collapsed in South Tarawa	<ul style="list-style-type: none"> Management plan in development Transplant activities on some islands are not successful
Giant clam <i>Were</i>	Heavily fished Recruitment overfishing on some islands <i>T. maxima</i> only lightly impacted on Abemama <i>T. gigas</i> extirpated from some islands KNBSAP lists 3 species as endangered	<ul style="list-style-type: none"> Management plan in development Limits and controls needed, fisheries regulations exist in Gilbert Islands Restocking needed, some current programs exist
Pearl oyster <i>Baeao</i>	Stocks have been reduced to low levels and wiped out in some islands	<ul style="list-style-type: none"> Limits and controls needed Restocking needed Moratorium was recommended in 1990
Spider conch		<ul style="list-style-type: none"> National management plan in development Concerns about overharvesting on numerous islands, limits and controls needed
(Spiny) lobster <i>Nnewe</i>	Some species are threatened	<ul style="list-style-type: none"> Regulations exist; limits imposed on catch length and prohibition on berried females
<p>Source (in addition to own research): Beets 2000; Johannes and Yeeting 2000; Awira <i>et al.</i> 2008; ROK 2011; Banks 2012.</p> <p>*Note: Table may be incomplete. Key bonefish migration channels have been blocked by the Steward and Anderson causeway and the Betio-Bairiki pass since 1987 which have also significantly contributed to stock declines (Johannes and Yeeting 2000).</p> <p>KNBSAP is Kiribati National Biodiversity Strategies and Action Plan (2005).</p>		

Table 3. Status of key coastal artisanal and subsistence fishery species in Kiribati. Species status varies by scale i.e. island-wide vs. WCPO-wide. MFMRD collects some species assessment data but these are not made public. Kiribati species names are included where known.

Recreational fisheries

Kiribati supports a thriving, privately-owned, international sports fishing tourist industry. Tourists from the USA, Japan, Australia and New Zealand pay A\$ 35 for a catch-and-release license to fish in Kiritimati lagoons, the primary location of recreational fishing activities (Gillett 2009). With 'pleasure fishing' licenses generating a total reported revenue of A\$ 27,966 in 2007 (Gillett 2009), the number of recreational fishermen visiting Kiribati in a given year is estimated to be around 800. Kiribati recreational fisheries primarily target bonefish (*Albula glossodonta*). Other species fished include coastal pelagic species such as trevallies (*Caranx* spp.), wahoo, tuna and the occasional marlin (Preston 2008; Gillett 2009).

In Line Island lagoons, tourists are primarily fly-fishing anglers from the USA via Hawaii and are fishing for bonefish and trevally. Recreational fishing is expanding in the Gilbert Islands, and on Nonouti Island in particular, due to Australian sports fishermen. In Tarawa, there are regular, small, fishing tournaments with a fleet of between 5 and 10 game-fishing vessels, including small vessels from diplomatic missions (personal communication from Q. Hanich, 2013). Interest has been expressed in developing sport fisheries in the Phoenix Island Protected Area (PIPA) and on Tabuaeran (Preston 2008).

Recreational fisheries in Kiribati generate an estimated total economic benefit of A\$2.5 million per year in Kiritimati. These benefits are derived from sports-fish licensing fees, tourist expenditures and employment for approximately 70 professional guides (MFMRD 2011). It is unclear what training these guides receive or by whom it is provided. They are reportedly well-paid by Kiritimati standards (ROK 2011), but income figures are not provided in any known reports.

The increase in recreational fishing activities combined with the existing overexploitation of lagoon fisheries resources by artisanal and subsistence fishing activities has led to conflicts between resource user groups (Preston 2008; MFMRD 2011). Initial efforts were undertaken by the MFMRD to address this issue; these included a public education and awareness program for subsistence net fishermen (ADB 2009). Following these initial efforts, the government did not implement a widely accepted proposal

to close off a portion of the Kiritimati lagoon to gillnetting and instead implemented bonefish protection regulations in 2008 (Preston 2008). These regulations prohibit the catching and possession of bonefish entirely, although it is difficult to determine how effectively this is being enforced (Preston 2008).

Aquarium trade

Kiribati also supports an export-based wild-capture aquarium trade of 'pet fish', with 143,977 'pieces' sold in 2006 for approximately A\$900,000 or roughly US\$ 4.60 per piece (Preston 2008). In 2010, 11 licensed private operators exported approximately 150,000 pet fish with a value of over US\$ 1 million (SPC 2010). This represented approximately 78% of the value of all fishery exports from Kiribati (ROK 2011). Harvesting is undertaken by small-scale commercial coastal fishermen. In the mid to late 2000s, there were more than 70 'pet fish' collectors in Kiritimati. They collectively operated as the Petfish Divers Association under a single overarching business license issued by the Kiritimati Island Council (Preston 2008). However, Govan (In Press) reports that there are currently no active export licenses for 'pet fish'. A separate organization called the Petfish Exporters Association has operated in the past. There are no direct personal income numbers available for this activity; Kronen et al. (2006) estimate that collecting pet fish generates US\$ 13.23 per hour of fishing time.

Wild-captured species are primarily finfish and are harvested by divers. The primary species of interest is the flame angel (*Centropyge loricula*) or *Bakaurantaake*, which comprised approximately 75% of total exports in the mid-to-late 2000s (Preston 2008). Two firms accounted for over half of this trade (ROK 2011). A number of other species, such as damselfish (Pomacentridae), angelfish (Pomacanthidae), tangs (Acanthuridae), wrasses (Labridae) and butterfly (Chaetodontidae) are caught and exported (Preston 2008). Some live coral trade is also reported.

Aquarium fish are primarily caught and traded out of Kiritimati. Export consignments travel by air to Honolulu, then onto mainland USA and other international markets. There is at least one operator that accesses Hong Kong markets via Nadi, Fiji (ROK 2011). Kiritimati operations have an air link with special air freight consignments (Barclay and Cartwright 2008; MFMRD 2011).

Corals are exported primarily to Europe, as imports of live corals are restricted in Hawaii (MFMRD 2011; ROK 2011). There is some aquarium trade in South Tarawa, and this is where the activity began in 1980 (Preston 2008). However, the aquarium trade in Tarawa is constrained by unreliable air connections, and the only active operation there mostly exports farmed giant clams (Preston 2008).

Unregulated capture exploitation for the aquarium trade has reached levels where resource exploitation has led to harvest declines and increased diving accidents. As a result, controls are now being considered in Kiritimati (Preston 2008; MFMRD 2011). While the MFMRD Fisheries Division is involved in the management of the aquarium trade, MELAD has become involved in biodiversity management aspects of the aquarium fishery (Preston 2008). The SPC has provided staff training for aquarium trade monitoring and is assisting with the development of a management plan for Kiritimati (ROK 2011).

Subsistence-based coastal fisheries

Sixty to seventy percent of all coastal fishery production in Kiribati originates from domestic subsistence fishing activities for food consumption (Gillett 2009). Food subsistence activities, including fishing, are undertaken by approximately 39% of I-Kiribati males and 36% of females 15 years and older (Gillett 2009). This proportion is much higher in rural outer islands (51%) than in South Tarawa (20%). Subsistence fisheries, which are all destined for domestic consumption, take place in both lagoon and coastal oceanic environments throughout Kiribati. The 2010 census reports that nearly 60% of surveyed households were involved in lagoon or reef "collection" activities, and non-monetary subsistence fishing conservatively accounted for 13% of Kiribati's informal sector economy in 2010 (Kiribati Census 2010; SPC 2013a).

Subsistence fishing techniques include bottom and mid-water hand-lining, pole and line, spearing, trapping, netting, reef and shore gleaning, and diving (Awira et al. 2008; Preston 2008). Subsistence fishing vessels include: traditional canoes operated by sail or paddle; wooden canoes with small outboard motors; and larger outboard skiffs. Tarawa has the largest small vessel fleet in all of Kiribati; this includes thousands of vessels (MFMRD 2013b).

Subsistence fishing targets a wide range of reef-associated, pelagic and benthic invertebrate species. Subsistence catch data for Kiribati are uncertain and out-of-date. Coastal subsistence production in the mid-2000s was estimated at approximately 13,700 t, valued at A\$34 million, with a market price of approximately A\$2.47/kg (Gillett 2009; MFMRD 2013a). Of this, the most up-to-date MFMRD coastal fisheries branch estimates report a total reef fish catch of between 4,500 t and 7,500 t (Banks 2012).

Reef and lagoon-associated species harvested using lines, nets, traps, and spears include: bonefish (*A. glossodonta*), snappers (*Lutjanus* spp.), groupers (*Epinephelus* spp.), coralgroupers (*Plectropomus* spp.) jacks and trevallies (*Carangidae*), emperors and breams (Lethrinidae), silver fish (possibly *Aphareus rutilans*), goatfish (*Upeneus* spp. and *Mulloidichthys* spp.), mullet (Mullidae), spiny lobster, and octopus (Octopoda) (Awira et al. 2008). Fisheries for spangled emperor (*Lethrinus nebulosus*) are significant in some lagoons including Tarawa. However, as with other species in Kiribati, population declines have occurred due to overfishing and the blocking of spawning channels by causeway construction (Johannes and Yeeting 2000; Preston 2008).

Bonefish are caught using nets, often with milkfish in fish drives (Preston 2008). Catches of bonefish species have been declining due to overharvesting (Preston 2008), and in Kiritimati the catching and possession of bonefish by artisanal and subsistence fishers has recently been banned outright (Preston 2008). Bonefish stocks have fluctuated since the 1950s, when the introduction of monofilament nets and outboard motors coincided with causeway construction to significantly impact stocks. The bonefish stock that was once the backbone of the Tarawa lagoon fishery collapsed decades ago, although hundreds of stone traps are still visible on the island's outer-reef flat (ROK 2011), and some fishing still occurs. This fishing activity is still important in other atolls.

There is not much subsistence tuna caught or sold in North Tarawa; this activity is more common in South Tarawa. Other pelagic fish species caught for subsistence purposes include the flying fish (*Cypserulus* spp.) and oil fish (*Ruvettus pretiosus*). These are harvested beyond the reefs with smaller mesh gillnets (Awira et al. 2008) and used as food and bait. In North Tarawa, milkfish fry are occasionally collected to sell to local aquaculture operations.

Fisheries for the peanut worm (*Siphonosoma australe* and *S. indicus*) or *ipo* worm are substantial and important for primarily subsistence benefits. This activity is undertaken primarily by women and occurs throughout Kiribati. Worms are fished at low tide using a length of wire, squeezed to remove the sand from their gut, and then threaded on a stick to sun-dry. These are later consumed or sold in local markets such as in South Tarawa. Little additional information exists for these harvests and current and historical harvest quantities have not been recorded (Preston 2008).

Shellfish such as *te bun* clams and trochus are also harvested by gleaning. In the early 1990s, subsistence harvesters collected about 1,000 t of clams annually from lagoons around Tarawa (Awira et al. 2008). Current clam harvests are around 200 t (Banks 2012).

Many additional invertebrates are harvested from tidal mudflats and seagrass beds (Fay et al. 2007). These are collected by women and children for subsistence purposes and are sold in local markets. Land crabs (*Cardisoma carnifex*

and *Geograpsus grayii*), hermit crabs (*Coenobita perlata*), coconut crabs (*Birgus latro*), and ghost crabs (*Ocypode* spp.) are all caught in different parts of Kiribati. Coconut crab is overexploited on inhabited islands but it is abundant in the Line Island group where there is no harvesting. Shrimp, prawns and sea urchins are occasionally harvested. The lipped stromb (*Strombus luhuanus*) is heavily exploited in some areas of Tarawa. Other mollusc species collected by women in South Tarawa include: the surf clam (*Atactodea striata*), the venus clam (*Gafrarium pectinatum*), the Pacific asaphis (*Asaphis violascens*) and the snail *Cymatium muricinum* (Preston 2008). In Kuria, giant clams (possibly *Tellina palatum*) are caught and consumed for subsistence purposes (Awira et al. 2008).

Aquaculture

Aquaculture in Kiribati is predominantly a livelihood-based activity and is promoted as an alternative livelihood option in the outer islands. With the exception of government-subsidized seaweed (*Kappaphycus alvarezii*) farming, aquaculture activities in Kiribati in recent years have been minimal, with only small-scale commercial production and limited export capacity. The estimated total production of marine aquaculture products in 2007 was about 143 t plus 100 'pieces', with a total landed value of around A\$ 90,000 (Gillett 2009). In that same year FAO (2013) reports that 1,117 t wet weight of aquaculture species were produced in Kiribati. This quantity has since increased to 4,293 t in 2011 (FAO 2013).



Bonefish for sale in South Tarawa.

Many of the aquatic species farmed in Kiribati are also caught in the wild by I-Kiribati fishermen. Of the four to six aquatic species currently farmed in Kiribati, only two species are cultured for direct human consumption. The remaining species, such as *te Bun* and giant clam, are farmed either for wild stock enhancement or for ornamental purposes. The MFMRD coastal fisheries branch is responsible for aquaculture research and development. Little or no information is currently published on: employment; income; licensing; ownership and management; total area farmed; local consumption of aquaculture products; local aquaculture techniques and feeds; and sourcing of juveniles.

Species cultured for food

Milkfish and seaweed are the only species that are currently cultured for direct human consumption in Kiribati in any significant quantities. It is not known how much of the limited production quantities are retained for domestic consumption. It is likely that all seaweed is exported abroad but inconsistent export statistics make this unclear. In the past, tilapia (*Oreochromis mossambicus*) were introduced to the island as a source of food and baitfish, but this was rejected as a food source by the I-Kiribati and has since become an invasive pest in milkfish ponds (Awira et al. 2008). Other species farmed in small quantities for subsistence purposes include mojarra (*Gerres* spp.) and mullets (Awira et al. 2008).

Milkfish

Kiribati has been farming milkfish in ponds for subsistence purposes for more than a century (Catala 1957; Johannes and Yeeting 2000). It has been reported that “every Island Council in Kiribati has a milkfish farm” (Preston 2008) but this may no longer be the case. The Temaiku Fish Farm was originally established in 1975 on reclaimed land near the airport on Tarawa. Funds and support were provided by the UK, the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Development Programme (UNDP) (Barclay and Cartwright 2008). The initial plan was to rear and sell naturally recruited or purchased milkfish fry as baitfish to support the local pole and line tuna fishery under the government-owned Te Mautari Limited (Barclay and Cartwright 2008; Gillett 2009). This undertaking

never fully materialized. The 14, half-acre milkfish ponds never produced at full capacity and had predation problems from early on (Awira et al. 2008; Barclay and Cartwright 2008; ROK 2011).

The Temaiku Fish Farm was presumably closed for some time, as the MFMRD reported that it was ‘resurrected’ with technical support and advice from Japan Tuna as the Temaiku Ecofarm (Gillett 2009). The Temaiku Ecofarm practices integrated farming techniques using pigs and chickens to increase algae in ponds, which in turn provides a food source for milkfish (ADB 2009). All of these products are then sent to market on a “semi-commercial basis” with sales revenue covering direct operating costs (ADB 2009). It is presumed that the production of pigs and chickens is entirely for domestic consumption. Some milkfish are sent to Nauru as personal consignments (MFMRD 2013b). Twelve ponds are reportedly currently stocked with 18,000 milkfish each, but operations are feed-limited and poaching by nearby village members has been reported as a problem (ROK 2011). Fish are raised to about 110 g and then sold for A\$ 2.50 each (ROK 2011).

Milkfish culture is reported to have ‘begun again’ in 2004 at the Taiwanese Technical Mission in Ambo, South Tarawa (Gillett 2009; ROK 2011). The Government of Kiribati also supports milkfish farming operations in hypersaline ponds in Kiritimati (Preston 2008).

In 2007, Kiribati’s reported production of milkfish was 5 t (FAO 2013). The domestic sale price of milkfish in 2006 was A\$ 2.20/kg (Gillett 2009). Reported production of milkfish in 2008 was a ‘few hundred’ kg per month and valued at around A\$ 400–500 per month (Gillett 2009; MFMRD 2011). In 2011, production of 3 t of milkfish was reported to FAO (FAO 2013). Milkfish is used for bait and smoked for human consumption in Tarawa (MFMRD 2011). It is not clear how much is produced for baitfish and how much goes to human consumption. Exports of milkfish are sent overseas to Honolulu to supply the large Filipino community there; this export activity is sourced by both capture and aquaculture activities (Preston 2008).

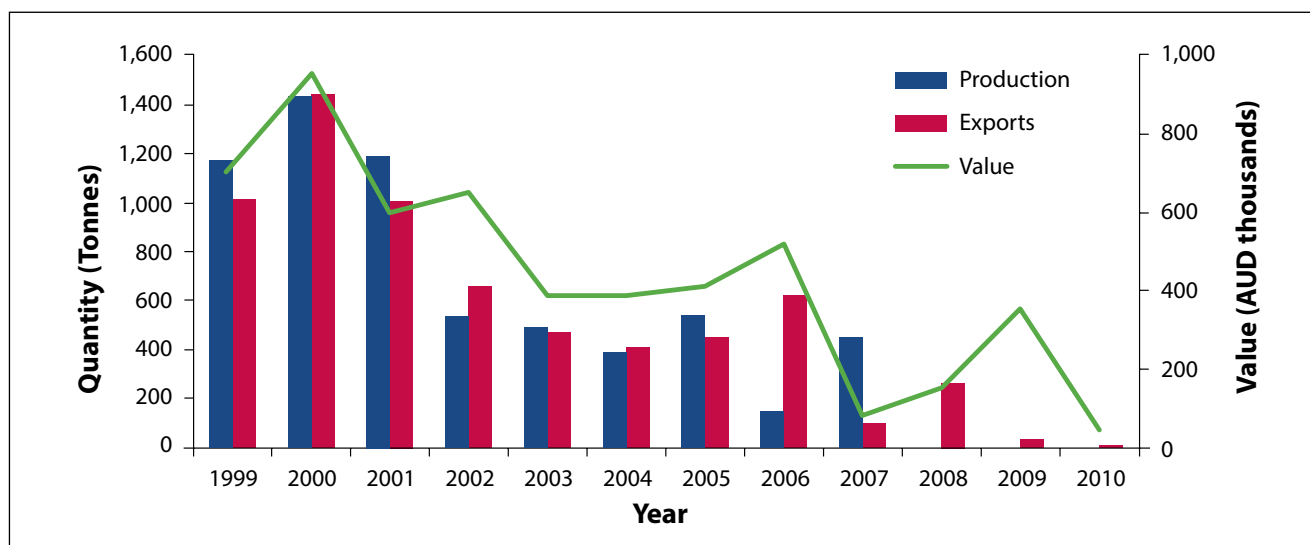
Seaweed (*Kappaphycus alvarezii*)

Seaweed is one of Kiribati's main exports. It is also the country's largest and longest-running aquaculture product. The red algae species *Kappaphycus alvarezii*, also referred to as *cottonii*, is important in the production of carrageenan (Awira et al. 2008). Seaweed production is subsidized by the Government of Kiribati with the aim of enhancing income opportunities in the outer islands. Cottonii seaweed is lagoon-grown, sun-dried and then packed into bales and exported abroad (Awira et al. 2008; Gillett 2009). The government-run CPPL in Betio pays A\$0.55/kg to seaweed farmers (MFMRD 2011). Recent export trade details are not readily available but past markets include Denmark, New Zealand and the USA (Awira et al. 2008). Private-sector buyers with Chinese connections are now becoming involved in the seaweed exports market (MFMRD 2011).

The KNSO publishes seaweed production data and export quantities and values online from 1999 up to 2010. This is achieved with assistance from the SPC PRISM information portal (KNSO 2013) (Figure 5). Production statistics vary considerably from what is reported by FAO, but this is likely because FAO statistics are reported in wet weight. For example, state-owned Atoll Seaweed Company reported production of 446 t of seaweed in 2007 (KNSO 2013). For this same year, FAO reports a production of 1,112 t of wet weight seaweed (FAO 2013). The most recent KNSO export quantity is 7 t in 2010 (KNSO 2013). This is reported by FAO as 4,745 t of '*Eucheuma nei*' red seaweed (FAO 2013).

Initially supported by development funding from the EU and New Zealand, seaweed production in Kiribati has declined over the years. This is because the government purchase price has been artificially set too high and it is difficult to make a profit from CPPL buying operations (Preston 2008). Atoll Seaweed closed in 2007 and CPPL took over operations.

