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Marine science and technology transfer: can the Intergovernmental Oceanographic Commission advance governance of biodiversity beyond national jurisdiction?

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Abstract

Marine scientific research is crucial to forge solutions in the development of a new international legally binding instrument for the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction (ABNJ) under the 1982 United Nations Convention on the Law of the Sea. The transfer of marine technology, capacity development and marine genetic resources are key issues. This paper examines how the Intergovernmental Oceanographic Commission (IOC), as a competent international organisation for marine scientific research and technology transfer, can inform the development of the instrument. Synergies between marine technology transfer and non-monetary benefit sharing of genetic resources are illustrated. Four key lessons from the IOC are examined: 1. Coordinating international cooperation in marine scientific research; 2. Enabling open access to data and knowledge; 3. Facilitating capacity development through scientific training and education; and 4. Governance of marine scientific research. Realising the potential of the IOC to advance governance solutions for ABNJ will depend on increased political will from Member States and strengthened partnerships to reduce resource constraints and enhance the IOC's capacity at global and regional scales.

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Marine Science and Technology Transfer: can the Intergovernmental Oceanographic Commission Advance Governance of Biodiversity Beyond National Jurisdiction?

Harriet Harden-Davies, 2016.

ABSTRACT

Marine scientific research is crucial to forge solutions in the development of a new international legally binding instrument for the conservation and sustainable use of marine biological diversity in ocean areas beyond national jurisdiction (ABNJ) under the *1982 United Nations Convention on the Law of the Sea*. The transfer of marine technology, capacity development and marine genetic resources are key issues. This paper examines how the Intergovernmental Oceanographic Commission (IOC), as a competent international organisation for marine scientific research and technology transfer, can inform the development of the instrument. Synergies between marine technology transfer and non-monetary benefit sharing of genetic resources are illustrated. Four key lessons from the IOC are examined: 1. Coordinating international cooperation in marine scientific research; 2. Enabling open access to data and knowledge; 3. Facilitating capacity development through scientific training and education; and 4. Governance of marine scientific research. Realising the potential of the IOC to advance governance solutions for ABNJ will depend on increased political will from Member States and strengthened partnerships to reduce resource constraints and enhance the IOC's capacity at global and regional scales.

KEYWORDS: areas beyond national jurisdiction; biodiversity; marine genetic resources; marine scientific research; transfer of marine technology; law of the sea.

1. INTRODUCTION

Marine scientific research, technology transfer and capacity development are vital lynchpins in the development of a new international legally-binding instrument (ILBI) on the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction (ABNJ) (UNGA, 2015a) under the *1982 United Nations Convention on the Law of the Sea* (LOSC, 1982).¹ These historic negotiations for ABNJ, 65% of the global ocean surface, incorporate the high seas (water column beyond national jurisdiction) and the Area (seabed, ocean floor and subsoil beyond national jurisdiction).² The Intergovernmental Oceanographic Commission (IOC) is the competent international organisation for marine scientific research³ and marine technology transfer (UNESCO, 2014). It is therefore timely to examine the potential role of the IOC in informing the development, and supporting the eventual implementation, of the ILBI.

The issue of marine genetic resources, including questions on the sharing of benefits, illustrates the important role of marine science and technology in meeting the urgent need to develop pragmatic solutions for access and benefit sharing of marine genetic resources (MGR) in ABNJ, as highlighted at the first and second Preparatory Committee (PrepComs 1 and 2)⁴ meetings for the development of the ILBI. Marine scientific research is the first step in accessing MGR⁵ from ABNJ and deriving “benefits” from their use (Harden-Davies, 2016, Oldham *et al.*, 2014, Vierros *et al.*, 2016). Possible benefits include advancing scientific knowledge of marine biodiversity and enabling the exploitation of MGR for the development of biotechnology products (Leary *et al.*, 2009, Arrieta *et al.*, 2010). The “non-monetary” benefits are increasingly recognised as more immediate and likely than monetary benefits

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¹ A Preparatory Committee will meet four times during 2016 and 2017 and report to the United Nations General Assembly on its progress by the end of 2017. Four key elements will be considered in particular, together and as a whole: 1. Marine genetic resources, including questions on the sharing of benefits; 2. Area-based management tools, including marine protected areas; 3. Environmental impact assessments; and 4. Capacity building and the transfer of marine technology (UNGA, 2015).

² LOSC, Article 1(1).