While some seaweed production occurred in the Gilbert Islands in 2011, nearly all production of seaweed in Kiribati now occurs in Tabuaeran (formerly Fanning Island) in the Line Islands group (Preston 2008; Gillett 2009). This is because the Gilbert Islands are more prone to disease outbreaks (Gillett 2009). The Gilbert Islands involved in seaweed production include: Tarawa, Butaritari, Aranuka, Abaiang and Beru (Awira et al. 2008). There are multiple seaweed producers (Preston 2008). Operations are run on a family scale; seaweed farming employs both men and women. However, employment and income numbers from this activity are not specifically reported. Some seaweed production is reported to FAO as wild caught; an estimated 20 t of seaweed was reportedly harvested from the wild in 2009 (FAO 2013). The SPC is currently providing farming start-up assistance to coastal fisheries for a new species of seaweed (MFMRD 2013b).



Source: data from KNSO 2013; figure reproduced from Bell et al. 2011.

Figure 5. Production (in blue) and exports (in red) of seaweed in Kiribati between 1999 and 2010, in tonnes. Production data are not publically available beyond 2007. Exports in 2010 are reported as less than 10 t. Value of exports (in green) is represented in thousands of Australian dollars.

Species cultured for enhancement or ornamental purposes

Over the years, various aquaculture activities have been established in order to try and enhance declining wild populations of popular and overfished coastal species. These efforts have not been particularly successful. In 1997, farming trials for sponge took place at Marakei but no further economic development took place (Preston 2008). Wild stock enhancement operations have also existed for pearl oyster and trochus (Awira et al. 2008). The Taiwanese Technical Mission in Ambo is currently undertaking research and development on sea cucumber culturing for enhanced export capability (ROK 2011), and efforts are being made to enhance local *te Bun* populations on some islands.

Giant clams

Giant clams (*Tridacna* spp.) are cultured in Kiribati. A small seeding farm is in operation at the southern end of North Tarawa and the MFMRD coastal fisheries branch also runs a hatchery in Tanaea. Hatchery-raised juveniles are distributed to local villages to rear until they are large enough for export (MFMRD 2011). The primary export market is Germany (MFMRD 2013b). MFMRD coastal fisheries section currently has a pilot farming operation for giant clam in Abaiang, and one is set to begin in Butaritari. Pilot trials are aimed at communities with reliable air transport and who have a history of wild clam harvests. These communities can get A\$ 2 per clam for the aquarium trade, compared to a string of 10 clams for A\$ 1 as food in the local markets. Little additional data exists for this activity and production data is not currently collected (MFMRD 2013b).

Trochus

Trochus are not native to Kiribati and have been introduced from Fiji. Spawning and rearing was initially undertaken at the coastal fisheries branch hatchery. In 2003, 4,000 juveniles were released on outer reefs in Marakei, Tarawa and Abaiang (Awira et al. 2008). Restocking occurs in Butaritari and Maiana. Restocking is aimed at providing income opportunities for lagoon-limited islands but the success of this restocking program is not known. Restocking on Butaritari is not going as planned, as people are consuming the young trochus rather than letting them reseed (MFMRD 2013b).

Blacklip pearl oyster

Since the 1990s, the coastal fisheries branch has attempted to establish a wild stock enhancement hatchery in Tanaea, with little success (Preston 2008) and had unsuccessful reseeding field trials in Abaiang, Butaritari and Onotoa (ROK 2011). Kiribati began rearing trials of black pearl in 1996, with harvests in 2003 and 2008 (Gillett 2009). Production in 2008 yielded “a few hundred” low-quality pearls, with an estimated average farm-gate value of A\$25 per pearl (Gillett 2009). Pearls were tended through community arrangements. Sales of pearls once provided significant income for Kiritimati (Awira et al. 2008). There is also a demand for pearl shell for local tuna-fishing lures (Preston 2008). The success of hatchery activities and further sector expansion have been hampered by a combination of biological and human factors and have more or less stalled since 2007 (ROK 2011).



Giant clam farming in North Tarawa.



Smoke-dried fish in South Tarawa.

Processing, markets, and trade

Almost all commercial oceanic fisheries in Kiribati waters do not land their catch in Kiribati for processing. Kiribati's coastal tuna fisheries catch is not typically processed in facilities and is mostly sold whole in local markets. As such, Kiribati does not have a large value-added fish processing industry and both processing and export activities are heavily supported by the government-owned CPPL and joint ventures. Sector statistics are not readily available and export and import data are incomplete and out-of-date. Kiribati's processing and exports sectors do provide I-Kiribati with some employment, income and revenue benefits as well as government revenue. The following section summarizes known benefits.

Fisheries processing in Kiribati

Kiribati has one processing factory, which recently opened in 2012. The Kiribati Fish Ltd. (KFL) is a joint venture between the State-owned enterprise (SOE) CPPL, the Shanghai Fishing Company and its Fiji subsidiary Golden Ocean (Banks 2012). It is located in Betio, South Tarawa. It has a rotating staff of about 100 people and a daily operational capacity of around 15 t (personal communication from Mr. Lee, 2013). KFL staff is roughly evenly split by gender. The company is set up to process yellowfin tuna sashimi loins and to send these by ultra low temperature (ULT) freezer to Japanese markets. There is also a potential to expand and diversify tuna products in the future to include G&G and H&G (gilled and gutted; and headed and gutted) whole tuna for USA and Japanese markets, as well as carbon

monoxide (CO) loins for the USA market.

The KFL has stated its intention to buy fish from both local and foreign tuna fleets and has made efforts to do so. However, locally harvested fish are not high quality and supplied quantities are so low that the plant can only run about once a week (personal communication from Mr. Lee, 2013). At the time this report was written, the factory had not yet received its hazard analysis and critical control points (HACCP) approval and therefore has restrictions on what products it is allowed to export and to where. Kiribati has recently established a competent authority and has created the Kiribati Seafood Verification Agency to help fill this institutional gap (Banks 2012).

The CPPL, which harvests, purchases and processes Kiribati marine resources, owns four retail outlets on Tarawa. It has an exclusive right to byproducts sold by purse seiners during transshipment activities (Banks 2012). Other products purchased by the CPPL from local fishermen, and exported abroad include: farmed seaweed, wild-caught spiny lobster, reef fish, tuna and bêche-de-mer.

Small-scale processing for domestic markets and from artisanal and subsistence catches is primarily done by women. Processing activities include: cleaning, gutting, salting, drying and baking (Vunisea 2003). Dried fish are commonly sold in Kiribati. Dried species that originate in Butaritari and are sold in South Tarawa markets include: tuna, reef fish and clams. In 2003, The Tuna Jerky Company (Teikabuti) operated to meet the demand of buyers in Fiji (Vunisea 2003). It employed 10 women and was owned by a woman. It ceased operations in 2005 (Barclay

and Cartwright 2008) due to the downturn in the Asian financial markets (personal communication from M. Savins, 2013). Smoked milkfish is also sold, presumably in domestic markets, but possibly also abroad as a personal consignment. Some small-scale smoking of tuna and other species is being done at fish centers in the outer islands, with Japanese support.

Fisheries processing and export activities in Kiribati are controlled and regulated by the *Fisheries (Processing and Export) Regulations* (1992). These regulations provide a directive for forms, fees, fish processing establishments, exports, samples and offences pertaining to processing and exports in Kiribati (Banks 2012).

Fisheries exports

Export statistics are not well reported, are often incomplete and are occasionally inconsistent (Preston 2008; Gillett 2009). It is often difficult to accurately interpret how to attribute exports of tuna to Kiribati when the vessel catching the fish is owned by one country but flagged to Kiribati, and the fish are transshipped in Kiribati waters but landed in another country entirely. Domestically, reporting, approval, and inspection protocols for export shipments could be improved considerably. The Customs Division of the Ministry of Finance and Economic Development (MFED) maintains an export database, which includes marine

products (Govan, In Press), but this information is not made public. Combined fishery exports in 2006 (i.e. including coastal, offshore and aquaculture) comprised approximately 58% of all Kiribati national exports (Gillett 2009). This proportion rose to 83% in 2011 (Banks 2012). Farmed seaweed is a major export commodity for Kiribati; seaweed export volumes and values are one of the few fishery products published online by the KNSO. However these statistics are not up-to-date. Coastal small-scale commercial fisheries exports are provided in Table 4.

Fisheries statistics from the outer islands are not always sent to the fisheries division headquarters in South Tarawa (Preston 2008); this likely contributes to incompleteness of export data. It may be possible to collect atoll-level export data but such information is not currently centrally compiled.

The main export markets for purse seine-caught tuna in Kiribati waters are: Ecuador (45% of total exports in 2010), Thailand (54% in 2010), and Japan (32% in 2010) (Banks 2012). Exports to Ecuador go to Spanish-owned processing plants. High-grade tuna is destined for the Japanese sashimi market, mid-grade tuna is destined for non-Japanese markets, and low-grade tuna is destined for canning and for the USA and EU markets.

Product	Quantity (t)	Value (A\$ '000)
Finfish ¹	663	585
Shark fin ²	1	131
Bêche-de-mer ³	58 (63 in 2012)	216
Lobster	4.6	65
Small clams ⁴	560 (pieces)	–
Live reef fish	0	0
Aquarium or 'pet fish' ⁵	143,967 (pieces)	900
Seaweed ³	155 (7 in 2010)	622
Total est. minus 'pieces' and seaweed	1,142	1,900
Total est. fishery exports (Gillett 2009)	1,300	2,500

Source: Gillett 2009; KNSO 2009; KNSCMP 2013.

¹ It is not clear what species are included in finfish.

² Dry weight fins equate to 118–152 t of live sharks; numbers in MFMRD report state fins production of 2.7 t.

³ Likely in dry weight.

⁴ 'Small clam' is assumed to mean small specimens of giant clam (*Tridacna* spp.) (Preston 2008).

⁵ Aquarium species are not for human consumption and some or all 'clams' may not be either.

Table 4. Coastal fishery exports 2006 in t and A\$ 1,000. These data are probably incomplete and more recent data has not been made available.

Personal consignments

A notable quantity of fish are also sent as 'personal consignments' both domestically and overseas. In 2006, 13.6 t of reef fish, ocean fish, milkfish and lobster were shipped in this manner. At least some of this regularly passes through the airport in South Tarawa. The Kiribati Fisheries Division 2006 Annual Report (Preston 2008) notes that the CPPL exported 4.7 t of finfish from Kiritimati in 2006, with a further 6.2 t being sent as personal consignments; half of this was milkfish. Exports of milkfish are sent overseas by air cargo to Honolulu to supply the large Filipino community there (Preston 2008). Reef fish species which include snapper and bonefish are regularly sent abroad to family contacts overseas. Export destinations for personal consignments are not specified but it is likely that some are sent to Honolulu and Nadi (Preston 2008). It is not clear if personal consignments are included in export statistics, as this activity is not always considered legal. CPP personal consignments in 2006, and CPP shipments of frozen fish from the outer islands into Tarawa are not included in fisheries division statistics (Preston 2008).

Other coastal fishery exports

Other coastal fishery products reported as exported since 2000 but that are not currently explicitly reported include: tuna jerky, milkfish, trevally (*Caranx* spp.), paddletail (*Lutjanus gibbus*), grouper, wahoo, yellowfin, spangled emperor, Labridae, Serranidae and parrotfish (*Scaridae*) (MFMRD 2011). Lobster does not appear in fisheries division export statistics but they were definitely exported from Kiritimati at one point (Preston 2008). The Kiribati Fisheries Division 2006 Annual Report notes that Kiritimati fishermen sold 4.6 t of lobster to local exporters in 2006 (Preston 2008).

Approximately A\$17,513 (€ 22,330) of live clams and aquarium fish were exported to the EU in 2011 (Banks 2012). The export quantity recorded by the KNSO for this exchange is 0 t.

Fisheries reexports

While no reexports of fish or fisheries products are reported for Kiribati, the MFMRD has a reexports certificate (Banks 2012) and Gillett (2009) mentions the exclusion of reexports in his compilation of export statistics.

Fisheries imports

Kiribati imported 589 t of fishery products in 2011 (Banks 2012). These imports are not explicitly listed in the KNSO online imports database (KNSO 2009) and little additional information exists publically on fisheries imports into the country. Canned tuna and canned mackerel are imported into Kiribati but quantities, values and trade details are not available. Regardless, this does not appear to be a staple food product. The Japan Overseas Fisheries Cooperation Foundation (OFCF) indicates that 380 t of primarily canned seafood worth about A\$572,840 was imported into Kiribati in 1995 (Gillett 2009). A total of A\$18,726 worth of dried fish products was imported into Kiribati from the Marshall Islands and Australia during that time. It is not clear if this value is represented in the total. No fish are currently imported for value-added processing. Fisheries-specific import trade partner information is not available. However, Kiribati's major import partners in descending order of economic value are: Australia, New Zealand, Fiji, Japan, China, USA and 'other' Oceania.

LIVELIHOOD AND SUBSISTENCE BENEFITS FROM KIRIBATI FISHERIES

The 2009 population of 103,500 I-Kiribati is young, with nearly three-quarters of the population under 34, and roughly even by gender (Kiribati Census 2010). The population is heavily concentrated in the urban capital of South Tarawa, with high internal migration between islands. Half of all I-Kiribati were considered to be living below the national poverty index in 2006 (Government of Kiribati 2012); this proportion was slightly higher in urban areas. However, 'poverty' in Kiribati is a complex issue in that many I-Kiribati live in a state of "affluent subsistence", with plentiful food and natural resources and little need for cash (Government of Kiribati 2012). Kiribati fisheries provide a range of employment, income, revenue and education livelihood benefits for I-Kiribati, as well as subsistence food security benefits through the consumption of fisheries resources. The following section summarizes these benefits. The 2006 household income and expenditure survey (HIES) conducted by the KNSO supplies much of the most up-to-date information in this section (KNSO 2006).

Employment statistics

In 2010, 3,811 I-Kiribati, or 19.5% of the total number of employed paid workers were

engaged in the 'agriculture and fisheries' sector (Kiribati Census 2010). This is the second largest sector for employment next to 'wholesale, retail trade and repair of motor vehicles'. This is a significant increase from 2007, where a total of 936 workers, or 7% of the total employed economy, were reportedly engaged in agriculture and fishing (Gillett 2009). The specific contribution of fishing activities to employment cannot be explicitly extracted, and determining employment numbers is complicated by the sizable informal cash-based artisanal and non-monetary subsistence fishing sector. Fishing activities currently make up around 20% of Kiribati's informal sector economy (SPC 2013).

One estimate places the percentage of I-Kiribati households engaged in fisheries, including the subsistence sector, at around 80% (Banks 2012). The HIES survey in 2006 had similar results (Table 5). Low official estimates of fisheries employment may also occur because 'fishing' often only considers the capture of finfish (Vunisea 2003); this would therefore exclude many shore-based harvest activities and some processing, distribution and selling activities. Employment levels in the fisheries cash economy are also unclear. A Forum Fisheries

	Gilbert Islands				Line Islands (2000)	
	Tamana	Arorae	North Tarawa	South Tarawa	Tabuaeran	Teraina
Total population (#)	916	275	5,678	40,311	1,733	1,409
Annual catch by island (t)	781	596	1,372	5,370	926	1,121
Households surveyed (#)	196	275	693	5,245	–	–
Fishing households (%)	93	91	96	57	167 (#)	241 (#)
<i>Of which are full-time fishing households (%)</i>	6	4	5	8	–	–
<i>Of which are part-time fishing households (%)</i>	13	5	17	14	–	–
<i>Of which are subsistence fishing households (%)</i>	81	91	78	78	–	–

Source: Data compiled by the Fisheries Division in 2008; Gillett 2009.

Table 5. Results of 2006 fishing household surveys, by island. Fishing household data for the Line Islands (year=2000) is a number not a percentage. Survey methodology may not be robust.

Agency (FFA) survey in South Tarawa in 2008 notes that there was an average of 3 fishermen and 1.5 women fish handlers/sellers for each full-time commercial tuna troll fishing craft (Sullivan and Ram-Bidesi 2008) (Table 6). Current access agreements dictate I-Kiribati

crewing requirements and the distribution of these opportunities is managed through the Marine Training Centre (MTC) (DFAT 2014).

Employer	Employment type			
	Vessel crew	Shore-based processing, vending, etc.	Administrative	Other or unknown
General industry				
Fishing industry (general)	–	90 (2013) <i>approximate</i>	–	200 (2013) <i>'stevedores'</i>
Tuna industry (general)	15 (2008)	70 (2008)	–	–
Tuna trolling (general)	378 (2008) <i>approximate</i>	189 (2008) <i>approximate</i>	–	–
Government and state-owned enterprise				
Ministry of Fisheries (MFMRD)	4 (2001)	–	215 (2013) <i>staff and observers</i> 105 (2010) <i>active observers</i>	–
Police Maritime Unit (MoJ)	19 (2011) <i>on vessel TEANOAI</i>	–	–	17 in <i>Marine Platform and Ops Unit</i> 70 (2008) <i>total</i>
Central Pacific Producers (CPPL)	21 (2004) <i>on carrier vessels</i>	40 (2001)	17 (2008) <i>clerical staff - approximate</i>	–
Temaiku Ecofarm	–	–	–	–
Joint ventures and private enterprise				
Kiribati Fish Ltd. Marin Marawa Fisheries (MMF)	–	–	–	100 (2013)
Recreational industry	–	–	–	70 (2010) <i>guides</i>
Foreign vessels				
Kiribati Fishing Services	–	–	–	–
<i>Japanese vessels (oceanic)</i>	325 (2005)	–	–	–
Republic of Korea, Taipei vessels (oceanic)	100 -200 (2005)	–	–	–
South Pacific Marine Services	865 (2012) <i>seafarers</i>	–	–	–
EU purse seine vessels (est.)	8 (2010) <i>minimum</i>	–	–	–
Source: MISA 2008a; Gillett 2009; WCPFC 2011; Banks 2012; MARE 2012; MRAG 2013; DFAT 2014. *Note: This list is incomplete				

Table 6. Number of I-Kiribati with full or part-time jobs in both coastal and oceanic fisheries throughout the 2000s*.

Women in the work force

There is an increasingly high incidence of single or female-headed households in Kiribati as men leave for long periods of time to crew foreign vessels (Vunisea 2003; Barclay and Cartwright 2008). The societal role of women in the workplace is therefore expanding as they take on more of the financial responsibility of looking after their families.

The role of women in Kiribati fisheries activities is not widely acknowledged and is undervalued. In part, this is because fishing prowess is considered a symbol of social status and respect among I-Kiribati men and the traditional concept of 'fishing', i.e. for finfish or other large marine species, excludes the roles traditionally dominated by women (Vunisea 2003). In addition, matters of community concern are traditionally decided upon by men in councils and most decision-making functionally excludes participation and input from women (Vunisea 2003). However, personal observation notes that a woman's group representative may sit in on at least some islands council meetings.

In reality, I-Kiribati women play a major supportive and participatory role in coastal Kiribati fisheries, and they dominate shore-based harvesting and gleaning activities as well as domestic marketing and sales of fish (Vunisea 2003). Most of the coastal and inshore artisanal and subsistence-scale invertebrate collection is done by women and children (Preston 2008). Women are also largely responsible for processing the domestically-retained artisanal and subsistence catch once boats return to shore; this includes cleaning, gutting, salting, drying and baking (Vunisea 2003). When there is a large landing of tuna in the outer islands, women will get together in

large social gatherings to process the fish and are responsible for its equitable distribution within the community. This is a cultural food sharing tradition known as *te kaonono* (Vunisea 2003). On a seasonal basis, women will often go out to seiner mother ships berthed in Betio Harbour and exchange food items for cheap tuna discards which they then sell fresh at a low price in the local markets (Vunisea 2003). Women are also strongly represented in clerical and administration activities associated with the Kiribati fisheries sector, and within government ministries in particular. The Western and Central Pacific Fisheries Commission (WCPFC) reports that 11 I-Kiribati women were Observers in 2011 (WCPFC 2012).

An FFA survey in South Tarawa in 2008 reported that approximately 189 women were involved full-time in the sale of tuna and that 99.5% of all fish vendors were women (Sullivan and Ram-Bidesi 2008). These women were often the wives of the fishermen and commercial fishing was carried out by men only. The processing supervisor at CPPL was a woman as of 2008, as were a few loining and processing employees (Gillett 2009). It is not known if fisheries training opportunities are provided to women for their current roles in processing, marketing and vending. However, in the past a woman's workshop was run for the purpose of creating value-added processed products for fisheries (Awira et al. 2008).

In terms of women's groups, the Ministry of Health and Community Affairs established the AMAK (*Aia Mwaea Ainen Kiribati*) in 1976 as an overarching organization for women's issues, there are an unknown number of women's church groups, and there is a group for seamen's wives (MISA 2008a). It is not clear how Kiribati scores on Millennium Development Goal 3: Promote gender equality and empower women.



A woman fish vendor on the roadside in South Tarawa

Income and expenditures

Minimal domestic income and expenditures data are readily available for fisheries in Kiribati and what exists is largely out-of-date. Kiribati's average gross national income (GNI), including factor income abroad, is A\$ 159 million or A\$ 1,758 per capita (ADB 2009). A summary of readily available information on income and expenditures in Kiribati:

- Remittances from overseas contribute significantly to household finances. In 2000, Kiribati vessel crew remitted a total of A\$ 12,088,000 to their families. Seaman's remittances constituted 18% of urban cash income and 9% of rural cash income in 2010 (Kiribati Census 2010). The average seaman saved or remitted an estimated A\$10,000 home in 2012 (DFAT 2014).
- In 2004, 325 I-Kiribati crew on Japanese vessels earned a total of A\$ 1,695,230 or an average of A\$ 5,281 per person; these values were similar in 2005 (Barclay and Cartwright 2008).
- In 2005, the State-owned CPPL paid A\$ 0.75 an hour for unskilled labour (Barclay and Cartwright 2008). This was known to be lower than the standardized minimum government wage but this wage was accepted by workers because of the lack of alternative employment options.
- A 2006 household and income expenditure survey (HIES) conducted by the KNSO reports that 2,000 t of fish were purchased for subsistence purposes across Kiribati for A\$ 5.9 million, at an average of A\$ 2.96/kg (Tiroa 2007). This estimate is considered to be too low by Preston (2008).
- In 2006, almost 50c of every dollar spent in Kiribati originated from factor income and transfers from abroad (ABD 2009).
- The 2008 market price of tuna at A\$ 2.65 and tuna sales of A\$ 4 million per year represent an estimated A\$ 21,000 in annual sales per full-time fish vendor (Sullivan and Ram-Bidesi 2008).
- Collecting 'pet fish' generated an estimated A\$ 14.28 per hour in mid-2000, as opposed to an estimated A\$ 1.44 per hour for conventional finfishing (Kronen et al. 2006).
- Sales of fish and agricultural crops make up 26% of urban cash income and 49% of rural cash income (Kiribati Census 2010).

Education and training

Most I-Kiribati have completed their primary and secondary education (84-87% completion of primary) (Government of Kiribati 2012). The current school curriculum does not include fisheries or fisheries issues and general public awareness of coastal resource management is considered to be poor (Preston 2008). A technical training program does exist for merchant seamen but the typical inshore commercial fisherman learns his trade in his village. The Kiribati Maritime Training Centre (MTC) was established in 1970, in partnership with a commercial shipping agency, to provide training for merchant seamen (FTC 2013). This training program was taken over by the Fisheries Training Centre (FTC) in 1989 with Japanese aid. As of 2003, the JTC has trained up to 60 crew members per year to the standard level of discipline and safety required on Japanese vessels. Out of 300 total trainees since 2003, 200 are or were employed on 33 different Japanese fishing vessels (FTC 2013). This programme is still running, with 40 trainees in 2012 (FTC 2013). However, it is now going through a restructure and merger of the maritime and fisheries programmes.

Registered recruiting for this programme is recognized by the Ministry of Labour and Human Resource Development. Recruiting agencies include (FTC 2013)

- Kiribati Fishermen Services (KFS);
- Kiribati Employment Marine Services (KEMS);
- Central Pacific Producers Limited (CPPL);
- Central Pacific Maritime Agency (CPM).

The SPC provides various ad hoc fisheries training programs in: safety at sea; seafood handling and data collection; and research and development methods, in cooperation with the MFMRD Coastal Fisheries Branch. The Atoll Research Centre, which is affiliated with the University of the South Pacific, also has a small amount of academic marine resources training available.

	National	Urban	Rural	Coastal
Annual per capita fish consumption (kg)	62.2	67.3	58	115.3
% from subsistence fishing	63	46	79	–
% purchased	37	54	21	–
% consumption comprising fresh fish	92	91	93	95
% of animal protein	84	80	89	–
Source: Bell et al. 2009.				

Table 7. Per capita fish consumption statistics for Kiribati for the years 2001–2006. 92% of this is fresh fish. Data are calculated from household income and expenditure surveys (HIES) and socio economic surveys (SES). SESs were used to collect coastal fishing community data and have some associated standard error due to sample size. The World Health Organization (WHO) recommends that the daily protein intake for good nutrition (i.e. nutritional base) should be ~0.7g of protein per kg body weight per day.

Fish consumption and food security

Fish provide over 80% of Kiribati's annual animal protein consumption at approximately 62 kg per capita (Bell et al. 2009) (Table 7). This represents approximately 30% of the country's total protein consumption of both plants and animals (Banks 2012). Fish consumption is higher in urban areas of Kiribati, unlike in most other Pacific Island Countries and Territories (PICTs) (Bell et al. 2009). Almost all fish consumed in Kiribati are sourced from domestic artisanal and subsistence fishing activities, and tuna are an important component of this consumption (Bell et al. 2009; Banks 2012). In 2008, the average estimated annual per capita tuna consumption in South Tarawa was 39 kg (Gillett 2009). A fish consumption survey in 2005 showed annual per capita fish consumption values of 32.6 kg in Makin, 68.8 kg in Maiana and 36.9 kg in Nonouti (Gillett 2009). The MFMRD's 2012 coastal fisheries survey reports an annual per capita consumption of

126 kg in Butaritari (MFMRD 2013c). It is not known how much aquaculture contributes to domestic fish consumption but it is likely to be negligible.

Kiribati is identified as one of the few PICTs where estimated production from coastal fisheries is expected to meet the forecast needs for food security by 2030 (Table 8) (Preston 2008; Bell et al. 2009). However, a redistribution of supply to population centers such as South Tarawa will be critical, and that doing so may prove problematic because of the high costs of infrastructure, transport and the distance between islands.

	National	Urban	Rural
Current annual coastal domestic fish supply 2008 (t)	12,500*	–	–
To meet <i>nutritional base</i> in 2020 (t)	4,240	2,500	1,740
To meet <i>expected demand</i> in 2020 (t)	9,050	4,780	4,270
To meet <i>nutritional base</i> in 2030 (t)	5,040	3,290	1,750
To meet <i>expected demand</i> in 2030 (t)	10,230	6,080	4,150
Source: Bell et al. 2009.			

Table 8. Forecasts of fish required to meet per capita consumption of fish for good nutrition (nutritional base), and to meet expected demand based on current rates of fish consumption. * denotes a rough estimate.

Revenue from fisheries activities

Fisheries activities in Kiribati provide a number of different revenue streams, of which access fees and licensing revenue from oceanic tuna fisheries constitute the majority. This revenue is derived primarily from fees negotiated through foreign fishing access agreements rather than catch or processing revenue. Oceanic tuna fishery license fees and access revenue provide the Government of Kiribati with between 40 to 50% of its annual government revenue (WCPFC 2011; Banks 2012) (Table 9). In 2006, foreign vessel access licensing fees provided A\$ 25-30 million in annual revenue (Gillett 2009). The Kiribati national budget that same year was A\$ 60,026,000 (Gillett 2009). In 2010, foreign vessel access licensing fees generated A\$ 41.7 million in revenue following the application of the PNA vessel day scheme (VDS). This increased to more than A\$ 58 million in 2012 when Kiribati significantly exceeded its PNA allocation due to transitional issues with implementation.

Despite the amount of annual revenue generated, access and licensing fees for oceanic tuna are an unstable source of income for Kiribati. Strong variations in revenue occur in response to El Niño events and the value of Kiribati access fees has not kept pace with the increased value of WCPO fisheries, particularly with regard to skipjack.

Other licensing revenue associated with oceanic tuna fisheries includes revenue from vessel observer fees transshipment, and fuel bunkering. In 2006, the annual 'observer fee' per vessel was A\$600 for a total of A\$ 7,768 (Gillett 2009).

The total annual revenue generated from transshipment fees is dependent on ENSO events. In El Niño years, transshipment revenue might be as high as A\$ 1.5 million while in La Niña years this revenue might be a significantly lower at A\$ 250,000 (Banks 2012). Transshipment revenues of approximately A\$ 6 per tonne are based on quantities determined

through port sampling (Banks 2012). Revenue from transshipment fees was reported as A\$ 4,568 in 2007 (Gillett 2009) but this value is considered to be too low to represent all transshipment fee revenue (Gillett 2009). Accessible information on fuel bunkering or other possible sources of oceanic fisheries revenue is minimal and was not available for this report.

The fisheries division licenses both local and foreign entrepreneurs to export coastal marine products under four "processing and establishment" license categories (per-license cost was not supplied) (Gillett 2009):

- i) Foreign investor (100% foreign owned) – A\$ 5,000 revenue in 2006
- ii) Semi-foreign (more than 50% foreign-owned) – A\$ 3,500 revenue in 2006
- iii) Semi-foreign (more than 50% local-owned) – A\$ 1,500 revenue in 2006
- iv) Local company (base fee) – A\$ 300 revenue in 2006

Licensing of other fisheries is a revenue generator for both the Government of Kiribati and island councils. Govan (In Press) reports that local fishing and licensing contributes around A\$ 50 - 100,000 to general revenue annually. No breakdown of revenue is readily available for revenue generated by island councils from licensing activities and it is not clear to whom this information is reported. The State-owned enterprise CPPL is negative revenue generating, meaning that it typically operates at a loss (Preston 2008).

Reported government revenue from "sales of fish and fish posters" is listed as A\$ 12,575 in 2007 (Gillett 2009) but it is not clear what this is.

In 2007, reported revenue from recreational 'pleasure fishing' licenses was A\$ 27,966 (Gillett 2009). Sport fishing generates an estimated economic benefit of \$ 2.5 million per year including license fees, jobs and hotel-based tourist expenditures (Preston 2008).

	2009	2010	2011	2012	2013
Fishing license fees (A\$ millions)	29.5	41.7	29.2	58.3	86.8
Percentage of GDP (%)	18.0	24.9	17.3	32.7	71.0

Source: MFMRD 2013d; Ministry of Finance 2014 (unpublished data).

Table 9. Annual Kiribati offshore licensing fees as they relate to the national GDP.

Artisanal and small-scale commercial production was valued at around A\$ 22 million in the mid-2000s (Gillett 2009); this is assumed to have been mostly domestically retained by individuals or small businesses. Little additional fisheries revenue information exists for Kiribati; however it is known that the Government of Kiribati receives very little direct revenue from its coastal fisheries resources.

The total contribution of fishing to the 2010 Kiribati GDP, in current prices, was estimated at A\$ 10,545,000, which represents about 6.8% of both the formal and informal sectors combined (SPC 2013). Additionally, the contribution from farmed seaweed was estimated at A\$ 62,000. Fishing activities make up about 20% of Kiribati's total estimated informal sector GDP of A\$ 55,323,000 and non-monetary subsistence fishing makes up nearly 13% of this value (SPC 2013). These are possibly low-end estimates.

Kiribati has a number of domestic laws, regulations and policies that govern the management of its fisheries resources. It is also party to a number of international treaties and agreements, which provide the country with institutional guidance and operational obligations. However, Kiribati struggles with a number of institutional challenges. This section provides an overview of how Kiribati fisheries are governed, managed and supported by domestic and international institutions, policies and law. For a more detailed description of Kiribati's fisheries monitoring, control and surveillance capacity and related challenges, refer to Govan (In Press).

Institutional structure in Kiribati

Kiribati is a parliamentary republic whose executive branch consists of a president (*beretitenti*), vice president, and a cabinet of 12 appointed ministers who are elected into the legislative House of Assembly (*Mwaneaba Ni Maungatabu*). This legislative branch also includes an attorney general, who is an *ex-officio* member. The judiciary branch consists of a high court and a court of appeal, with judges appointed by the president. Legal counsel is permanently seconded from the attorney general's office for drafting and implementing prosecutions.

The MFMRD is the lead agency responsible for fisheries and marine resources governance and management in Kiribati. Under the Fisheries Act (2010) and the Marine Zones (Declaration) Act (2011), the minister of fisheries is responsible for developing and managing Kiribati fisheries from 3 nm out to the 200 nm limit. Under the Local Government Act (1984, amended 2006), coastal fisheries within 3 nm of the low-tide line are to be managed by island councils. Other ministries also play a role in the management and administration of fisheries in Kiribati. An institutional hierarchy map for Kiribati fisheries is provided after Section 4.1.3 (Figure 6).

Kiribati's local-scale government operates more or less independently from central government controls for day-to-day matters and is conducted through island councils, which have elected members. Local council affairs relating to fisheries include revenue, licensing and expenditure decisions and the formulation of bylaws.

Ministry of Fisheries and Marine Resource Development (MFMRD)

The MFMRD has five core divisions: the Fisheries Division, the Resource Economics and Policy Division, the Mineral Resources Division, the Information Technology Division, and the Accounts, Administration and Human Resources Division. The ministry reports to a permanent secretary appointed by the minister of fisheries. Govan (In Press) reports a total of 132 posts dedicated to the MFMRD in the establishment register. Only the fisheries division, which provided employment for 88 people in 2008, will be covered in any detail in this section (Table 10).

The fisheries division includes: a director of fisheries; principal officers for coastal, oceanic and aquaculture; a handful of analysts and over 20 administrative, financial and non-technical staff. Principal officers report to the director and are responsible for managing each of the three branches within the fisheries division. Under the coastal fisheries branch, a large number of fisheries assistants work alongside island councils.

MFMRD staff members represent Kiribati at WCPFC, PNA and the Forum Fisheries Commission (FFC). Higher-level meetings at PNA, FFC and meetings where there are ministerial forums and binding decisions may also be attended by the minister and the permanent secretary.

A new competent authority has been established within the ministry and is under the coastal fisheries branch. The Kiribati Seafood Verification Agency (KSVA) was created to: regulate and control fish processing establishments; make provisions for the verification of all seafood exports; and to make sure fish being exported are 'fit for purpose'. The KSVA is capable of making recommendations to the minister of fisheries on licensing, permitting, fees and levies (Banks 2012).

The MFMRD is one of the larger and more technically capable ministries in Kiribati but its effectiveness is limited by a number of institutional and governance weaknesses. These weaknesses include high staff turnover; long-standing vacancies in senior positions; and systemic policy and procedural issues (MFMRD 2013a).

Administrative division	Primary responsibility	Additional responsibilities
Fisheries Division (Supervised by Chief Fisheries Officer)	Exploration, exploitation, development, utilization, proper management and conservation of fisheries and marine resources within the EEZ	<ul style="list-style-type: none"> Long-term: maximize resource returns and ensure they are being sustainably utilized for current and future human needs in Kiribati
Oceanic Fisheries Branch	Generate employment opportunities for workers on fishing vessels, manage marine resources on a sustainable basis	<ul style="list-style-type: none"> Collect scientific data on catch and gear technology Promote employment opportunities on foreign vessels
<i>Licensing Unit</i>	Generate revenue from Kiribati tuna resources through fishing license and access agreements with foreign partners	
<i>Monitoring, Control, and Surveillance Unit</i>	Carry out enforcement duties to protect the country's marine resources	<ul style="list-style-type: none"> Implement monitoring, control and surveillance at regional and national level Carry out port sampling work Implement VMS register and monitor the system Maintain fisheries database management information system (FMIS) Deployment of observers on foreign vessels
Coastal Fisheries Branch	Development and management of coastal and inshore fisheries resources	
<i>Rural and Sustainable Fisheries Development Section (RSFD)</i>	Studies the economic feasibility of fishery development and conducts trials	<ul style="list-style-type: none"> Local fisheries development assistance Provide training courses for fishers Includes boatbuilding and mechanical units Oversee fisheries assistants stationed in outer islands
<i>Fisheries Licensing, Assessment, Monitoring and Management Section (FLAMM)</i>	Coastal fishery licensing functions, surveys and assessments	<ul style="list-style-type: none"> Issue commercial inshore licenses Resource research and field surveys, including artisanal fishery surveys, stock assessments, coral monitoring, ciguatera testing Monitor export activities through the collection of fisheries data and surveys Monitor fisheries ponds Ensure compliance with closed areas Houses the Statistics Unit
<i>Human Resource Management and Information Section (HRMI)</i>	Support training and information services	<ul style="list-style-type: none"> Coordinate in-service training for fisheries staff both overseas and internally Manage the library Compile Annual Reports Disseminate fisheries information to public
<i>Kiritimati Fisheries Development Branch</i>	Support coastal fishers in Kiritimati and other Line Islands	
Aquaculture Research and Development Branch	Conduct research on marine resources that have development potential and coordinate collaborative regional research activities	<ul style="list-style-type: none"> Administrative possession of Extension and Research vessel

Source: Preston 2008; Banks 2012.

Table 10. Institutional structure of the MFMRD Fisheries Division in 2011, with a description of major responsibilities. In practice these divisions operate with some fluidity and there are overlaps in responsibility.

Island councils

Island councils are empowered and protected by three different pieces of national legislation. The Local Government Act (1984, amended in 2006) authorizes councils to make marine resource bylaws and to license businesses that operate within three nautical miles (nm) from the low-water mark. The Fisheries Act (2010) also contains provisions to protect the traditional fishing rights of Kiribati communities and the government reports that the Native Land Ordinance (1977) and amendments recognize customary tenure of fish traps, reefs and fishponds (ROK 2011). It has been reported that only three councils have ever enacted bylaws to manage or govern fisheries under their jurisdiction, of which a *te Ororo* ban on a handful of islands was one (MFMRD 2013b). However, none of these bans have been considered particularly effective; it is not clear if successful prosecutions have ever occurred; and there is a considerable lack of clarity as to whether bans are official and have ministerial approval or are a result of council decrees which are understood to be bans.

Most island council business relates to generating licensing revenue from local businesses, which includes commercial fishers from other islands. Locals are not charged fishing fees, but they must pay a market fee if they wish to sell their product at local markets and may pay fees for equipment rentals. Councils were at one time given the responsibility of operating a number of fisheries centers for donor-funded programs in the outer islands but this too has been largely unsuccessful. Island councils are responsible for deciding the placement of FADs in local waters and for developing local bylaws for approval at the ministerial level. There is typically one island council per island; the exception is South Tarawa, which has two – Betio Town Council and Teninainano Urban Council (Bairiki to Bonriki).

The MFMRD is supporting the formation of fishermen's cooperatives on some islands, which it hopes will improve the function of local governance (Preston 2008). At one time, each island council was assigned an MFMRD Fisheries Assistant to advise on licensing and management issues but MFMRD lacks sufficient staff to cover every council and there is a minimal operational budget for these

staff. Eutan North Tarawa Council has a special constable who supervises the police responsible for enforcing local bylaws but no boats are assigned to support this activity. Island councils liaise with the Ministry of Internal Affairs (MIA) on a range of matters, which may at times be related to fisheries. This includes assistance with the formulation of regulatory bylaws for fisheries management, for which consultation with the MFMRD is not a necessary condition. According to the Fisheries Act, the MFMRD has the authority to override island council bylaws in the event that national regulations and bylaws should ever conflict. There is no evidence that this has ever happened or would happen in practice.

Fisheries responsibilities within other government ministries and organizations

In addition to the MFMRD, a number of other government ministries share responsibilities for aspects of the fisheries sector in Kiribati (Preston 2008; ROK 2011; Banks 2012). These ministries are represented in the institutional hierarchy (Figure 6).

- **The Ministry of Health** has the Food Inspection Service, which regulates food safety and food imports, including fish.
- **The Ministry of Environment, Lands and Agriculture Development (MELAD)** issues development consent permits and fines to activities that may have a negative impact on the environment, which includes fisheries. The Environment and Conservation Division is concerned with biodiversity protection and conservation, which under the 1999 Environment Act includes marine life and habitats. The Lands Division is responsible for issuing building permits for potentially environmentally damaging coastal constructions. MELAD is conscious of the need for greater communication and cohesion between ministries with regards to improving the effectiveness of environmental protection in Kiribati. The Kiribati Integrated Environment Policy KIEP (2013) highlights a number of potential synergies between ministries related to coastal fisheries.
- **The Ministry of Communications, Transport and Tourism Development (MCTTD)** maintains the register of the operators or 'beneficial owners' of vessels flying the Kiribati flag, including their

nationality. It is also responsible for the clearance of all vessels entering port.