³ IOC is identified as a competent international organisation for marine scientific research in LOSC Annex VIII, Article 2(2).

⁴ The first PrepCom was held 28 March 2016 – 7 April 2016, the second PrepCom was held 26 August 2016 – 9 September 2016, at the United Nations, New York.

⁵ MGR are not mentioned in the *1982 United Nations Convention on the Law of the Sea* and there is no internationally agreed legal definition. MGR are considered to include biological material from animals, plants or microbes that is of actual or potential value (Vierros *et al.*, 2015). This could include samples of entire organisms (animals, microbes or plants), individual genes, proteins or biologically produced chemicals as well associated data.

from MGR in ABNJ (Brogiato *et al.*, 2014, Griebner, 2014, Oldham *et al.*, 2014, Lallier *et al.*, 2014) on account of the cost, time, and barriers that could delay or prevent commercialisation (Leary and Juniper, 2013, Martins *et al.*, 2014). However, disparities in scientific and technical capacity worldwide (Bernal and Simcock, 2016, Juniper, 2013) and gaps in the international legal framework have raised concerns of equitable access and benefit sharing of MGR in ABNJ (Glowka, 1996, Arico & Salpin, 2005, Arnaud-Haond *et al.*, 2011, Brogiato *et al.*, 2014). Marine science, technology transfer and capacity development are inextricably linked to defining problems and developing solutions for MGR in ABNJ.

Although the relevance of the IOC for the ILBI has long been recognised (Arico and Salpin, 2005, Arico, 2015, Glowka, 1999, Glowka, 2010, IOC, 2015a, IOC, 2016a, IOC, 2016b, Hall, 2015) an analysis of the potential role of the IOC in supporting the development of the ILBI has not yet been undertaken. First, this paper introduces the role of IOC in marine scientific research governance and highlights the interlinkages between transferring marine technology and sharing non-monetary benefits of MGR. Second, lessons provided by IOC for the development of the ILBI are discussed: i) international cooperation; ii) open-access to data and knowledge; iii) capacity development and transfer of marine technology; and iv) governance of marine scientific research. Third, the paper argues that the IOC is uniquely positioned to take a lead role in informing the development of a robust ILBI that can adapt to, and benefit from, scientific and technological advances; the mandate, capacity and constraints influencing the role of IOC in the development and implementation of the ILBI are also discussed.

2. THE IOC AND THE IMPORTANCE OF MARINE SCIENCE AND TECHNOLOGY

2.1. IOC

The IOC was established in 1960 as a body within the United Nations Educational, Scientific and Cultural Organisation (UNESCO)⁶ and received functional autonomy in 1987. It has 148

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⁶ IOC was established by Resolution 2.31 adopted by the General Conference of UNESCO at its 11th session (Nov-Dec 1960) and in conformity with the recommendation of the Intergovernmental Conference on Oceanic

member states and runs a large portfolio of marine scientific research projects.⁷ The purpose and objectives of the IOC (IOC, 2000, IOC, 2014) are well-aligned to the ILBI, including:

- promoting international cooperation;
- coordinating research and capacity development;
- sharing knowledge and research results;
- developing standards and guidelines;
- providing technical guidance advancing scientific knowledge of deep-sea ecosystems;
- international and regional coordination;
- responding to emerging scientific and policy issues raised by expanding use of marine resources; and
- applying knowledge for societal benefit.

The IOC's mandate to assist States in the implementation of LOSC Parts XIII (marine scientific research) and XIV (development and transfer of marine technology) position it as a key actor in the development of the ILBI. LOSC Parts XIII and XIV provide the foundation for sharing non-monetary benefits from MGR and transferring marine technology. It sets a framework for marine technology transfer⁸ and capacity development⁹ that promotes international cooperation, exchange of experts and establishment of centres of excellence. LOSC also establishes responsibilities for marine scientific research to:

- protect the marine environment;¹⁰
- cooperate internationally;¹¹
- publish and share knowledge and data;¹²
- conduct research with appropriate scientific methods and means;¹³ and

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Research (Copenhagen 11-16 July 1960). Statutes of the Intergovernmental Oceanographic Commission (IOC, 2000), Article 1(1).

⁷ <http://ioc-unesco.org/> (accessed 14/03/2016).

⁸ LOSC, Articles 266, 270, 271, 272, 273.

⁹ LOSC, Articles 269, 275, 276.

¹⁰ LOSC, Article 240(d).