- **The Ministry of Line and Phoenix Islands Development (MLPID)** is a coordinating body for activities in these islands, including the development of bonefish capture regulations in Kiritimati.
- **The Ministry of Justice (MOJ)** houses the Kiribati Police Service (KPS) and the Police Maritime Unit (PMU), which has some responsibility for fisheries compliance activities. The extent of this responsibility with regards to coastal fisheries enforcement is currently unclear.
- **The Ministry of Finance and Economic Development (MFED)** develops the operational budgets for government ministries. It also houses the National Statistics Office, which is in charge of the Census and surveys such as the 2006 HIES. It also houses the Customs Division and keeps statistical records for select fisheries data such as seaweed production and exports and fish exports.
- **The Ministry of Commerce, Industry and Cooperatives (MCIC)** is responsible for evaluating foreign investment in the marine resources sector, local companies involved in marine product export, and supporting private sector development.
- **The Ministry of Internal Affairs (MIA)** liaises with island councils with regard to local government fisheries bylaws and Outer Island development activities.
- **The Office of the Attorney General** provides legal input and assistance with drafting legislation and policy.

There are a few civil organizations with fisheries interests in Kiribati. The majority of these are located or active in Tarawa. The Betio Fishermen's Association (BFA) organizes private fishers and works towards improving their representation in political decision-making processes (Preston 2008). The Tarawa Fishermen's Cooperative has been primarily involved in providing members with fishing gear and equipment with minimal cost mark-ups. There are around nine active registered fishing cooperatives in the 'Northern District' islands (Table 11), but there are reportedly a number of more informal unregistered associations (MFMRD 2013b).

There are a handful of boat owner associations throughout the islands. The most recently formed association, the Nareau Tuna Boat Owner's Association (NTBOA), is an amalgamation of three local and previously informal associations: Katonu Tuna Boat Owner's Association (KTA) based in Bairiki, Causeway Tuna Association (CTA) based in Bikenibeu, and Bonnano Tuna Association (BTA) based in Betio. Members of the NTBOA are small-scale fishers with boats mostly less than 7 m length and whose catches of predominantly small skipjack and yellowfin are mostly landed in the Tarawa market. The NTBOA was formed to strengthen and unify fisherman input to government on local fisheries issues and to provide a supporting organization for local fishers to apply to supply the Kiribati Fishing Ltd. processing and export facility on Tarawa. Additional operational priorities are reported to include FAD installation, establishing bulk fuel arrangements for members, improving safety at sea, and construction of a small boat channel in the causeway region (MRAG 2013).

Island	Name	No. of members	Active since
Marakei	Marakei Fishermen's Cs	52	2008
North Tarawa	Maurin Nuatabu Fishermen's Cs	28	2010
	Nei Nuonuo Fishermen's Cs	14	2011
Tab South	Tab South Fishermen's Cs	42	2010
Onotoa	Onotoa Fishermen's Cs	–	–
Tamana	Tamana Fishermen's Cs	–	2006
Arorae	Aroroe Fishermen's Cs	216	2006
Christmas	Christmas Fishermen's Cs	10	2002
Banaba	Banaba Fishermen's Cs	55	2008

Source: Unpublished from MFMRD.

Table 11. List of active registered fishing cooperatives in the Northern District as of mid-2013.

Kiribati is a member of the Pacific Islands Tuna Industry Association (PITIA). The association “provides information and services to its members to encourage information and engagement of industry in key policy decisions affecting their businesses” (PITIA 2013).

There are a few local and international non-governmental organizations and most operate in South Tarawa. Some of these are members of the Kiribati Association of Non-Governmental Organizations (KANGO).

Govan (In Press) reports that the Kiribati Local Government Association (KILGA) has ‘good contact’ with island councils, engages in local-level projects, and provides a forum, as well as council-level networking and lobbying opportunities.

Church groups such as the Kiribati Protestant Church (KPC) also play an important community role in the dissemination of fisheries information bulletins (MFMRD 2013b).

It is not clear if fisheries-specific subsidies, loans or insurance are available to support Kiribati fishermen but if there are, they are not common. Formal banking organizations are often unwilling to provide financing for such a high-risk industry. Village banks exist in the outer islands as a means of providing micro-financing options. These activities are monitored by the Island Project Officer (IPO). The island council treasurer also engages in banking activities in the absence of a formal presence by the Bank of Kiribati/ANZ Bank (MISA 2008a).

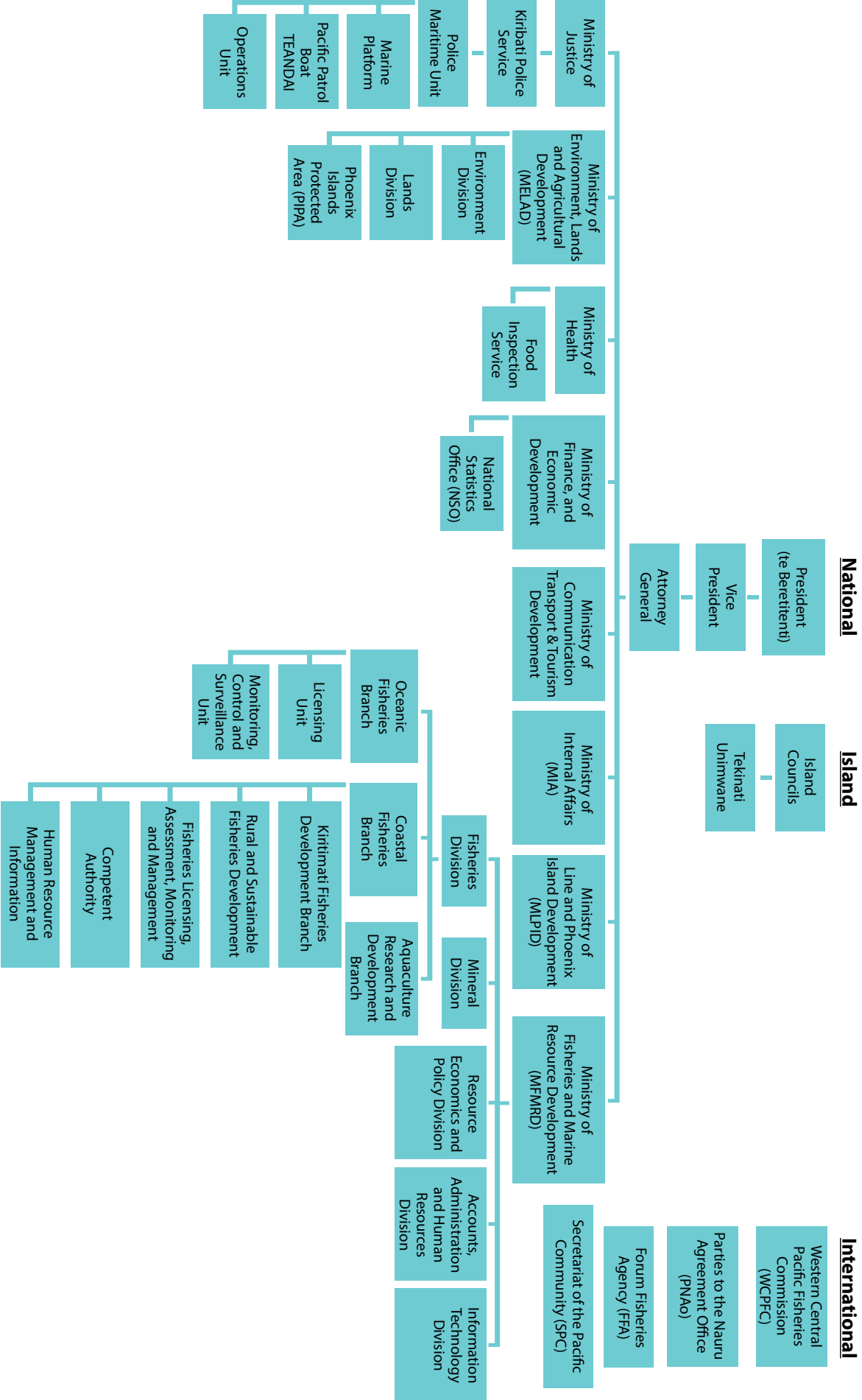


Figure 6. Kiribati institutional hierarchy diagram as it relates to the management of fisheries in Kiribati. The multitude of interactions between elements vis à vis fisheries policy development, support, and decision-making at the international, national, and island level are not represented here. This represents a best estimate - Some of the linkages between institutional elements may be incomplete or slightly inaccurate.

Fisheries data collection and management

No single ministry is responsible for the collection, housing, maintenance and updating of all fisheries statistics in Kiribati. The following ministries and sections share responsibility for collecting, analyzing, reporting, organizing and managing Kiribati fisheries statistics (Preston 2008; Banks 2012; MFMRD 2013b):

MFMRD Oceanic Fisheries Section

- Collects and analyses fisheries statistics;
- Collects scientific data on catch and gear technology, registration and licensing of foreign vessels, purse seine and longline data;
- Compiles and maintains vessel monitoring system (VMS) register;
- Maintains fisheries management information system (FMIS);
- Conducts port sampling to verify catches; and
- All purse seine and longline catch data is entered from the vessel logbooks into the SPC TUFMAN.

MFMRD Coastal Fisheries Section

- Monitors fish resources and export activities;
- Collects relevant fisheries data and surveys, data on fish and marine exporters of overseas products, marine products sent from outer islands to Tarawa, and marine products sent as personal consignments;
- Collects commercial inshore license information;
- Collects data from commercial and subsistence fishermen about where they fish in the lagoon, reef and ocean within 12 nm;
- Collects coral bleaching and ciguatera information;
- Conducts artisanal fisheries survey every 3 years – includes demographic data; consumption number and type of fish and invertebrates caught; types; frequencies; sizes and lengths; gender division of activities; some effort data; and types of fishing activities, by island;
- Compiles annual reports and manages information library;
- Compiles data from private fishing enterprises (it is not clear what these data are); and
- Disseminates fisheries information to public in the form of posters, pamphlets, radio announcements and videos.

Ministry of Communications, Transport and Tourism Development (MCTTD)

- Maintains the register of the operators or 'beneficial owners' of vessels flying the Kiribati flag, including their nationality.

Ministry of Internal Affairs (MIA)

- Houses a repository for fisheries bylaws.

Ministry of Finance and Economic Development (MFED)

- Houses the Kiribati National Statistics Office (KNSO);
- Houses the Customs Division which maintains an exports database (Govan, In Press);
- Undertakes (through the KNSO) censuses and surveys which may contain fisheries information; and
- Collects and publically disseminates (through the KNSO) statistical records for select fisheries data such as seaweed production and exports.

The statistical and reporting protocols for Kiribati fisheries statistical information are not transparently defined. Compliance is generally uneven for those statistical and reporting protocols that do exist, such as a 45-day limit for offshore tuna catch reporting (MFMRD 2011). It is not clear who collects data on aquaculture, recreational fisheries or the aquarium trade. Some of this information is probably collected in some capacity by the coastal fisheries branch, and some of it may be collected by the MFED Customs Division. It is unclear how collected coastal fisheries data contributes to management decision-making.

Preston (2008) also found that there are significant problems with the effective organization and management of Kiribati fisheries data. In his own information compilation he found that it was difficult to find publically accessible information from survey results, fishery statistics, development activities and other sources because of inadequate library organization, outdated statistical collection protocols and poor reporting (Preston 2008). Kiribati's statistical capacity is heavily supported by the SPC, who does all of Kiribati's data analysis and houses much of its raw data. It is unclear who reports fisheries statistics to FAO but it is not the KNSO.

Domestic fisheries policy and legislation

Kiribati has created a number of domestic fisheries policies and legislation to assist in the governance and management of its marine resources (Table 12). However, much of this is dated and suffers from poor enforceability (Preston 2008). The Fisheries Act (2010) is relatively recent and gives the MFMRD the power to promote the development of fishing and fisheries, including

licensing, the protection of species, prohibitions of fishing gear, and the organization and regulation of markets and exports. The Local Government Act (1984, amended 2006) is also significant due to the involvement of island councils in the management of coastal fisheries but it requires significant updating. The Environment Act (1999) also provides significant provisions to promote resources conservation and protection of marine biodiversity.

Legislation	Year signed/ amended	Purpose
Kiribati Wildlife Ordinance (Cap 100)	1976	<ul style="list-style-type: none"> Provides protection for some birds and other animals, including turtles “No person shall hunt, kill or capture any wild turtle on land except under and in accordance with the terms of a valid written license granted to that person by the Minister.” Specific full protection for green turtle in Line and Phoenix Is.
Marine Zones (Declaration) Act	1983/2011	<ul style="list-style-type: none"> Defines and establishes a 12 nautical mile (nm) territorial sea and a 200 nm exclusive economic zone (EEZ). Recently updated to enable the proper establishment of maritime zones, rights, and obligations in line with UNCLOS.
Merchant Shipping Act	1983/2006	<ul style="list-style-type: none"> “To provide for registration of foreign ships, and matters ancillary thereto”.
Local Government Act (<i>As amended by the Island Councils Ordinance 2006</i>)	1984/2006	<ul style="list-style-type: none"> Designates management of coastal fisheries within 3 nm of the onshore low-water mark to island councils.
Environment Act	1999/2007	<ul style="list-style-type: none"> To provide for and establish systems for development control, environmental impact assessment, and pollution control. To reduce risks to human health and prevent the degradation of the environment. To protect and conserve natural resources threatened by human activities.
Phoenix Islands Protected Area Conservation Trust Act	2009	<ul style="list-style-type: none"> “This Act establishes the Phoenix Islands Protected Area Conservation Trust as a body corporate and defines its functions and powers.”
Fisheries Act (aka ‘the Act’)(<i>Replaces Fisheries Ordinance</i>)	2010	<ul style="list-style-type: none"> Gives MFMRD minister the power to promote and regulate fishing and fisheries. Provides for protection of customary fishing grounds. Restricts foreign fishing vessels from fishing within fishery limits (i.e. lagoon or inland). Prohibits use of explosives, poisons, etc. License must be granted by the minister for exemption from some prohibitions.
Native Lands (Amendment) Act (<i>Replaces Native Lands Ordinance of 1977</i>)	2000/2011	<ul style="list-style-type: none"> Gives legal recognition to local ownership of lands, including fish traps, reefs and fishponds.

Source: Awira et al. 2008; Preston 2008; Parliament of Kiribati 2011; Banks 2012; ECOLEX 2013.

Table 12. Summary of national acts relating to the governance and management of Kiribati domestic fisheries within 12 nm

Kiribati has also developed its first National Fisheries Policy, which has recently been approved by cabinet. This policy is intended to set new directions and a roadmap for effective fisheries management, conservation and development for the next 12 years. It is designed to ensure strategic planning and integrated fisheries management approaches at all levels and to achieve sustainable development in a more coordinated and collaborative manner between all stakeholders. The policy is designed to harmonize the national plans and activities of government sectors, nongovernmental and civil society organizations (NGOs and CSOs), the private sector, and local communities, with a view to enhancing food security, creating employment opportunities, and fostering sustainable livelihood and economic growth for current and future generations of I-Kiribati.

Regulation and policy in coastal fisheries

Few management regulations exist for either the coastal fisheries resource or the small-scale fishery resource. In terms of species conservation, much of what is in place provides very little protection, if any, to the intended fishery resource. Within domestic waters, there are currently no limits on the number of coastal fishing licenses assigned, and the resource rent capture of this essentially public good is poor (Preston 2008). There are a small number of coastal resource-specific regulations (Table 13). Destructive and drift-net fishing are also widely 'prohibited', but this may not be backed by official regulations. There are effectively no limits on the composition or quantity of coastal catch and no catch or effort controls (Preston 2008). It is not clear if any safety-at-sea regulations exist for coastal fishers.

No management plans are currently in place for any species in Kiribati, although there are a handful of plans at various stages of preparation, with the support of SPC. One has been in preparation for *bêche-de-mer* for a number of years and is currently waiting to be tabled by cabinet (personal communication from R. Tumoa, 2013). Two local fishery management areas exist – in North Tarawa and in Kiritimati, but it is not clear what sort of management takes place. The North Tarawa Conservation Area (NTCA) was established in 1996 in order to protect the area's biodiversity

and habitats while encouraging sustainable development but this area has not been actively managed for some time (MELAD 2013), and it is not clear if it was ever given official legal status. There is a designated MPA in the Phoenix Islands (PIPA), which has received international attention for its proposed size and significance. However, initial plans to implement PIPA have stalled and 87% of the MPA is still open to large-scale commercial fishing. PIPA management decisions are undertaken by a management committee composed of MELAD and the MFMRD, while enforcement of PIPA falls to the MoJ, which administers the Police Maritime Unit. PIPA has two wardens supported by the police.

Island councils have the authority to create fisheries bylaws within their 3 nm jurisdiction to conserve their local marine resources but their capacity for generating and enforcing these bylaws is limited. Furthermore, island councils are not required to inform MFMRD of any new fisheries bylaws. Only the Ministry of Internal Affairs (MIA) needs to be consulted, and MIA does not regularly coordinate with MFMRD on coastal fisheries matters, despite being the official repository for fisheries bylaws. MIA has recently developed a bylaw template for developing fisheries bylaws, but it is not clear if any consultation with MFMRD took place. It is evident that improvements to cross-ministry communication and coordination would be of great benefit to achieve effective coastal fisheries management and conservation efforts.

Regulation and Policy	Year signed/ amended	Purpose
Prohibited Fishing Areas (Designation) Regulations	1978	The regulations consist of 3 articles and a schedule listing the areas in which fishing is prohibited. “Any person who fishes in a prohibited fishing area commits an offence and shall be liable to imprisonment for 6 months and to a fine of A\$ 1000 (art. 3).”
Fisheries Conservation and Protection (Rock Lobster - <i>Panulirus</i> species) Regulations	1979/1992	“Any person who catches, takes, kills, has in possession, sells, exposes for sale, buys for sale or consigns to any person for the purpose of sale- (a) any immature rock lobster; (b) any female rock lobster bearing its eggs, Shall be guilty of an offence and liable to a fine of A\$ 100 or imprisonment for 3 months” (art. 3). A rock lobster shall be deemed to be immature if the length of the carapace is less than 85 mm measured from its eyes (art. 2(b)).”
Fisheries (Vessel License) Regulation	1982	Provides directives for the licensing of vessels.
Fisheries (Processing and Export) Regulations	1981/1992	Provides a directive for forms, fees, fish processing establishments, exports, samples, offences pertaining to processing and exports.
Fisheries (Protection of Bonefish of Kiritimati) Regulation	2008	Prohibits catching and possession of bonefish. Govan (In Press) was unable to find a copy of this regulation.
National Sea Cucumber Management Plan	201X	Approved by Cabinet in mid-2013 but not yet signed into force or implemented. Establishes an enforceable management structure for the ecologically sustainable development of the sea cucumber fishery.
Kiritimati Aquarium Trade Management plan	201X	In co-development with SPC.
National Fisheries Policy	2013	Approved by cabinet in 2013. A roadmap for effective fisheries management, conservation and development for the next 12 years.

Source: Awira et al. 2008; Preston 2008; Parliament of Kiribati 2011; Banks 2012; ECOLEX 2013.

Table 13. Summary of regulations and policy for the governance and management of Kiribati domestic fisheries within 12nm. Additional species management plans are in an early development stage.

Customary marine fishing rules and tenure

Customary fishing rules and tenure have a long history in Kiribati. Prior to colonial times, customary marine tenure was the means by which marine resources were divided amongst households and families. In pre-colonial Betio, households were divided into eight *kaingas*, a ‘clan’ or cluster of households (*utu*) with common interests. Each *kainga* had its own exclusive plot of land and a designated marine area to tend (Johannes and Yeeting 2000).

Other strict rights governed the ownership of fish traps, sea walls, reclaimed land and fishponds. Some islands such as North Tabiteuea had customary rules prohibiting fishing or sailing within a prescribed limit at a time during the fishing season – *te ikabuti* (Johannes and Yeeting 2000). There were a number of specific customary regulations about when, where, and how, to fish during the bonefish spawning season. These rights and regulations were enforced with sanctions, fines,

and censures handed down as punishment as late as the early 1990s in some areas (Johannes and Yeeting 2000). A number of seafood taboos also existed relating to age, sex, totem or entire communities but it is thought that these taboos were related to resource control and allocation rather than to conservation (Johannes and Yeeting 2000).

The first Fisheries Ordinance of 1946 recognized traditional fishing rights and made specific provisions for registering customary rights. However, no formal registration of customary marine tenure (CMT) was ever undertaken once colonial rule was established and the recognition and enforcement of customary marine tenure has gradually faded from importance. This is particularly so in urbanized South Tarawa, but some of the more rural islands and communities including North Tarawa have retained and exercised some forms of CMT into the 2000s (Johannes and Yeeting 2000).

The Western concept of public-use rights for fisheries resources has broadly prevailed in Kiribati, but not without creating some ongoing conflict between I-Kiribati communities and the government. British Colonial Law instituted common property rights to Kiribati marine resources outwards from the high tide line but, in accordance with *de facto* CMT rules, allowed private ownership of stone fish traps and certain islets (ROK 2011). This has caused problems in Tarawa, where a lot of the residents are migrants, with no CMT claims. In the past, Tarawa landowners have tried unsuccessfully to appeal to the government to limit shellfish resource extraction by people not indigenous to Tarawa. In the 1980s, State-owned *Te Mautari* ran into problems implementing a milkfish fry collection operation to support aquaculture baitfishing for commercial tuna-fishing interests in once-tenured waters on Tarawa (Johannes and Yeeting 2000). Traditional owners of the lagoon floor at Ambo have also complained about a government-run seaweed farm being implemented in their area, and similar complaints existed with government milkfish ponds at Bonriki (Johannes and Yeeting 2000).

The new Fisheries Act now includes a provision that protects customary fishing rights by prohibiting the taking of fish in any marine, lagoon or reef area forming the historical

customary fishing ground of a *kainga* except by members of that *kainga* or under a license granted by the minister of fisheries at their discretion (Awira et al. 2008). The enforceability of this provision is not known. Other outer islands have *de facto* CMT rules that forbid individual ownership of sandbar and reef areas and only permit individual ownership of islets and stone traps (ROK 2011). It is not clear to what extent the social and cultural authority of CMT and other customary regulations is still observed and enforced in Kiribati, but it is likely that outer islands still retain and observe some of these rules without formal government sanction. In Butaritari, for example, the *tekinati* (association of elders) recently moved to ban commercial shark fishing in their waters. Despite the current lack of legislative approval, this ban is expected to be endorsed by the island council because of the significant cultural authority of this action. The continuing influence of CMT may also partly explain the lack of clarity between official bylaws and council-sanctioned rules and prohibitions.

International fisheries policy and legislation

In addition to its domestic fisheries regulations, Kiribati is signatory to a range of international fisheries policy instruments (Table 14). These create international obligations for Kiribati to maintain a minimum international standard of fisheries management and governance. In addition to the policy measures in the table below, Kiribati also has management and governance obligations under the PNA VDS and has agreed to implement various minimum terms and conditions for licensing foreign fishing vessels.

Furthermore, Kiribati is a member of the Western and Central Pacific Fisheries Commission (WCPFC) and is legally bound to implement a number of conservation and management measures that apply to waters outside of 12 nm. These include:

- Provisions for monitoring, control and surveillance of fishing vessels, including requirements for vessel monitoring systems and observer schemes;
- Purse seine effort limits and longline and catch limits for yellowfin and bigeye;

- Bycatch requirements for mitigating impacts on associated and dependent species, such as sea turtles, seabirds and sharks;
- Specific rules for FAD closure and catch retention;
- Regulations for transshipment;
- Implementation of compliance and monitoring systems; and
- Monitoring and reporting of various species, including bycatch.

Instrument	Year	Notes
Protocol to the International Convention for the Regulation of Whaling: IWC (1959)	2004	By accession
Convention on International Trade Endangered Species: CITES (1975)	No	Is still authorized to provide CITES certificates of origin for all EU markets
International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978: MARPOL 73/78 (1983) – (Amend. 2008)	2007	By accession
Convention for the Protection of the Natural Resources and Environment of the South Pacific Region: SPREP (1990)	No	
Convention for the Prohibition of Fishing with Long Driftnets in the South Pacific (1991)	1992	
Convention on Biological Diversity: CBD (1993)	No	
United Nations Food and Agriculture Organization Cooperative Agreement FAOCA (1993)	No	Contracting party only as of 1999
Protocol to the International Convention for the Safety of Fishing Vessels (1993)	2007	
United Nations Food and Agriculture Organization Code of Conduct for Responsible Fisheries: FAO CCRF (1993)	No	
United Nations Convention on the Law of the Sea: UNCLOS (1994)	2003	
United Nations Fish Stocks Agreement: UNFSA (2001)	2005	
Convention on the Conservation and Management of High Migratory Fish Stocks in the Western and Central Pacific Ocean: (2003)	2004	By accession
United Nations Food and Agriculture Organization Agreement on Port State	No	
Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing: APSM (2009)		
Source: Banks 2012; ECOLEX 2013.		

Table 14. Summary of major international instruments related to fisheries and signed or ratified by Kiribati. The year of entry into force is listed in parentheses. Access arrangements are treated in a separate table.

International access agreements

Since UNCLOS' entry into force in 1982 and the designation of EEZs, the MFMRD has negotiated and renegotiated a number of regional and bilateral access agreements granting permission to foreign States to fish in oceanic waters within Kiribati's EEZ (Table 15). In exchange, Kiribati receives revenue from foreign vessel licensing fees, some processing revenue, lump-sum payments and other financial arrangements. Access agreements are the largest revenue generators for the Kiribati economy. In addition to these access arrangements, Kiribati has unspecified private company agreements with El Salvadorian and Ecuadorian vessels operating out of Latin America on behalf of Spain.

strengthening activities. New Zealand and the European Community also support related training and governance programs, while Republic of Korea, Japan and Taiwan all contribute ODA to various fisheries-related development and infrastructure projects.

Institutional strengthening programmes in Kiribati

The Government of Kiribati is heavily reliant on international and regional agencies and bilateral donors to support necessary programs and funding for marine resource management and development in the country. These are highlighted in Table 16.

A number of international NGOs are active in the South Pacific but there are no NGO offices in Tarawa. Both Conservation International (CI) and the New England Aquarium support the function of the Phoenix Island Protected Area (PIPA). The Nature Conservancy, World Wide Fund for Nature (WWF), Pew Charitable Trusts and Greenpeace have all supported fisheries resource conservation initiatives in Kiribati either on a one-time or an ongoing basis over the years. A few local NGOs also consult on social and environmental issues with topics relevant to fisheries. There are a handful of universities involved in fisheries or marine habitat initiatives – these include the University of the South Pacific, the University of Wollongong and the University of British Columbia.

In terms of foreign government aid, Australia is the largest financial donor to Kiribati, providing approximately A\$30.4 million in official development assistance (ODA) in 2012–2013 (DFAT 2012). Of this, A\$25.5 million is delivered through the bilateral aid program, but only a small portion of this is for fisheries institutional

FISHERIES GOVERNANCE, AGREEMENTS AND INSTITUTIONS

Agreement	Signed	Signatories	Purpose of agreement	Notes
Nauru Agreement (PNA)	1982	Federated States of Micronesia (FSM), Kiribati, Marshall Islands, Nauru, Papua New Guinea (PNG), Solomon Islands, Tuvalu	Provides agreement framework for cooperation between parties and to increase participation in fisheries	-
US Treaty	1987	USA and 16 Pacific Island Parties	An access agreement allowing 55 US purse seine vessels to enter in PLC waters	• Access fees + (Lump-sum + 21% of total catch value)
Niue Treaty	1992	All FFA member countries	Provides flexible arrangements for cooperation in fisheries surveillance and law enforcement	• Agreements under this treaty may be bilateral, sub-regional, or regional
FSM Arrangement	1994	FSM, Kiribati, Marshall Islands, Nauru, PNG, Palau, Solomon Islands, Tuvalu (in 2002)	Grants preferential access to foreign boats that are willing to base operations in region	• Vessels under this arrangement must be consistent with Palau Arrangement
Palau Arrangement	1995	Palau plus PNA countries	Regulates the number of purse seinning vessels to be licensed by the involved parties	• License limit: 205 purse seiners from 1995 to date
VDS	2008	PNA countries	Replaces existing license allocation scheme and the cap of 205 purse seine vessels. To promote the conservation of tuna stocks	• Management scheme under Palau Arrangement
Fisheries Partnership Agreement	2012	EU and Kiribati	Provides EU fishermen with fishing opportunities in the Kiribati fishing zone in exchange for financial contributions. Replaces existing 2008 agreement.	<ul style="list-style-type: none"> • New treaty from 2012 to 2016. • Fixed contribution of EUR 1.325 million year or EUR 35/caught • Increase in ship owners fee to EUR 131,250/purse seiner and 15,000/longliner • Allows 4 purse seine vessels and 6 surface longliners to fish 15,000 t/year from Spain, France, and Portugal
Bilateral Access Agreements	Ongoing	Japan, Taiwan, Republic of Korea, China – and corporate agreements with companies from Ecuador, New Zealand and El Salvador	Provides foreign fishing vessels with fishing opportunities in the Kiribati fishing zone, sold in vessel days in accordance with the PNA VDS.	• Consistent with the PNA VDS.
USA multi-lateral fishing access agreements with FFA members	Interim Arrangement	USA and FFA members	Provides USA flagged fishing vessels with fishing opportunities in the Kiribati fishing zone, sold in a regional allocation of vessel days in accordance with the PNA VDS.	• Under negotiation

Source: Summarized primarily from FFA 2012b.

Table 15. Summary of regional and bilateral fisheries agreements pertinent to Kiribati. Agreement names are abbreviated.

Agency	Primary Supportive Role
Pacific Islands Forum Fisheries Agency (FFA)	Supports programs within the Oceanic Branch of the fisheries division
Secretariat of the Pacific Community (SPC)	Socio economic surveys, training fisheries division staff in survey techniques, experimental fishing trials, support of information products, review of coastal fisheries management legislation, some management plan support, support of CBFM initiatives
South Pacific Regional Environment Programme (SPREP)	Strategic priorities for management, monitoring, governance
World Bank and the Global Environment Facility (GEF)	Kiribati Adaptation Project – aims to reduce vulnerability to climate change
United Nations Food and Agriculture Organization (FAO)	Policy and strategic support, aquaculture development
South Pacific Applied Geoscience Bureau (SOPAC)	GIS support for Fisheries Management Section to monitor status of coral reefs
Global Environment Facility (GEF)	International Waters Project Pacific Islands Oceanic Fisheries Development and Management Programme
Germany - Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)	Climate change capacity and adaptation projects, Whole of Island Approach projects
Australia	Defence Cooperation Program - Provides ongoing training and support to Police Maritime Unit for the operation of its patrol boat Support for the development of the Kiribati National Fisheries Policy. AusAID - Community based fisheries programmes, Tuna Impact Assessment Monitoring, Control, Surveillance (MCS) training
New Zealand	Fisheries training NZAID projects
Japan	Fisheries training and in-kind support
Taiwan	Technical aquaculture and agriculture support, research and development
Republic of Korea (South Korea)	Office supplies and fisheries equipment
European Union	Discretionary funding
USA	FFA fund, surveillance and enforcement support, multiple USAID-assisted projects for food security and climate change
Source: includes Preston 2008; MFMRD 2011; Banks 2012; DFAT 2012.	

Table 16. Major international and regional agencies and donors involved in fisheries sector institutional strengthening activities in Kiribati as of 2013.

KEY CHALLENGES FOR KIRIBATI AND ITS FISHERIES RESOURCES

Kiribati faces a number of critical challenges with respect to the future of its fisheries and the benefits they provide to I-Kiribati. These challenges include current and potential future declines in valued marine species due to unsustainable fishing practices throughout the Kiribati EEZ, and changes to oceanic conditions due to global climate change. In the face of these resources declines, additional challenges include ensuring that sufficient fish protein continues to be available for a growing I-Kiribati population. The changing nature of the fishing industry, both domestically and globally, has created new and unresolved social challenges for Kiribati. Maximizing and diversifying the economic benefits of its current fisheries resources to achieve greater financial benefit and stability is another challenge for Kiribati. All of these challenges are exacerbated by institutional weaknesses and a lack of adaptive capacity in the government sector responsible for fisheries management, development and conservation. The following section provides an overview of the challenges presented above in five broad categories.

Sustainability and climate change

Unsustainable fishing practices are currently widespread throughout the Kiribati EEZ and pressure on fisheries resources is expected to increase as both domestic and international demand for food fish continues to grow. Left unchecked, such practices will only exacerbate any medium- to long-term climate-driven social, economic and environmental impacts on Kiribati fisheries resources².

Climate change and Kiribati fisheries

Climate change is forecast to have substantial impacts on Kiribati coastal and oceanic fisheries, their habitats, and the little land area available to I-Kiribati. Over the rest of the twenty-first century and as early as 2030, changes to the state of global oceans are forecast to include alterations to: ocean temperatures, salinity, acidity, currents and sea levels. Changes to climate will include greater variability in the: year-to-year frequency and intensity of rainfall and drought events; coastal erosion; seawater contamination of Kiribati's few freshwater

aquifer resources; and land area losses due to sea level rise. Kiribati is only a couple of meters above sea level. Sea-level rise in Kiribati has been measured at 1 to 4 mm per year since 1993; this equates to a current minimum sea level rise of 20 mm or a maximum of 80 mm, compared to 20 years ago. This section draws primarily from research findings in Bell et al. 2011 and ABM and CSIRO 2011.

A comprehensive climate change report by the Australian Government in 2011 found that climate models for Kiribati indicate with "very high confidence" that both sea surface and air temperatures will increase around Kiribati over the twenty-first century (ABM and CSIRO 2011). In particular, the frequency and intensity of extreme heat days is likely to continue to increase. Rainfall is expected to become more variable, with more extreme wet periods and droughts. Ocean acidification is also forecast to continue.

In the coming decades, these climatic changes are expected to affect the distribution and abundance of oceanic fish resources in the Kiribati EEZ, as well as in the quality and diversity of the coral reef and intertidal habitats that support coastal fisheries. Of particular interest to Kiribati are the potential effects of climate change on the abundant skipjack resources of the region and the future catches of this species within the nation's EEZ (see below).

Changes to fish distribution and abundance

Kiribati's annual tuna catch and the associated contributions to government revenue and domestic food fish supply are strongly tied to the change in oceanic conditions brought about by El Niño Southern Oscillation (ENSO) events. These events, which occur at irregular intervals and last for irregular periods of time, are characterized by changes to sea surface temperature, ocean currents and the distribution of ocean nutrients. El Niño episodes are the warm oceanic phase of ENSO and are accompanied by high air surface pressure in the western Pacific. Skipjack tuna, which dominates the large tuna fisheries of the region, is caught more easily further to the east during El Niño episodes (Lehodey et al. 1997) and high catches of this species are made in

Kiribati's EEZ at such times. During La Niña SO episodes, the cool oceanic phase of ENSO, the distribution of skipjack tuna shifts westward towards Papua New Guinea. At such times, relatively poor catches are made in the Kiribati EEZ. For example, the strong La Niña year in 2011 resulted in low tuna catches and very low associated access revenue returns for Kiribati (MFMRD 2013a). The small catches also affected the artisanal tuna fishery and domestic food fish supplies.

As the climate changes, the distribution of skipjack tuna is expected to move progressively east, so that the locations of the best catches will be more similar to those occurring under present-day El Niño condition (SPC 2012). The latest modeling for skipjack tuna suggests that modest increases in catch are likely to occur in Kiribati's EEZ by 2035 (Bell et al. 2013). Because ENSO events are expected to continue in the future, there will still be substantial inter annual variation in tuna catch.

The modeling of the effects of climate change of the other species of tuna (yellowfin, bigeye, and albacore) is not as advanced as the modeling for skipjack tuna. Nevertheless, this preliminary modeling also indicates that the effects of global warming on the tropical Pacific Ocean will affect the distribution and abundance of these species. For example, modest decreases in the catches of bigeye tuna are expected to occur in the Kiribati EEZ by 2050.

Other effects of climate change on fish species include changes to the reproductive success, recruitment, survival and growth of coastal (reef) fish species due to changes in ocean temperature, acidity, currents and mixing. These changes in oceanic conditions may also affect the larval dispersal and recruitment success of fish and the production and distribution of phytoplankton and zooplankton that supports the food webs underpinning coastal fisheries production. Thus, the value of traditional fishers' knowledge as to what species to catch, where to catch them and when, will likely decrease as oceanic and habitat conditions change.

As a result of the projected changes to the ocean, and to the quality of coral reefs (see below), the productivity of coastal fisheries is expected to decrease by 20% by 2050. Given

the projected increase in tuna catch and the high proportion of tuna in coastal fish catches in Kiribati, the availability of fish for coastal communities is not expected to be affected to this extent, provided adaptations can be made to switch some fishing effort from reefs to tuna.

Changes to habitat quality and availability

The projected growth in atmospheric CO₂ concentration as a result of climate change is anticipated to perpetuate ocean acidification. This acidification, combined with an overall increase in ocean temperatures, has already led to increased hard coral die-off in Kiribati. These effects are forecast to become worse, particularly around the easternmost islands of Kiribati, where saturation levels of aragonite are forecast to be among the lowest in the region in the future. Organisms that use aragonite, one of the two common forms of calcium carbonate in the ocean, to build coral skeletons and shells will be susceptible to decreased calcification due to ocean acidification. In general, coral reefs are not found where seawater aragonite saturation states are less than 3. In Kiribati, the aragonite saturation state declined from 4.5 (optimal for growth) in the late 1900s to about 3.9 (adequate for growth) in 2000. However, the projected decrease in aragonite saturation as the ocean continues to acidify is expected to lead to a progressive decline in the country's coral reef health.

Coral reef die-offs will affect the quality and availability of fish habitat and the abundance of reef-associated fish. Reef fisheries currently provide a valuable subsistence food source for I-Kiribati. This potential for coastal reef fisheries catch declines has significant ramifications for domestic food security in the face of human population increases in Kiribati.

Depending on the degree and timespan of future oceanic temperature increases, and degradation of coral reefs, the incidence of fish-borne disease outbreaks such as ciguatera, might also become more frequent (Llewellyn 2010; Bell et al. 2011). An increase in the incidence of ciguatera in reef fish has potentially serious consequences for communities dependent on subsistence coastal fisheries in Kiribati. The MFMRD coastal fisheries branch collects information on coral reef bleaching and ciguatera outbreaks (see Section 4.1.4.).

Changes to the availability of suitable coastal habitat for fish have the potential to negatively affect future aquaculture development opportunities. Such changes may compromise the siting potential and function of aquaculture operations.

Sustainability of coastal fisheries

In addition to potential impacts from climate change, the status of Kiribati fisheries resources are further threatened by persistent unsustainable fishing activities (Table 3). The effects of these unsustainable practices are particularly evident in the country's coastal fisheries resources. A review of Kiribati fisheries literature and fisheries independent sampling surveys collected in the late 1970s and early 1990s indicates that "large changes" to important coastal finfish resources have been ongoing in the country since at least the late-1970s (Beets 2000). These changes include shifts and declines in local abundance and species composition; and demonstrated declines in catch per unit effort in Tarawa Lagoon. These changes were precipitated by a decline in traditional fishing methods and an increase in the use of outboard engines and monofilament nets. Beginning in the 1970s, several lagoon fish aggregations and migrations have ceased or changed patterns, with the predominant cause appearing to be habitat loss or alteration and overfishing (Beets 2000). The lack of fishing quotas, species management plans, number of fishing licenses issued, and gear restrictions for lagoon and coastal resources across Kiribati only exacerbates these declines.

One cause for this habitat loss or alteration is from the blockage of fish migration channels and the alteration of coastal sedimentation patterns by the construction of causeways and seawalls (Beets 2000; Preston 2008). Unregulated development, pollution and poor waste management practices such as using lagoons as latrines have also led to coastal degradation in some areas, particularly in South Tarawa (Preston 2008). Without active management intervention, as much as 48% of Kiribati reefs are assessed to be 'at risk' from fishing, coastal and marine pollution and sedimentation (Bryant et al. 1998). Institutional structures, management regulations, and legislation do exist, with the purpose of ensuring the appropriate use of marine

resources and habitats (see Section 4), but these have not been significantly effective in practice. This may be partly because the provisions relating to marine resource conservation are scattered among several pieces of legislation.

There are a number of common fisheries resource exploitation trends throughout the Kiribati Islands. Many of these species have the potential to generate significant economic and social welfare benefits, but a lack of management intervention has led to their continued overexploitation. Fishing pressure has gradually increased over time in most islands where the primary or increasing purpose of fishing activities is for export (Awira et al. 2008). Commercially important fish stocks are generally found in low densities on islands in close proximity to the capital (Awira et al. 2008). Market demand in Southeast Asia for *bêche-de-mer* and shark fin products has notably increased the exploitation rates for these species in the past few years (MFMRD 2011). Islands such as Abaiang, Abemama, Kuria and Kirimati still have a healthy and relatively abundant population of carnivorous reef-based *Lutjanidae* snapper, but herbivorous *Scaridae* reef fish are much less abundant due to gillnet-associated fishing pressure (Awira et al. 2008).

Kiribati's oceanic coastal fisheries resources face significant sustainability challenges. Regional and domestic conservation and management of tuna is particularly challenging because of the interconnectivity of highly migratory and biologically different stocks, and the number of countries involved in fishing for them in the WCPO. These interconnectivities make it particularly difficult to generate and execute species-specific management responses.