¹¹ LOSC, Articles 239, 242, 243.

¹² LOSC, Article 244.

- conduct scientific research in the Area for the benefit of all mankind.¹⁴

The question of access and benefit sharing of MGR in ABNJ highlights both synergies and tensions between the LOSC Parts XIII and XIV. For example, ambiguity created by the lack of a definition of marine scientific research and the absence of any mention of genetic resources in the LOSC, combined with questions over the sharing of research outcomes and transfer of technology, draws scrutiny to the balance of freedom and responsibility in marine scientific research in ABNJ.¹⁵ Statements made at PrepComs 1 and 2 revealed concerns that the ILBI could potentially hinder research in ABNJ. A discussion of these issues, the interpretation of which will likely be a defining feature of the development of the ILBI, is not within the scope of this paper. Instead, this paper illustrates how the IOC can help the ILBI to achieve two objectives - marine technology transfer and non-monetary benefit sharing - through marine scientific research and cooperation.

2.2. Common themes link technology transfer and non-monetary benefit sharing

Synergies between sharing non-monetary benefits from MGR and marine technology transfer enable these elements to be considered “together and as a whole” in accordance with UN resolution 69/292 (UNGA, 2015a). The definition of marine technology provided by the IOC’s Criteria and Guidelines on Transfer of Marine Technology (CGTMT)¹⁶ (IOC, 2005) and the examples of non-monetary benefits provided by the *2010 Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization* (Nagoya Protocol) provide a framework that enables the identification of five common themes that are underpinned by marine scientific research and technology (Figure 1). Recognising these similar themes opens the door for the development of synergistic governance solutions based on marine science and technology that could enable an ILBI to simultaneously achieve non-monetary benefit sharing of MGR and transfer of marine technology through:

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¹³ LOSC, Article 240(b).

¹⁴ LOSC, Article 143.

¹⁵ Marine scientific research is a “freedom of the high seas”, LOSC, Article 87(1)(f).

¹⁶ The CGTMT were drafted in response to LOSC article 271 and adopted by the IOC Assembly (Resolution XXII-12) in 2003.

1. Access to data, samples and information (e.g. open-access to data, publication of knowledge);
2. Capacity development (e.g. marine scientific training, research equipment, regional centres of excellence);
3. International cooperation (e.g. research in ABNJ, training);
4. Scientific and socioeconomic benefits (e.g. advanced knowledge of ABNJ, research directed to priority needs, enhanced reputation of scientific institutions); and
5. Standards, guidelines and methodologies (e.g. guidelines, criteria, standards).

Figure 1

Given the importance of marine scientific research to investigating and sustainably using biodiversity in ABNJ, the ILBI should arguably provide a framework that facilitates, not hinders, scientific research (DOSI, 2016, Harden-Davies, 2016).¹⁷ This will require developing an innovative and effective access and benefit sharing regime that supports research and fosters capacity development and transfer of marine technology. The development of the ILBI is an opportunity to build support for and enhance implementation of LOSC Part XIV.

The IOC's mandate to assist States in the implementation of LOSC Parts XIII and XIV is reflected in the vision, functions and objectives articulated in the IOC medium term strategy 2014-2021 (IOC, 2014). These align with the common marine science and technology themes that link marine technology transfer and non-monetary benefit sharing of MGR (Table 1) and provide pragmatic lessons and mechanisms that could be adopted or enhanced by the ILBI (section 3).

Table 1

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¹⁷ This was highlighted by Australia, Canada, New Zealand and US at PrepCom 1 (International Institute for Sustainable Development, 2016).

3. SCIENCE SOLUTIONS FOR TECHNOLOGY TRANSFER AND BENEFIT SHARING

The IOC provides four key lessons for marine technology transfer and non-monetary benefit sharing of MGR that could inspire the ILBI: international cooperation (section 3.1); data sharing (section 3.2); capacity development and marine technology transfer (section 3.3); and governance of marine scientific research (section 3.4). The mandate, capacity and resources of IOC to play a role in the ILBI are discussed in section 4.

3.1. International cooperation

International cooperation is essential for accessing deep-ocean areas in ABNJ, sharing marine research resources and managing large volumes of data associated with marine biodiversity and MGR in ABNJ. The IOC promotes international marine scientific cooperation by providing a forum for IOC member States to interact (Hall, 2015). The IOC has a long history spanning more than 50 years of facilitating and coordinating international marine scientific research, including: the first (1959-1965) and second (2015-2020) International Indian Ocean Expeditions; tsunami warning systems (since 1965); and climate change research, beginning with International Decade of Ocean Exploration (1971-1980) and the Geochemical Ocean Sections Study (1971-1978).