Given the significance of Kiribati tuna fisheries in the WCPO region, Kiribati must be involved in any regional measure to reduce fishing impacts to sustainable levels. This applies to tuna in particular, but there is growing regional and global concern over the sustainability of other oceanic species such as sharks, which are targeted in some Kiribati coastal fisheries and caught as bycatch in Kiribati offshore tuna fisheries. Any actions taken with regards to the regional sustainability of tuna stocks will require careful negotiation to ensure that any measures do not unfairly impact on Kiribati interests.

In particular, care will need to be taken with any measures that restrict the use of FADs to control purse seine effort and reduce tuna fishing mortality. Such a measure might result in much-needed reductions in the mortality of non-target juvenile yellowfin and bigeye tuna in the WCPO but it will negatively affect Kiribati's highly valued purse seine fleet. Given the institutional and governance structure challenges that Kiribati faces (see Section 5.5), it will probably require technical assistance to implement any conservation measures.

Population, food security and coastal fisheries management

Population and food security challenges

Almost half of I-Kiribati in the entire Kiribati chain live in two urban centers. South Tarawa contains 44% of the Kiribati-wide population of 103,500 in 2010 and Kiritimati contains 6% (MFMRD 2011). With a recorded population density of 2,558 people per km² in 2005, South Tarawa, and Betio in particular, are considered to be seriously overpopulated (MFMRD 2011). This is in stark contrast to the approximately 127 people per km² in the remainder of country. This presents a set of unique environmental and socioeconomic challenges for the country, as it suffers from the effects of overpopulation, while lacking a sufficient population base to readily support a high-skills industry and institutional development initiatives.

The most significant medium- to long-term population concern in Kiribati is the challenge of ensuring future food security for the highly concentrated population of South Tarawa, without compromising the already threatened sustainability of lagoon fisheries in Tarawa or elsewhere in the country. Kiribati lagoons and coastal fisheries are heavily used for artisanal and subsistence domestic food needs (see Section 2.2 and 5.1.2.). Currently, these fisheries provide sufficient fish protein to meet domestic demand and unlike in many Pacific Islands, Kiribati fisheries are projected to continue to do so if serious redistribution issues are addressed in a timely manner (ADB 2009; Bell et al. 2009).

Tarawa's large population provides a strong market for selling fish resources. Fish provide over half of Kiribati's animal protein consumption at 62 kg per capita annually

(Bell et al. 2009), and approximately 25% of the country's total protein consumption (See Section 3.5). However, with an expected population increase to 130,000 I-Kiribati by 2025, the subsequent growth in a per-capita food fish demand, combined with a limited domestic capacity for supply, a strong dependence on imported staple foods such as flour and rice, and rising international food prices, means that pressure on lagoon resources will continue to increase.

Already there are signs of overexploitation and habitat degradation in lagoons around South Tarawa and in surrounding islands. A 2009 SPC study identified that continued efforts to supply urban market demand may eventually lead to overfishing and local food fish undersupply in adjacent rural communities, as these fishermen become motivated to supply urban demand (MFMRD 2011). These fishermen currently face considerable challenges in terms of transporting their catch to distant markets. Some resource stakeholders have raised concerns that overfishing and population pressures are placing coastal fisheries under increasing pressure, and that urgent management interventions are required to safeguard subsistence and artisanal fishing communities. Further adding to overexploitation pressure, is the possibility that increasing ocean temperatures due to climate change may also increase the incidence of fish-borne disease outbreaks such as ciguatera, which could affect critical subsistence reef fish fisheries and the availability of fish protein in turn.

Wild fisheries resources are not the only possible option for supplying fish to a growing population. MFMRD has a long-running aquaculture programme but little funding to support its existing and proposed projects. There exists no clear strategic business or development plan for the industry. Many of the existing projects are decades old with little or no review of their significance or priority, and there is no apparent consideration of the changing industry and development circumstances around their operation. Government-funded enhancement projects for threatened and high-value species have had no notable positive impact on the recovery of wild stocks to date (Preston 2008).

While the MFMRD employs skilled and experienced aquaculture staff, operational capacity is poor, particularly with regard to training and expertise in certain operational skill sets (MFMRD 2013a). If interest in this sector is renewed, and the appropriate funding, technical support, and companion management measures are developed and put in place, the best prospects for production may be seaweed, milkfish and *te Bun* translocation. Any commercially-viable sector expansion is likely to be restricted by suitable siting and space constraints along with strong competition from countries with lower production costs and more established and effective transportation to key markets (MFMRD 2013a).

Coastal fisheries management challenges

The Government of Kiribati faces considerable challenges in managing its coastal fisheries resources to effectively provide fish protein resources to its entire population. One significant challenge is the lack of cohesion between the broader government, the MFMRD, and the island councils responsible for the management of resources inside 3 nm from the low-water line (See Section 5.5). Coastal fisheries in Kiribati (within 12 nm of the shore) are largely unregulated, with existing management arrangements focused on licensing revenue rather than on conservation. Island councils have some understanding of sustainability issues, but lack technical expertise and face strong financial pressures. Fisheries management activities therefore focus on license and revenue collections almost by necessity and there is limited capacity for additional support from the current MFMRD. Any conservation and sustainable management activities undertaken in coastal fisheries should apply a co-management approach.

Social challenges in Kiribati fisheries

In line with global fisheries trends, I-Kiribati fisheries have become increasingly mechanized and outsourced, and employment opportunities have moved increasingly offshore. There is an increasingly high incidence of single or female-headed households in Kiribati as men leave for long periods of time to crew foreign vessels (Vunisea 2003). The societal role of women in the workplace is expanding as they take on more of the financial responsibility of looking after their families. The

participatory and supportive role of women in the I-Kiribati work force may be slowly changing but their role in providing knowledgeable input into needed changes and development opportunities has not. A general lack of recognition about the vital role that I-Kiribati women play in the fishing sector, particularly in coastal and inshore artisanal and subsistence fisheries as well as in the processing and vending sub-sectors, undermines the ability of Kiribati to effectively assess the value and status of its fisheries or to use existing knowledge to better adapt and develop its fisheries.

The increase in transshipment, and the fact that Kiribati is a major port for DWF vessels, is thought to be exacerbating existing alcohol abuse and marital conflict, and has led to increases in prostitution, as well as a rise in the spread of Hepatitis B, HIV/AIDS and other STIs (Vunisea 2003; Barclay and Cartwright 2008). The rise in young, often teen, female casual sex workers called *korekoreas* or more recently *ainen matawa* has been of particular concern to the Government of Kiribati and local communities (McMillan and Worth 2010). *Ainen matawa* reside in small community groups on both Tarawa and Kiritimati. They are not necessarily exclusively women (McMillan and Worth 2010). The spread of STI and HIV infection among the broader seafaring community is thought to have been greatly exacerbated by prostitution activities, and efforts have been made by government, NGOs, local authorities, churches, and traditional bodies to try and curb these activities with little success to date (Vunisea 2003). Seafaring vessel crew and wives made up more than 50% of Kiribati's 38 HIV cases in the mid-2000s; this is not a problem specific to prostitution in Kiribati (Barclay and Cartwright 2008). Despite the fact that the Kiribati sex trade is against traditional and customary beliefs and principles and that *ainen matawa* are largely socially marginalized as a result (McMillan and Worth 2010), sex trade workers cite lack of alternative employment options and an 'easy life' as motivation for engaging in prostitution (McMillan and Worth 2010).

Another social challenge in Kiribati fisheries is the high-risk fishing methods in which many I-Kiribati fishermen engage. Deaths due to dangerous fishing practices such as free diving and blast fishing and losses at sea are not

uncommon. The Marine Guard keeps a record of these statistics. Fishermen often disregard safety advice delivered by the coastal fisheries branch because they interpret this advice as being told how to do their job and because fishing prowess is a matter of great pride in the I-Kiribati community (MFMRD 2013b). The SPC and the coastal fisheries branch have held two safety-at-sea workshops and at-sea safety is a big part of outer islands extension work (MFMRD 2013b). Skills taught include basic engine maintenance and what to carry onboard to be safe. MRAG has also been involved in safety at sea activities (personal communication from D. Souter, 2013). One of the incentives of putting out FADs is to ensure safety of fishermen (MFMRD 2013b).

Licensing revenue and development

Kiribati's focus in coastal fisheries management and development should not be on revenue collection, but it could still do more to collect a reasonable resource rent from the commercial uses of its common pool inshore resources. The challenge in doing so will be to balance the need to keep fisheries healthy and sustainable in outer islands, while supplying growing demand in South Tarawa. This presents a significant development opportunity in logistics and industrial service provisioning. For example, the Government of Kiribati could require a fee for a service and nationals could deliver this service on a commercial fee basis. Such services could create further employment, income and revenue. Fuel bunkering is also another service that has the potential to generate fees.

In addition, the cost of doing business in Kiribati is relatively high. Fisheries development in Kiribati is undermined by insufficient and degraded infrastructure; limited shore-based facilities and developable land; problems with freight, water and electrical power; critical institutional weaknesses; and lack of government financial support (MFMRD 2011). Despite significant support from the FFA, Kiribati is still struggling to establish a competent authority to monitor and certify seafood exports. The successful establishment of this authority is necessary for the new processing facility at Betio and for exporting to the EU.

A key challenge to the expansion of small-scale commercial fisheries is the lack of economically efficient mechanisms to transfer fish from abundant fisheries in outer islands to strong markets in South Tarawa (Preston 2008). Further aquaculture sector development faces strong competition from countries with low production costs and more efficient transportation links to major markets (Preston 2008). There will also be competition from relatively cheap and readily available tuna.

Governance and institutions

Kiribati suffers from institutional challenges in its lead agency for fisheries - the Ministry of Fisheries and Marine Resource Development (MFMRD), and very limited capacity in the island councils that manage coastal fisheries. Some of these issues are highlighted in Section 4.

The MFMRD suffers from an ongoing high turnover in senior executive positions and systemic problems in: financial analysis and reporting; lack of documentation (with subsequent concerns for transparency and accountability); lack of technical advice into access negotiations and international negotiations; weaknesses in licensing; and a decision bottleneck at the ministerial level.

The MFMRD has a long-running aquaculture program but has little funding to support its existing and proposed projects. Many of the continuing projects within this program have been in operation for over a decade with scant review of their significance or priority, or consideration of the changing industry and development circumstances around their operation. Although MFMRD has skilled and experienced staff in aquaculture operations, there is a significant gap in policy and strategic planning, which means that the aquaculture program is not supporting local development as effectively as it might otherwise.

In 2010, the Kiribati parliament confirmed a new Fisheries Act. However, coastal fisheries within three nautical miles are managed by island councils, through the Local Government Act. This Act requires review and substantial updating of its provisions relating to fisheries. Island councils have some understanding of sustainability issues but face strong financial pressures and tend to focus on licensing and revenue collection.

The MFMRD and the government have a number of operational weaknesses with respect to the organization and management of information on Kiribati fisheries. This information is critical to the information used in fisheries management decision-making (Preston 2008). Information from survey results, fishery statistics, development activities, and other sources are difficult to access because of: inadequate library organization, outdated statistics collection and archiving protocols, poor reporting and inadequate information-sharing protocols. Fisheries information is not currently organized in a manner that would support island-by-island resource assessments and it is not clear how it informs current coastal fisheries management and policy. This information is necessary for the development of domestic and regional, national and island-based fisheries management plans (Preston 2008).

FOCUS ON COMMUNITY-BASED FISHERIES MANAGEMENT

Kiribati is the world's twelfth largest maritime State, stretching across thousands of kilometers and encompassing some of the world's most diverse and productive marine ecosystems. It is a nation of seafarers and fishers, rich in their knowledge of the sea and their skill. This provides I-Kiribati with an accessible resource and livelihood that provides crucial food security and a critical pathway out of poverty.

Kiribati faces a difficult challenge where it must balance economic development interests with food security concerns and manage tensions between artisanal and commercial fishing interests. Small-scale artisanal fisheries offer important opportunities to develop local economies and address distribution obstacles to food security for urbanized communities such as Tarawa. In order to promote these developments, it is important to build certainty in regulation, reduce competition from state-owned enterprises and ensure fishing effort is limited to sustainable levels. Small inshore vessels can efficiently supply fresh fish and tuna to the local market at competitive prices, allowing for some specialization to fill different customer demands for a diversity of ocean fish (sashimi, different tunas for customer requests, billfish, mahi mahi etc.).

Increasing the benefits from sustainable fisheries to Pacific islanders offers one of the best opportunities to address some of the key economic issues facing the countries of the region. In the smaller island and atoll states in particular, where there is very little land, there are few other opportunities for sustainable economic development. For some countries, commercial fisheries are possibly the only sector with that potential. Improving the sustainability of fisheries is likely to become of increasing strategic significance in regional economic growth and stability.

AusAID (2007)

Simultaneously, it is critical to protect food security through managing subsistence and artisanal fisheries and limiting fishing efforts to sustainable levels – in some cases, this may entail closing down overfished fisheries and

rebuilding stocks. The best scenarios for subsistence fishers are those where communities have controls in place that recognize overharvesting and set socially enforced rules that protect everyone's future. This might involve limiting access by reef areas or seasons, drawing on traditional practices and community decisions and rules. For example, some islands do not allow powerboats, or prohibit gill nets for flying fish capture. It might also involve the transfer of some subsistence fishers into alternate fisheries in order to enable shoreline stocks to recover.

The SPC/FFA report, *The Future of Pacific Island Fisheries*, painted a bleak scenario of the effects of fisheries management failures for Pacific Island States:

Community-based management arrangements collapse after donor interventions cease, and poverty and commercialization destroys conservation ethic. Massive overfishing, particularly in urban areas due to domestic and export demand and failure of management systems; resource abundance driven so low that production of important species drops remarkably... Many high-value species are wiped out due to the failure of even simple management. Coral bleaching and other effects of climate change alter species composition and reduce fishery production from reefs. Uncontrolled pollution and poorly designed development degrade habitats. Exports after 2010 surge but subsequent overfishing causes resource and export volume to crash leading to a large decrease in employment in some countries. Tourists repelled by barren reefs. Flows of fish to urban areas crash due to low catch rates in nearby areas, and poor logistics of transporting fish to urban areas. Failed 'development' schemes and habitat destruction have resulted in declines in flow of fish to villages. Some food fish exported at the expense of domestic food supplies. Collapsed coastal fisheries accelerate urban drift.

Gillett and Cartwright (2010)

Given the high dependence on fisheries by Kiribati, this worst-case scenario is likely to result in a future of food aid, mass emigration and social, economic and environmental catastrophe. It is no exaggeration to conclude that the viability of Kiribati as an independent State is directly linked to the sustainability of its marine resources.

In order to avoid this potential scenario, it is critical that communities, industry and government collaborate to implement conservation and management mechanisms that promote economic development, limit fishing effort to sustainable levels, and protect important habitats. Given Kiribati social and governance structures, this initiative must be driven by island communities, with technical and regulatory support provided by MFMRD and other ministries, as required.

Protection of village food fish supplies is arguably the most important objective of the management of coastal fisheries in the Pacific islands, but to know if such management efforts are effective overall, some idea of the gross coastal fisheries production is required. In terms of government priorities, it seems that a lack of production information tends to lead to a lack of attention.

Gillett (2009)

Developing and implementing effective conservation and management regimes requires information and data on fishing activities, and at least some understanding of the fish stocks and habitats impacted by the activities. Unfortunately, there are significant gaps in knowledge and data about coastal fisheries. Kiribati has focused its limited resources on the high-revenue generating oceanic tuna fisheries and has devoted relatively few resources to the coastal subsistence and artisanal fisheries sectors. This makes it difficult to accurately analyze and represent the benefits from coastal fisheries, especially in terms of GDP contribution, employment and nutrition.

Community-based fisheries management pilot trials

In 2012, AusAID provided A\$6 million to ACIAR to support community-based fisheries management (CBFM) and aquaculture projects in Kiribati, Solomon Islands and Vanuatu. ACIAR contracted Worldfish, SPC and ANCORS to implement these projects from 2013 to 2016. Following initial consultations in Kiribati, MFMRD and the project team agreed that community-based fisheries management (CBFM) pilot trials should be held in North Tarawa and Butaritari.

Initial consultations with MFMRD identified limited available or accessible data on coastal fisheries in Butaritari and North Tarawa, and confirmed that coordination between MFMRD and other ministries with the relevant island councils was weak. There is a significant amount of personal knowledge held by MFMRD staff of the coastal and lagoon fisheries in North Tarawa and Butaritari but there are few formal records of the significance of these fisheries to food security, livelihoods or national exports due to the significant institutional information and data management weaknesses mentioned in Section 5.5. Nevertheless, some socioeconomic and fisheries information does exist at the island level. The available information for North Tarawa and for Butaritari is presented here with key fisheries issues identified in the initial consultations for these islands.

Profile: North Tarawa

North Tarawa is one of two islands that make up Kiribati's capital Island of Tarawa. It is composed of several islets and 15 villages (Figure 7.). A main dirt road and small causeways connect some, but not all, of these villages. The island's administrative capital is in Abaokoro, which has much of the essential infrastructure on the island, including junior and secondary schools and a medical center. Prior to British colonialism, North Tarawa had a king based in Taratai but the island has been administratively governed by the elected islands council and Unimwane Association for decades (MISA 2008a).



Figure 7. A map of North Tarawa showing villages and major landmarks.

In 2010, the population of North Tarawa was 6,102 people, from 5,678 in 2005 (ROK 2012a). This represents nearly 6% of Kiribati's total population, at a density of roughly 400 people per km² and an average family size of 6 people. At least 37% of the North Tarawa population is under the age of 15, and 66% of the population is under 30 years old (ROK 2012a). The population is roughly even by gender (MISA 2008a). The villages closest to South Tarawa have had the greatest population growth, and some people commute to South Tarawa for work from these villages. Transportation throughout much of the island is difficult, as many islets are divided by sea channels with no bridge or causeway and can only be reached on foot at low tide. However, there are regular 'commuter' boats that travel from around the islands to Buota and South Tarawa. These boats rely on oil and petrol from South Tarawa.

A total of 34% of the population over 15 years of age is engaged in some kind of cash work, which is high in comparison to other outer islands, due to North Tarawa's high participation

in market-oriented activities. The Eutan Tarawa Council in Abaokoro is the biggest employer in North Tarawa, employing 64 people in 2010. A total of 35% of the population holds a senior secondary certificate, which is about the same as the national average, while 11% have completed no schooling. This is slightly worse than the national average of 10% non-completion (ROK 2012a).

In terms of land and marine resources, North Tarawa has most of the same resources as other outer islands. On land this means coconut, pandanus and breadfruit. Produced products include building material such as thatch and coconut mats, for which North Tarawa is well-known, as well as toddy, cooked local foods, firewood, de-husked coconuts and handicrafts. The government-owned Kiribati Handicraft and Local Produce Company (KHLP) often facilitates the sale of handicrafts and local products for commercial purposes (MISA 2008a). North Tarawa does not engage in copra production as much as other outer islands, perhaps because of the number of alternative income options.

Most households own pigs and chickens (ROK 2012a). Land not used for settlements or infrastructure is individually owned by inheritance and some families may share lands.

Like most islands in Kiribati, North Tarawa is much richer in terms of its marine resources. It has 129 km² of reef with a base of 375 km² and 533.9 km² of lagoon (ROK 2012a). Fishing, largely excluding invertebrates, is an activity carried out by men. It is a commercial, subsistence and hobby activity and is the main source of animal protein for North Kiribati residents (MISA 2008a; ROK 2012a). Catches may be sold fresh or salted and dried, to the local community or sold in South Tarawa markets (MISA 2008a). Some catches may be freely distributed around the community at no cost.

The most common method of lagoon fishing uses nets but shellfish are commonly collected by women on the lagoon flats (MISA 2008a). Reef and lagoon species harvested using lines, nets, traps and spears in North Tarawa include *lkari* or bonefish, snappers (*Lutjanidae*), jacks and trevallies (*Carangidae*), emperors and breams (*Lethrinidae*), silver fish (possibly *Aphareus* spp.), goatfish (*Upeneus* spp. and *Mulloidichthys* spp.), mullet (*Mullidae*), surgeonfish (*Acanthurus* spp.), spiny lobster, and octopus (*Octopoda*) (ROK 2012a). Common shellfish species include *Bun* (*Anadara antiquata*), *Koikoi* (*Trachycardium* sp.), *Koumwara* (*Gafrarium pectinatum*), *Nikatona/Nikabibi* (*Perighkypta reticulata*) and *Nouoo* (*Strombus luhuanus*) (MISA 2008a). Seaworms are considered to be abundant in the North Tarawa lagoon but are not harvested as much as in the outer islands (MISA 2008a). Ocean fishing for skipjack and yellowfin tuna, shark, oil fish and flying fish using short and long lines also occurs but it is much less common than lagoon fishing. Not all fishers own boats or canoes, but more than 60% of the population has access to one (MISA 2008a).

In terms of fisheries governance, capacity, and infrastructure, there is no MFMRD technical fishery assistant on the island; this role is supposed to be cross-covered by coastal fisheries branch office in Tanaea (MISA 2008a). The MFMRD currently provides development support for income-based sea cucumber harvesting and provides some training programs in at-sea safety and fish handling. There is a small, privately operated, giant clam hatchery in Abatao; and a boat-building

business and infrastructure for fish smoking and fish jerky. There are no formal landing sites in North Tarawa and no permanent boat ramps, docks or sheds. There is a fish center and ice plant in Buariki but it is not currently operational. There is also a conservation area that was established in 1996 but this is not currently actively managed (MELAD 2013) and its legal status is unclear. Table 17 outlines some of the key fisheries activities and issues from a brief consultation undertaken in April 2013.

In terms of environmental issues, the biggest land-based environmental threats are coastal erosion and flooding during sea surges (ROK 2012a). This affects available land area for living and for agriculture and affects the quality of North Tarawa's predominantly open-well freshwater resources. Improper dumping of garbage and a lack of proper sanitation facilities has led to water pollution, including pollution of lagoon fishing grounds. Extended droughts are causing health problems related to the increased dust. However, with the exception of a common vitamin A deficiency, the population of North Tarawa is relatively healthy in comparison to Kiribati on the whole (ROK 2012a). North Tarawa has a persistent rat problem. Eradication programs have been unsuccessful and are complicated by local taboos (ROK 2012a).

In the marine environment, lagoons are at risk both from pollution and from overfishing and destructive fishing practices (MISA 2008a). Many of the formerly abundant species, which used to be common in the lagoon, such as goatfish, bonefish, lobster and octopus, are now much lower in abundance (MISA 2008a). Some of this overfishing is allegedly due to South Tarawa fishermen coming to fish in North Tarawa waters. Current island council bylaws are not robust enough to combat this threat. The fish center and ice plant in Buariki are also not currently operational and the management responsibility for the center is uncertain.

The North Tarawa lagoon has been identified as a 'key biodiversity area' due to the presence of 'trigger species' which include green turtles, bigeye tuna, humphead wrasse (*Cheilinus undulatus*) and giant clam (*T. gigas*) (MELAD 2013). The main threat to these species is listed as human population growth, particularly: the introduction of alien species, overfishing, housing and other development activities (MELAD 2013).



Artisanal fishing canoe in the North Tarawa lagoon.

Activity	Context
Commercial fisheries	<ul style="list-style-type: none"> • South Tarawa fishing in North Tarawa for red snapper for sale in South Tarawa. Some personal low-scale exportation in ice bins (eskies) at airport to family contacts overseas • South Tarawa fishing in North Tarawa for bonefish for sale in South Tarawa. Some personal low-scale exportation in eskies at airport to family contacts overseas. • In both cases, these are illegal activities. No fees paid to North Tarawa island councils. However, market fees are paid to South Tarawa island councils where the catches are sold. • Bêche-de-mer no longer operates due to overfishing. • Giant clam aquaculture for foreign export. • Sea worm is harvested by North Tarawa for sale in South Tarawa. • Lobster is harvested by North Tarawa for sale in South Tarawa. • Other small-scale catches are harvested by North Tarawa for sale in South Tarawa (goatfish, silver fish, occasionally octopus – some drying out of octopus when season is dry). • Old studies in 1990s on biosystems in North Tarawa • Export data is available for national exports of bêche-de-mer, shark fin and other species, but not disaggregated down to atoll. • Exporting agents may have information by atoll, but this is not currently collected. • North Tarawa mostly fishing from local canoes, shore based nets gillnets, handlining, diving, spearfishing • Collection of milkfish fry for sale to aquaculture • UVC (underwater) surveys and socio economic surveys by MFMRD
Subsistence fisheries	<ul style="list-style-type: none"> • Bonefish, snapper, silver fish, goatfish, lobster, and octopus are all caught and consumed locally. • Gleaning of shellfish • Rice and flour is sold in North Tarawa. • Not much tuna caught or sold (much more in South Tarawa)

Activity	Context
Governance arrangements	<ul style="list-style-type: none"> • Bêche-de-mer. No management arrangements or controls. MFMRD developing national management plan (under development since 2007 but SPC now providing support – expected to complete late 2013). • No plan for bonefish in either north or South Tarawa. There was an early attempt to establish a bonefish plan between Betio, Sth Tarawa and North Tarawa years ago. • National regulation on lobster covering all islands. • MFMRD can pass national regulations prohibiting, regulating activities which then override island councils bylaws (i.e. if Kiribati prohibits shark finning, this overrides bylaws). • North Tarawa has bylaws on fishing (for example, prohibiting splash fishing on bonefish but no capacity to enforce). See MISA for further info on bylaws. No process for informing MFMRD of bylaws. Island councils only inform MISA. • Export requirements and fees for all national exports. • MFMRD collects aggregated data (BDM, fins, KFL loins - ask Mbwenia for database) • Some community decisions will only be made at community/village level (i.e. community decides no more 'grog') but most key decisions are made by island council (for example, location of FADs is decided by Island Council).
Capacity	<ul style="list-style-type: none"> • Very little capacity to develop and implement bylaws. • Lack of capacity to consider fisheries issues. • Drafting of bylaws is weak with inadequate language. • Problems with demarcations of zones. • Island Council has no fisheries staff. Island council has a special constable who supervises police. They are responsible for enforcing bylaws. No boats. • MFMRD employs coastal fisheries assistant (FA) to support island councils. MFMRD pays salary but Island Council must provide housing. MFMRD does not do so for North Tarawa due to proximity. Instead MFMRD can respond to requests from North Tarawa for assistance. But MFMRD currently lack sufficient staff. MFMRD currently employs approximately 20 staff – not enough for every inhabited atoll. • No NGOs, but some church groups.
Management challenges	<ul style="list-style-type: none"> • Some police arrests and prosecutions of illegal fishing of snapper and bonefish in North Tarawa by South Tarawa. But regulations are very weak and some prosecutions have been lost or resulted in no fines. • Consultations with community should be with Island councils, then Maneaba by <i>maneaba</i>. Have to pay for sitting allowance for island councils and gifts/ food for <i>maneabas</i>

Table 17. Key activities and issues in North Tarawa coastal fisheries. Information was obtained through consultations in April 2013.

Profile: Butaritari

Butaritari is a northern Gilbert atoll island located nearly 200 km north of Betio, Tarawa. It is a long and narrow island, at 69.27 km long, with a maximum width of 2.6 km and a total land area of about 13.49 km² (ROK 2012b). Butaritari's 2010 population was 4346 (Kiribati Census 2010) which represents an increase from 3280 in 2005. Population growth trends are complicated by interisland migration with nearby Makin Island. At 322 people per km², Butaritari is the third most densely populated island next to South and North Tarawa and comprises roughly 4.2% of Kiribati's total population (ROK 2012b). The population is roughly even by gender. At least 35% of the population is under 15, which is consistent with the national average. There are relatively few people aged 15–19; this is most likely due to the lack of a secondary school on the island. The majority (91%) of the population is literate in the Kiribati language. Just 28% of the adult population has a secondary school certificate and 12% of adults have completed no schooling (ROK 2012b).

Butaritari's roughly 630 households are made up of 7 people on average and they reside in 12 major villages connected by a road that runs the length of the island (Figure 8). Kuuma and Keuea villages are connected to the mainland by the Teibo causeway while Bikaati remains unconnected. Most of these villages are located along the road on the lagoon-side (ROK 2012b). Temanokunuea is the central village and the location of the Butaritari Island council. It also supports an airstrip and a health clinic as well as government services such as communication, health, finance, a wharf and a boat harbor. It is the third most populous village next to Taubukinmeang and Ukiangang (ROK 2012b). Once governed by kings and chiefs, the people of Butaritari are now overseen by the Government of Kiribati through the Butaritari Island Council and Unimwane. Land ownership is family-based rather than individually owned. Freehold land is leased by the Island Council (MISA 2008b).

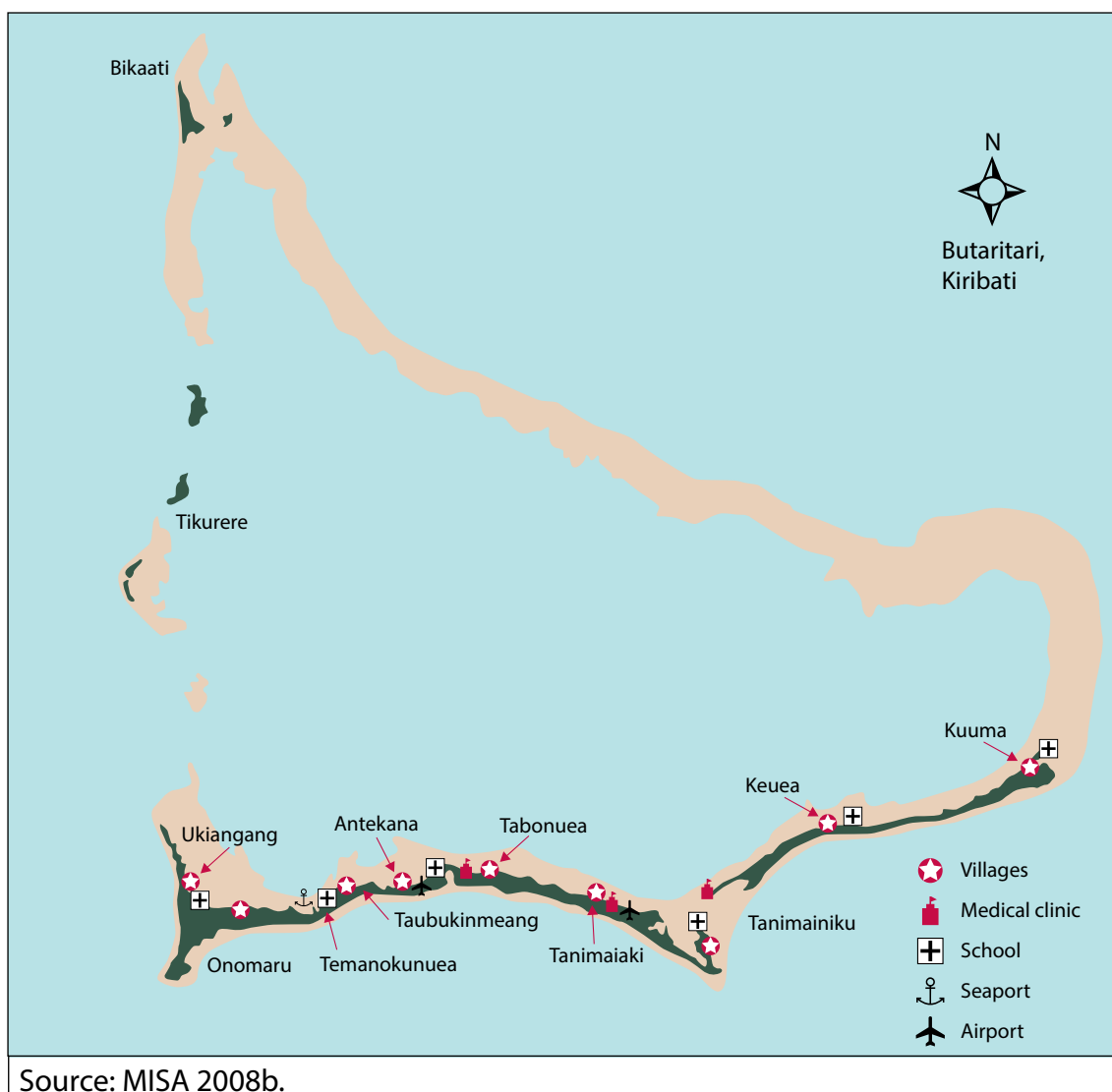


Figure 8. A map of Butaritari showing villages and major landmarks.

Despite having an air connection to Tarawa as well as a wharf, Butaritari does not have a regular air or ocean-freight service. The costs of purchasing and maintaining a vehicle are high and mechanical repair shops are generally poorly equipped. As such, few people on Butaritari own any kind of transportation and rely instead on private hire trucks as a key means of transport. The island council and a few church groups own trucks available for hire. The council, as well as some individuals, also own canoes and boats for fishing and interisland transport. Approximately one in three Butaritari households owns a boat (MFMRD 2013c).

Butaritari has one of the wettest and most humid climates in the Gilbert Islands. As a result, it seldom suffers from drought, although 86% of households still rely on wells rather than rainwater. Butaritari's regular rainfall as well as the presence of organic topsoil means that the island benefits from a comparatively biodiverse landscape. The island has four species of mangrove and agricultural crops are often abundant enough that the surplus is regularly shipped to markets and to relatives in South Tarawa (ROK 2012b).

Like most islands in Kiribati, a significant portion of Butaritari's family income is derived from agricultural and fisheries resource activities. While coconut growing and harvesting is still a common activity in Butaritari, another popular income-generating activity is growing bananas to export to South Tarawa. Pumpkin and cabbage are also regularly grown. At one point, MELAD was working to expand a common garden near the airport in order to facilitate fresh shipments to South Tarawa (ROK 2012b). Copra is not a main source of income for a range of reasons including the humid climate and issues surrounding family versus individual land ownership (ROK 2012b). Subsistence activities include fishing; toddy cutting; food crops such as coconut, pandanus, breadfruit and *bwabwai* (giant taro); weaving; thatch; rolling string; fetching water and fuelwood; making fish traps and hooks; cleaning and washing; and house construction. As on other islands, Butaritari's main environmental concerns are coastal erosion, in particular in the villages nearest to the causeway; and flooding of agricultural land during high sea surges. A lack of appropriate garbage disposal and sanitation systems also means that land and lagoon areas suffer from pollution problems.

Butaritari has abundant marine resources, with 86 km² of reef and 295.77 km² of lagoon (ROK 2012b). Artisanal survey data collected by the MFMRD coastal fisheries branch records that 63 individual species of finfish and 19 species of invertebrate were caught using primarily gillnets, handlines and trolling in Butaritari in 2012 (MFMRD 2013c). Invertebrate species caught include: octopus, clams, cone shells, rock lobsters, crabs and sea cucumbers. Butaritari has a species of fish believed to be unique to only that island in Kiribati: *te Kimokimo* or mackerel scad. Table 18 provides a list of coastal vertebrate species produced in Butaritari in 2012, courtesy of the 2012 MFMRD Coastal Fisheries Artisanal Survey.

The MFMRD estimates that finfish are consumed in Butaritari more than four times a week on average, for a total average per capita consumption of 126 kg of finfish per year. The vast majority of this is caught in three or four trips per week of two to three hours each by individual households for subsistence purposes (MFMRD 2013c). In contrast, canned fish is consumed less than one day per week. Roughly one-third of Butaritari's adult population identifies as a fisher (MFMRD 2013c). Of the number of fishers surveyed, roughly 4% are female and 3% of these are invertebrate fishers.

There are a number of MFMRD-led hatchery, farming and wild stock enhancement projects in Butaritari. Hatchery species for wild restocking include sea cucumber (White teatfish) and a shellfish called *bwaraitoa* (MISA 2008b). There is an adult *te Bun* transplant and reseeding program but people are not waiting for spawning and resettlement to occur before harvesting so the project is not progressing well (MFMRD 2013b). Farm-reared species include mother-of-pearl oyster and giant clam, both of which are grown from hatchery seed from Tarawa.

As with many outer islands, Butaritari suffers from a lack of fishing equipment and a difficulty in accessing domestic markets due to its remoteness. It has no ice plant and so salting and drying are the only preservation methods available. Butaritari has no FADs. While the addition of culverts to the Teibo causeway has helped improve the status of some fish species such as bonefish, depletion of lagoon resources such as sea cucumbers, mangrove crab (*ma'nai*),

octopus, lobster, and shark is an issue (ROK 2012b). Coral die-offs and reef habitat invasion are also an issue due to the unchecked growth of *Eucheuma* seaweeds which were once farmed in the islands but have since been left unmaintained. Table 19 outlines some of the key fisheries activities and issues from a brief consultation undertaken in April 2013.

Despite the relative abundance of agricultural and fishing activities on the islands, only 356 of 2840 adults over 15 were engaged in cash work in 2010 (Kiribati Census 2010). Of this number, 59 of these adults were involved in the Island council. This means that food exports are an important source of cash income for only a select number of families (ROK 2012b).

Family name	English common name	Kiribati common name	Total annual catch (t)
Acanthuridae	surgeonfishes, tangs, unicornfishes	<i>Koinawa, Mako, Riba</i>	10.7
Albulidae	bonefishes	<i>Ikari</i>	22.2
Balistidae	triggerfishes	<i>Binaing, Bubu</i>	6.0
Belonidae	needlefishes	<i>Mwake/Make</i>	13.2
Carangidae	jacks, pompanos, scads, runners	<i>Aong, Bari, Kama, Kimokimo, Nari, Rereba, Tauman</i>	93.8
Chanidae	milkfish	<i>Baneawa</i>	0.9
Elasmobranchii	sharks, skates, rays	<i>Bakoa</i>	0
Epinephelinae	groupers, sea basses	<i>Bakati, Kuau, Kuau te bero</i>	31.2
Exocoetidae	flyingfishes	<i>Onauti</i>	141.9
Gerreidae	mojarras and silver-biddies	<i>Amori, Kobe, Ninimwai, Nibongbong</i>	17.7
Hemiramphidae	garfishes	<i>Ana</i>	5.6
Kyphosidae	sea chubs	<i>Inonikai</i>	0.7
Lethrinidae	emperors	<i>Okaoka, Rou</i>	208.8
Lutjanidae	snappers	<i>Awai, Bawe, Bwao, Ikanibong, Ingo, Takabe, Tinaemia</i>	182.0
Mugilidae	mullet	<i>Aua, Baua</i>	50.3
Mullidae	goatfishes	<i>Maebo, Tewe</i>	70.0
Scaridae	parrotfishes	<i>Ikamawa, Inai</i>	11.1
Scombroidei	barracuda, wahoo, tuna, mackerel, swordfish	<i>Ati/Atiwaro, Baara, Baitaba/ Baiura/ Ingimea, Ikabauea, Raku</i>	109.9
Siganidae	rabbitfishes	<i>Imnai</i>	7.8
Tetraodontidae	pufferfish	<i>Buni, Tauti</i>	0.1
Other	misc. finfishes and other vertebrates	<i>Bukibuki, Karon, Kunkun, On, Manai, Mon, Nimwanang, Ntabwabwa, Rabono, Reiat, Uaanati</i>	55.8
Total			1,039.4

Source: MFMRD Coastal Fisheries Survey 2012.

Table 18. Coastal finfish caught in Butaritari in 2012. Additional unsorted grouper or parrotfish species produced include Ikaroro, Neimata, and Tania. Some invertebrate species have been included in 'Other'. Some concern exists over the reliability of catch data.

Activity	Context
Commercial fisheries	<ul style="list-style-type: none"> • Bêche-de-mer for national export through various Tarawa agents (~ 7 or 8) • Live reef fish previously for national export, but now banned. • Clams (dried and salted) for sale to South Tarawa • Dried reef fish for sale to South Tarawa • Dried tuna for sale to South Tarawa • Seaweed for sale to CPPL then national export • Lobster for sale to South Tarawa • UVC (underwater) surveys and socio economic surveys by MFMRD
Subsistence fisheries	<ul style="list-style-type: none"> • Snapper, reef fish, tuna, lobster, clams. • UVC (underwater) surveys and socio economic surveys by MFMRD
Governance arrangements	<ul style="list-style-type: none"> • Bêche-de-mer. No management arrangements or controls. MFMRD developing national management plan (underdevelopment since 2007 but SPC now providing support – expected to complete late 2013). • Foreign companies and individuals from other islands must pay Island council fee for harvesting bêche-de-mer. Locals exempt. • National regulation on lobster covering all islands. • MFMRD can pass national regulations prohibiting, regulating activities which override island councils bylaws (i.e. if Kiribati prohibits shark finning, this overrides bylaws). • Butaritari has bylaws on fishing. See MISA for further info on bylaws. No process for informing MFMRD of bylaws. Island councils only inform MISA. • <i>Tekinati</i> (association of elders) has banned commercial fishing for sharks. No legislative authority but significant cultural/social authority. Likely to go to island council to be endorsed. • Export requirements and fees for all national exports. • MFMRD collects aggregated data (BDM, fins, KFL loins - ask Mbweneea) • Some community decisions will only be made at community/village level (i.e. shark ban), but most key decisions are made by island council (for example, location of FADs is decided by Island council).
Capacity	<ul style="list-style-type: none"> • Very little capacity to develop and implement bylaws. • Lack of capacity to consider fisheries issues. • Drafting of bylaws is weak with inadequate language. • Problems with demarcations of zones. • Island Council has no fisheries staff. Island council has a special constable who supervises police. They are responsible for enforcing bylaws. No boats. • MFMRD employs one coastal fisheries assistant (FA) to support council and pays salary. Council provides housing. • No NGOs, but some church groups.