The IOC conducts a number of programs and projects (permitted by LOSC articles 238 and 247) that foster international marine scientific cooperation. Examples include ocean observations (e.g. Global Ocean Observing System, GOOS) and harmful algal blooms (e.g. Global Ecology and Oceanography of Harmful Algal Blooms Program). The newly formed GOOS Biology and Ecosystems Panel suggests a growing focus on biological research in IOC activities. Furthermore, the forthcoming deep-ocean observing system (DOOS) of GOOS could promote international cooperation in advancing knowledge of biodiversity in ABNJ (DOOS, 2014). However, deep-sea biodiversity in ABNJ is an emerging priority area for IOC.

Regional cooperation strengthens the governance of biodiversity in ABNJ (Rochette *et al.*, 2014). Regional scientific cooperation is particularly important in Southern Hemisphere ABNJ where marine research capacity is least (Bernal and Simcock, 2016) and biological sampling gaps are greatest (German *et al.*, 2011). IOC promotes regional science cooperation through regional bodies, GOOS and IODE. The IOC's regional sub-commissions, committees, project and program offices and training centres include: Africa and Adjacent Island States (IOCAFRICA); Caribbean and Adjacent Regions (IOCARIBE); Western Pacific (IOCWESTPAC); Central Indian Ocean (IOCINDIO); and Black Sea (BSRC). The level of activity and resourcing varies between regional bodies. Nevertheless, the IOC could use its convening power through regional bodies to galvanise support and facilitate global and regional cooperation to enhance knowledge of biodiversity and MGR in ABNJ and strengthen research capacity (section 3.3). This potential role was articulated by numerous delegations at PrepComs 1 and 2.

3.2. Access to data, knowledge and samples

Effective data management and open-access sharing will be critical for a new ILBI. The IOC has a role to facilitate knowledge exchange and sharing of data and information from ABNJ (BBNJ, 2013, IOC, 2016a, IOC, 2015a). Ocean data and information management systems need to be enhanced in order to support research in emerging ocean science issues (IOC, 2014) and enable the provision of evidence-based scientific advice to international policy processes (Levitus, 2012).

3.2.1. The International Oceanographic Data and Information Exchange (IODÉ)

The IOC manages and maintains international data platforms for marine scientific research results and data through the International Oceanographic Data and Information Exchange (IODÉ), a global network of 80 national oceanographic data centres with a single entry point - the IOC Ocean Data Portal.¹⁸ The objectives of IODE, established in 1961, include: discovery and exchange of marine data; long term archiving; international standards; capacity

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¹⁸ <http://www.oceandataportal.org/>

development; and supporting international marine scientific research programs. The delivery of a “*data and information service for the global ocean commons*” is central to its vision (IOC, 2013). This reflects the IOC data policy (IOC, 2003), which highlights the need for free and open access to data for the global common good. Like all IOC policies, it serves as a strong guideline but is not binding. Nevertheless, the objectives, infrastructure and expertise of the IODE could inform the development of a data sharing system for MGR in ABNJ that provides open-access to large, disparate data-sets and information. A role for the IODE in assisting the International Seabed Authority in the collection and management of environmental data was been identified in a memorandum of understanding between the IOC and the ISA signed in May 2000.

3.2.2. The Ocean Biogeographic Information System

The Ocean Biogeographic Information System (OBIS), fostered by the IODE¹⁹ after the completion of the Census of Marine Life,²⁰ is a large, open-access, global data system of the diversity, distribution and abundance of marine species. It provides a single point of access to millions of standardized marine species observations from hundreds of data holders. OBIS has been recognised in international fora for its contribution to marine science (IOC 2015a) and its role in enhancing international access to biodiversity data and information sharing (SBSTTA, 2015) in ABNJ (International Institute for Sustainable Development, 2016, UNGA, 2014, UNGA, 2015b).

OBIS enables benefit sharing and technology transfer through open-access to biodiversity data and information.²¹ It also sets common standards and guidelines and provides training and capacity development programs in best practice methods for biodiversity data collection, management and publication. OBIS is exploring options to adopt the marine bioprospecting database ‘bioprospector.org’, first compiled at the United Nations University,²² improve

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¹⁹ IOC adopted OBIS as part of IODE in June 2009 (IOC Assembly Res XXV-4).