Table 19. Key activities and issues in Butaritari coastal fisheries. Information was obtained through consultations in April 2013

CONCLUSION

Based on the initial consultations with MFMRD and the information summarized above, this report recommends that the CBFM project team recruit staff in Tarawa who are suitably skilled to lead consultations in Butaritari and North Tarawa with villages and island councils and support the development of community fisheries management plans that address priority local sustainability and livelihood concerns.

A priority task for the CBFM project in its early stages should be to develop benchmark monitoring and evaluation indicators for subsistence and artisanal fisheries in Butaritari and North Tarawa that can be surveyed regularly and maintained by MFMRD coastal fisheries staff. This should be developed in a manner that builds upon existing MFMRD and national demographic statistical programs and should be closely coordinated with SPC data programs. MFMRD currently undertakes occasional coastal fisheries surveys and has limited funding from bilateral donors to pay for fuel and travel expenses, but struggles to effectively record and utilize this information in its management support for island councils. In order to support subsequent management activities, it is recommended that the CBFM project team in Tarawa develop a database on coastal and lagoon fisheries.

Management priorities could include support for the implementation of the forthcoming bêche-de-mer management plan, with a key focus on ensuring that local communities in North Tarawa can manage the rebuilding of bêche-de-mer stocks and prevent poaching by fishers from South Tarawa. A medium-term priority could be to support the development of North Tarawa and Butaritari management arrangements for key artisanal and subsistence fisheries that can be implemented, managed, and sustained with minimal national support. It is likely, however, that the key challenge to the effectiveness of North Tarawa fisheries management will be spillover pressure from South Tarawa fishers who need new fishing grounds to replace their overfished traditional fishing grounds. In this context, a long-term priority task for the CBFM project should be to develop a Tarawa lagoon management mechanism that grows out of North Tarawa communities. The project should engage with South Tarawa to ensure the sustainability of critical subsistence fisheries, strengthen livelihoods through the sustainable development of artisanal fisheries, and address food security pressures through improvements in distribution networks.

A short-term priority in Butaritari could be to support local implementation of both the bêche-de-mer national management plan and a locally supported proposal to prohibit fishing for sharks. In the medium-term, the CBFM project should focus on identifying key livelihood and food-security challenges and opportunities, and develop a lagoon management plan that optimizes the balance between economic development and food security.

Consultations also suggested that a third CBFM pilot trial could be developed in either Kiritimati or one of the southern islands in the Gilbert group. The high expense of travelling regularly to Kiritimati probably rules out Kiritimati for this grant. This report recommends that the CBFM project further investigate opportunities to expand the project to a third pilot site in the Southern Gilberts.

- ¹ The terms 'oceanic' and 'offshore' are both used to describe fisheries activities taking place within the Kiribati EEZ but beyond the distance from shore typically utilised by small-scale commercial, artisanal, and subsistence fishing vessels. Fisheries activities which take place beyond a 12 nm territorial limit from the low-water baseline but within Kiribati's 200 nm EEZ are often referred to as 'offshore' fisheries.
- ² The authors acknowledge the assistance of Dr. Johann Bell in reviewing section 5.1.

BIBLIOGRAPHY

[ABM] Australian Bureau of Meteorology and [CSIRO] Commonwealth Scientific and Industrial Research Organization. 2011. *Climate change in the Pacific: Scientific assessment and new research. Volume 2: Country reports*. Australian Bureau of Meteorology and Commonwealth Scientific and Industrial Research Organization.

[ADB] Asian Development Bank. 2009. *Kiribati social and economic report 2008: Managing development risk*. Asian Development Bank, Philippines.

Atuna. 2010. *Kiribati generous to EU tuna fleet*. Latest Tuna Market News. Accessed 9 April 2013. <http://pna.atuna.com/>

AusAID. 2007. *Valuing Pacific fish: A framework for fisheries-related development assistance in the Pacific*. Canberra, Australia: AusAID.

Awira R, Friedman KJ, Sauni S, Kronen M, Pinca S, Chapman L and Magron F. 2008. *Kiribati Country Report: Profiles and results from survey work at Abaiang, Abemama, Kura and Kiritmati (May to November 2004)*. Pacific Regional Oceanic and Coastal Fisheries Development Programme. Secretariat of the Pacific Community (SPC).

Banks R. 2012. *Accompanying developing countries in complying with the implementation of Regulation 1005/2008 on Illegal, Unreported and Unregulated (IUU) Fishing*. Country Evaluation Report. Republic of Kiribati. EuropeAid/129609/SER/Multi. GOPA Consultants' Consortium.

Barclay K and Cartwright I. 2008. *Capturing the wealth from tuna: Case studies from Pacific Island countries. Chapter 5: Kiribati* pp. 117–147. Canberra: Asia Pacific Press, Australian National University.

Beets J. 2000. *Declines in finfish resources in Tarawa Lagoon, Kiribati: Emphasize the need for increased conservation effort*. Atoll Research Bulletin No. 490. National Museum of Natural History, Smithsonian Institute, USA.

Bell JD, Ganachaud A, Gehrke PC, Griffiths SP, Hobday, AJ, Hoegh-Guldberg O, Johnson JE, Le Borgne R, Lehoudey P, Lough JM, Matear RJ, Pickering TD, Pratchett MS, Sen Gupta A, Senina I and Waycott M. 2013. Mixed responses of tropical Pacific fisheries and aquaculture to climate change. *Nature Climate Change* 3:591–99.

Bell JD, Johnson JE and Hobday A, eds. 2011. *Vulnerability of tropical Pacific fisheries and aquaculture to climate Change*. Secretariat of the Pacific Community, Noumea, New Caledonia.

Bell JD, Kronen M, Vunisea A, Nash WJ, Keeble G, Demmke A, Pontifex S and Andréfouët S. 2009. Planning the use of fish for food security in the Pacific. *Marine Policy* 33:64–76.

Bryant DL, Burke L, McManus J and Spalding MD. 1998. *Reefs at Risk: A map-based indicator of threats to the world's coral reefs*. World Resources Institute, ICLARM – WorldFish Center, WCMC, UNEP. Washington DC.

[DFAT] Department of Foreign Affairs and Trade. 2012. *Kiribati country brief*. Department of Foreign Affairs and Trade. Australian Government. Accessed 25 January 2013. http://www.dfat.gov.au/geo/kiribati/kiribati_brief.html.

[DFAT] Department of Foreign Affairs and Trade. 2014 *Kiribati program poverty assessment*. Department of Foreign Affairs and Trade. Australian Government.

ECOLEX. 2013. *A database of environmental law*. A joint operation of IUCN, UNEP and FAO. <http://www.ecolex.org/start.php>. Accessed 3 May 2013.

Environment Act. 1999. *An Act to Provide for the Protection, Improvement and Conservation of the Environment of the Republic of Kiribati and for Connected Purposes*. Republic of Kiribati.

[FAO] Food and Agriculture Organization of the United Nations. 2013. *Global aquaculture production database*. Accessed 9 May 2013. <http://www.fao.org/fishery/statistics/global-commodities-production/en>.

Fay L, Vuki V, Sauni S and Tebano T. 2007. *Anandara fishing supports urban households in Tarawa, Kiribati and Suva, Fiji*. SPC Women in Fisheries Information Bulletin No. 17 – December 2007. Secretariat of the Pacific Community, Noumea.

[FFA] Forum Fisheries Agency. 2012a. *Value of WCPO tuna fisheries. MS Excel database*. Forum Fisheries Agency. Honiara, Solomon Islands.

[FFA] Forum Fisheries Agency. 2012b. *Treaties and agreements*. Accessed 1 May 2013. http://www.ffa.int/treaties_agreements.

[FFA] Forum Fisheries Agency. 2013. *Value of WCPO tuna fisheries. MS Excel database*. Forum Fisheries Agency. Honiara, Solomon Islands.

Fishbase. 2011. *Fish species of Kiribati*. Accessed 20 August 2013. http://fishbase.sinica.edu.tw/identification/RegionSpeciesList.php?resultPage=11&c_code=296.

Fisheries Act. 2010. *Act for the Conservation, Management and Development of Kiribati Fisheries and Control of Foreign Fishing and for Connected Purposes*. Republic of Kiribati.

[FTC] Fisheries Training Centre. 2013. Kiribati Fisheries Training Centre. Accessed 3 May 2013. <http://www.ftc.info.ki/>

Gillett R. 2009. *Fisheries in the economies of the Pacific Island countries and territories*. Kiribati. Asian Development Bank, Philippines. pp. 58–75.

Gillett R and Cartwright I. 2010. *The future of Pacific Island fisheries*. Secretariat of the Pacific Community and Pacific Islands Forum Fisheries Agency. Noumea.

Govan H. In Press. *Monitoring, control and surveillance of coastal fisheries in Kiribati and Vanuatu: Priorities for action*. Report to the Secretariat of the Pacific Community.

Government of Kiribati. 2012. *Kiribati development plan 2012–2015*.

Johannes RE and Yeeting B. 2000. *I-Kiribati knowledge and management of Tarawa's lagoon resources*. Atoll Research Bulletin No. 489. National Museum of Natural History, Smithsonian Institute, USA.

[KNSCMP] Kiribati National Sea Cucumber Management Plan. 2013. *Kiribati national sea cucumber management plan 2013. Draft version*. Ministry of Fisheries and Marine Resources Development and Office of the Attorney General.

[KNSO] Kiribati National Statistics Office. 2006. *Household income and expenditure survey (HIES) report*. Kiribati National Statistics Office. Tarawa.

[KNSO] Kiribati National Statistics Office. 2009. Kiribati National Statistics Office. Statistics Online. Accessed 2 May 2013. <http://www.spc.int/prism/Country/KI/Stats/>.

[KNSO] Kiribati National Statistics Office. 2013. Kiribati National Statistics Office. Statistics Online. Accessed 5 August 2013. <http://www.spc.int/prism/kiribati/>.

[KNSO] Kiribati National Statistics Office and [MFED] Ministry of Finance and Economic Development. 2012. *Report on the Kiribati 2010 census of population and housing*. National Statistics Office and Ministry of Finance and Economic Development. Vol 1.

Kronen M, Sauni S, Fay L and Vunisea A. 2006. *A socio-economic perspective on live reef fish for food trade for small-scale artisanal fishers based on case studies from the Pacific*. Secretariat of the Pacific Community/Australian Centre for International Agricultural Research. Noumea.

Lehodey P, Bertignac M, Hampton J, Lewis A and Picaut J. 1997. El Nino Southern Oscillation and tuna in the western pacific. *Nature* 389:715–718.

Llewellyn LE. 2010. Revisiting the association between sea surface temperature and the epidemiology of fish poisoning in the South Pacific: Reassessing the link between ciguatera and climate change. *Toxicon* 6(5):691–7.

Local Government Act. 1984. Amended in 2006. Republic of Kiribati.

McMillan K and Worth H. 2010. *Risky business Kiribati: HIV prevention amongst women who board foreign fishing vessels to sell sex*. International HIV Research Group, UNSW, Sydney.

MARE. 2012. *Ex-post evaluation of the current protocol to the fisheries partnership agreement (FPA) between the European Union and the Republic of Kiribati, and ex-ante evaluation including an analysis of the impact of the future protocol on sustainability. Final report*. POSEIDON, COFREPECHE, MRAG and NFDS. Internal document of DG MARE.

Marine Zones (Declaration) Act. 2011. An Act to make provisions in respect of the internal waters, the archipelagic waters, the contiguous zone, the territorial sea, the exclusive economic zone, and the continental shelf of Kiribati and for connected purposes. Republic of Kiribati.

[MELAD] Ministry of Environment, Lands, and Agricultural Development. 2013. *Kiribati biodiversity area report*. Ministry of Environment, Lands, and Agricultural Development.

[MFMRD] Kiribati Ministry of Fisheries and Marine Resources Development. 2011. *A draft strategic framework for institutional strengthening in fisheries managements and development*. MFMRD/FFA/SPC. Kiribati Ministry of Fisheries and Marine Resources Development.

[MFMRD] Kiribati Ministry of Fisheries and Marine Resources Development. 2013a. *Kiribati national fisheries policy (KNFP 2013–2015)*. Kiribati Ministry of Fisheries and Marine Resources Development.

[MFMRD] Kiribati Ministry of Fisheries and Marine Resources Development. 2013b. *Consultations with Ministry of Fisheries and Marine Resources Development, Fisheries Division staff. Buariki and Tanaea, South Tarawa. 12–14 August 2013*.

[MFMRD] Kiribati Ministry of Fisheries and Marine Resources Development. 2013c. *Coastal fisheries survey 2012*. Unpublished fisheries data for Butaritari. Excel spreadsheet.

[MFMRD] Kiribati Ministry of Fisheries and Marine Resources Development. 2013d. *Unpublished fishing and revenue data*. Excel Spreadsheet.

- [MISA] Ministry of Internal and Social Affairs. 2008a. *North Tarawa socio-economic profile*. Ministry of Internal and Social Affairs.
- [MISA] Ministry of Internal and Social Affairs. 2008b. *Butaritari Island socio-economic profile*. Ministry of Internal and Social Affairs.
- MRAG. 2013. Kiribati – Nareau tuna boat owner’s association. Report excerpt. MRAG Asia Pacific.
- MSC. 2013. Fisheries in the MSC program – Certified fisheries: PNA Western and Central Pacific skipjack tuna. http://www.msc.org/track-a-fishery/fisheries-in-the-program/certified/pacific/pna_western_central_pacific_skipjack_tuna. Accessed 8 May 2013.
- Parliament of Kiribati. 2011. Acts of Kiribati. Accessed 3 May 2013. <http://www.parliament.gov.ki/content/online-resources>.
- [PITIA] Pacific Islands Tuna Industry Association. 2013. Pacific Islands Tuna Industry Association. Accessed 4 September 2013. <http://www.pitia.org/about-us.html>.
- Preston G. 2008a. *Coastal fisheries development and management*. Working Paper 3. Institutional Strengthening Scoping Study Report. Kiribati Ministry of Fisheries and Marine Resources Development.
- Preston G. 2008b. *Coastal fisheries activities proposed for incorporation into an institutional strengthening project for the Kiribati fisheries sector. Institutional strengthening scoping study report*. Kiribati Ministry of Fisheries and Marine Resources Development.
- [ROK] Republic of Kiribati. 2011. *Diagnostic trade integration study*. Republic of Kiribati.
- [ROK] Republic of Kiribati. 2012a. *North Tarawa*. Republic of Kiribati Island Report Series. Office of Te Beretitenti.
- [ROK] Republic of Kiribati. 2012b. *Butaritari*. Republic of Kiribati Island Report Series. Office of Te Beretitenti.
- [ROK] Republic of Kiribati. 2013. *The Kiribati integrated environment policy (KIEP)*. Environment and Conservation Division of Ministry of Environment, Lands and Agricultural Development. Republic of Kiribati.
- [SPC] Secretariat of the Pacific Community. 2010. *Developing a sustainable marine aquarium trade industry on Kiritimati Island*. SPC Fisheries Newsletter No. 131. Secretariat of the Pacific Community. Accessed 12 December 2013. <http://www.spc.int/coastfish/en/publications/bulletins/fisheries-newsletter/152-spc-fisheries-newsletter-131.html>.
- [SPC] Secretariat of the Pacific Community. 2012. *Oceanic fisheries and climate change*. SPC Policy Brief 15/2012. Accessed 12 December 2013. http://www.spc.int/images/publications/en/policy_brief/policy-brief-15-en-oceanic-fisheries-and-climate-change.pdf.
- [SPC] Secretariat of the Pacific Community. 2013a. *Kiribati stats at a glance*. Kiribati National Statistics Office. Pacific Regional Information System (PRISM). Secretariat of the Pacific Community. Accessed 4 September 2013. <http://www.spc.int/prism/kiribati/>.
- [SPC] Secretariat of the Pacific Community. 2013b. Unpublished fisheries data. Secretariat of the Pacific Community.

Sullivan N and Ram-Bidesi V. 2008. *Gender issues in tuna fisheries – Case studies in Papua New Guinea, Fiji and Kiribati*. DevFish Programme. Honiara: Forum Fisheries Agency. Accessed 4 September 2013. http://www.spc.int/DigitalLibrary/Doc/FAME/FFA/Reports/FFA_2008_014.pdf

Tiroa T. 2007. *Analytical report on the 2006 Kiribati HIES*. Kiribati National Statistics Office.

[UCSD] University College San Diego. 2007. *Kiribati Islands expedition – Background*. Scripps Institution of Oceanography. University of California, San Diego, CA. Accessed 4 September 2013. http://cmbr.ucsd.edu/Gilbert_Islands/background.html.

[UN Data][UNSD] United Nations Statistics Division. 2013. 2011 World Statistics Pocketbook. Country Profile: Kiribati. Accessed 3 May 2013. <http://data.un.org/CountryProfile.aspx?crName=Kiribati>

[UN-OHRLLS] Un Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States. 2013. Small Island Developing States: About SIDS. Accessed 8 May 2013. <http://www.unohrlls.org/en/sids/43>.

Vunisea, A. 2003. *Social and gender considerations. Working paper for Kiribati tuna fishery development and management planning exercise*. Secretariat of the Pacific Community.

[WCPFC] Western and Central Pacific Ocean Fisheries Commission. 2008. *Conservation and management measures of sea turtles*. CMM 2008–03. Fifth Regular Session, Busan, Korea, 8–12 December 2008. Western and Central Pacific Ocean Fisheries Commission.

[WCPFC] Western and Central Pacific Ocean Fisheries Commission. 2010. *Conservation and management measures for sharks*. CMM 2010–07. Seventh Regular Session, Hawaii, USA, 6–10 December 2010. Western and Central Pacific Ocean Fisheries Commission.

[WCPFC] Western and Central Pacific Ocean Fisheries Commission. 2011. *Annual report to the commission. Part 1: Information on fisheries, research and statistics. Kiribati*. Scientific Committee Seventh Regular Session. Pohnpei, Federated States of Micronesia, 9–17 August 2011. Western and Central Pacific Ocean Fisheries Commission.

[WCPFC] Western and Central Pacific Ocean Fisheries Commission. 2012. *Annual report to the commission. Part 1: Information on fisheries, research and statistics. Kiribati*. Scientific Committee Eighth Regular Session. Busan, Republic of Korea, 7–15 August 2012. Western and Central Pacific Ocean Fisheries Commission.

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LIST OF ABBREVIATIONS

ACIAR	Australian Centre for International Agricultural Research
ANCORS	Australian National Centre for Ocean Resources and Security
CBFM	community-based fisheries management
CMM	conservation and management measure
CMT	customary marine tenure
CPPL	Central Pacific Producers Limited
DWFN	distant water fishing nation
EEZ	exclusive economic zone
ENSO	El niño southern oscillation
FAD	fish aggregating device
FAO	Food and Agriculture Organization of the United Nations
FFA	Forum Fisheries Agency
FFC	Forum Fisheries Commission
FPA	fisheries partnership agreement
FSMA	Federated States of Micronesia
GDP	gross domestic product
HIES	household income and expenditure survey
IUCN	International Union for the Conservation of Nature
KFL	Kiribati Fishing Limited
KNSO	Kiribati National Statistics Office
KSVA	Kiribati Seafood Verification Agency
LRFF	live reef food fish
MELAD	Ministry of Environment, Lands and Agricultural Development
MFED	Ministry of Finance and Economic Development
MFMRD	Ministry of Fisheries and Marine Resources Development
MIA	Ministry of Internal Affairs
MOJ	Ministry of Justice
MPA	marine protected area
MRAG	marine resource assessment group
NGO	non-government organization
NTBOA	Naureau Tuna Boat Owner's Association
PICT	Pacific Island Countries and Territories
PIPA	Phoenix Island protected area
PNA	parties to the Nauru agreement
PNG	Papua New Guinea
SIDS	Small Island Developing State
SPC	secretariat of the Pacific community
TUFMAN	tuna fisheries database management system
VDS	vessel day scheme
WCPFC	Western and Central Pacific Fisheries Commission
WCPO	Western and Central Pacific Ocean



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Contact details:
WorldFish, PO Box 500 GPO,
10670 Penang, MALAYSIA
www.worldfishcenter.org

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