²⁰ OBIS was established as the data repository and information dissemination system for the Census of Marine Life in 2000. The Census was completed in 2010.

²¹ OBIS records 18,922 marine species in ABNJ (3,519 exclusive to ABNJ) and a total of 3.1 million species observations recorded in ABNJ. OBIS also highlights gaps in sampling deep-ocean ABNJ (Appeltans, 2015).

²² Ward Appeltans, pers comms 5 April 2016.

accessibility of data and enhance efforts to translate data into knowledge for management (Appeltans, 2015). Crucially, OBIS engages with the international marine science community and is, for example, exploring options for a global deep-ocean data-sharing platform (Mengerink *et al.*, 2014, O'Hara *et al.*, 2015, Appeltans *et al.*, 2014). OBIS could thus play a key role in sharing non-monetary benefits of MGR in ABNJ and transferring marine technology. However, additional resources would be required to scale-up the scope and functionality of OBIS in support of the ILBI.

3.3. Capacity development and transfer of marine technology

Capacity building and technology transfer are key issues for the ILBI. Transfer of marine technology and capacity development are among the most effective ways to promote marine scientific research for sustainable development (IOC, 2015b, UNGA, 2015c) and address disparities in MGR in ABNJ. However, transfer of marine technology is arguably the most significant gap in the implementation of LOSC (Arico, 2015).

The role of IOC in technology transfer and capacity development activities is universally recognised and was highlighted at PrepComs 1 and 2. For example, at PrepCom 1 the G77+China proposed the establishment of a clearinghouse mechanism to support technology transfer. This received broad support (including from Australia, Chile and Sri Lanka), with the US suggesting it be modelled on the IOC and the Federated States of Micronesia suggesting that it include information on MGRs (International Institute for Sustainable Development, 2016).

3.3.1. Guidelines for transfer of marine technology

The role of the CGTMT in increasing scientific knowledge, developing research capacity and transferring marine technology has long-standing recognition at the UN (UNGA, 2007), including in the context of ABNJ (BBNJ working group, 2010), and is acknowledged in UN Sustainable Development Goal 14 (UNGA, 2015c). At PrepCom1 several groups and individual delegations (including the US, G77+China, EU, CARICOM, Argentina, Jamaica, Japan, Mexico and Costa Rica) referred to the CGTMT and its potential role in the ILBI (International Institute for Sustainable Development, 2016). The premise of the CGTMT -

that marine technology transfer should be conducted on “fair and reasonable” terms to enable all parties to “benefit on an equitable basis” from developments in marine science – aligns with the rationale for fair and equitable benefit sharing of MGR in ABNJ. The CGTMT provides a solid, internationally recognised foundation for marine technology transfer on which the ILBI should build. However, given the implementation gaps relating to LOSC Part XIV, there is clearly scope for stronger implementation of the CGTMT although this will be largely contingent on the will, efforts and resources of Member States.

The CGTMT identifies a special responsibility for IOC in facilitating transfer of marine technology and recommends that IOC should establish a clearinghouse mechanism for the transfer of marine technology (IOC, 2005), to link recipient and donor States. This has yet to be fully operationalised; reasons could include resource constraints or preferred bilateral measures. The CGTMT recommends the IOC Executive Secretary report on implementation progress (IOC, 2005). Since 2008 (IOC, 2008c), no dedicated marine technology transfer reports have been made. However, recent initiatives by IOC reflect a renewed commitment to capturing and enhancing marine technology transfer efforts (IOC, 2015b, IOC, 2016b). The IOC is uniquely well-placed to advise the international community on the challenges and opportunities of marine technology transfer.

3.3.2. Capacity development

An understanding of the marine scientific research capacity of States is needed to identify capacity development priorities and marine technology transfer opportunities for the ILBI. The IOC collects, analyses and publishes information relating to Member State practices in marine scientific research and technology transfer (Tirpak, 2008, UNDOALOS, 2010). The forthcoming IOC Global Ocean Science report will provide the first baseline assessment of marine scientific research capacity and conduct worldwide. IOC also maintains an Ocean Expert database. However, more could be done to evaluate these tools, the usefulness of which may be limited as they are voluntary and risk under-reporting. Options to cross-link between the IOC Ocean Expert database and the deep-sea experts database compiled by the

International Network for the Scientific Investigation of Deep-Sea Ecosystems (INDEEP) could be explored to provide marine scientific expertise to the development of the ILBI.²³

Partnerships, knowledge, infrastructure and resources are all important enablers of capacity development (IOC, 2016c). The IOC runs various capacity development initiatives, including the Ocean Teacher Global Academy (OTGA).²⁴ The OTGA provides a program of training courses and operates through a network of regional training centres to develop capacity in ocean data and management (UNGA, 2014). The OTGA could provide a model or vehicle to deliver training for MGR in ABNJ, such as sample curation, data management, genomics and natural products chemistry. Additional resources for these activities could be sought through the IOC Capacity Development Fund.²⁵

3.4. Governance of marine scientific research

Marine scientific research is an integral part of both the problem and solutions to governance of MGR in ABNJ. The use of underwater vehicles since the adoption of the LOSC has increased human knowledge about the vast diversity of deep-sea life (Ramirez Llodra *et al.*, 2010) and enabled access to MGR in ABNJ. The challenges and opportunities presented by these discoveries surpass the provisions of the LOSC, which does not define marine science research or mention MGR. This is not the first marine scientific research activity to raise legal questions that require balancing the freedom to conduct marine scientific research in the high seas²⁶ with other rights and responsibilities. Examples include ocean fertilisation and marine geoengineering research and the use of drifting buoys and floats in oceanographic data acquisition systems (ODAS)²⁷ (Bork *et al.*, 2008, Hubert, 2011, Verlaan, 2012).

The IOC has demonstrated leadership in identifying and addressing issues caused by gaps or ambiguity in the LOSC regime for marine scientific research. For example, it has played a

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²³ The list is based on information provided by scientists via a questionnaire, first issued in 2013 and updated in 2015, www.deepseaxperts.org (accessed 20/03/2016).

²⁴ www.oceanteacher.org (accessed 10/03/2016) OTGA was established by the IOC in response to LOSC Article 276.

²⁵ <http://www.ioc-cd.org/> (accessed 03/05/2016).

²⁶ LOSC, Articles 87(1)(f), 256, 257.

²⁷ E.g. the ARGO program (www.argo.net).

key role in addressing coastal States' concerns and setting globally accepted standards for the use of ODAS (IOC, 1993, IOC, 2007, IOC, 2008a). The IOC Advisory Body of Experts on the Law of Sea (ABELOS) played a lead role but has been largely inactive for some years and its future role is unclear. Nevertheless, IOC provides a unique international forum, linking Member States and intergovernmental organisations, for the discussion of marine scientific research issues that can inform international discussions on the law of the sea - such as the development of the ILBI. For example, IOC could articulate technical criteria for scientific research to align with legal requirements. This could aid the development of standards and guidelines for the collection, curation and sharing of biological samples, data and knowledge from MGR from ABNJ as may be required under an ILBI.

4. REVITALISING THE ROLE OF IOC?

The IOC's mandate, expertise and experience in marine scientific research, technology transfer and capacity development position it to play a lead role in the development and implementation of a robust ILBI. However, whether IOC will have the resources, capacity and authority to play such a role remains unclear at this stage. There are a number of factors that constrain IOC's ability to do more than passively inspire an ILBI.

4.1. Resources

Implementing the initiatives canvassed in section 3, such as establishing a clearinghouse mechanism for marine technology transfer or enhanced regional research cooperation for ABNJ, will clearly require funding for the ILBI to be effective. A discussion of funding options is not within the scope of this paper. However, it is highly unlikely that the IOC will have sufficient resources to cover the costs of enhancing marine technology transfer, capacity development and non-monetary benefit sharing in ABNJ in its current circumstances.

The IOC Medium Term Strategy 2014-2021 (IOC, 2014) and Capacity Development Strategy 2015-2021 (IOC, 2016c) reflect an ambitious future plan that is likely to contribute, at least indirectly, to an ILBI. However, persisting resource constraints, a concern for IOC since at least 2005 (Valladares, 2005), could restrict the IOC's capacity (IOC, 2014, IOC, 2016c) to contribute to the ILBI. The IOC has expressed "*great concern for the impact of the financial*

difficulties of UNESCO on the delivery of the IOC program” and “*great dissatisfaction*” with its budgetary allocation (IOC, 2015c), articulating a need to “*mobilize resources (personnel, funds, knowledge and observing networks)*” to achieve IOC’s goals (IOC, 2016c). One option to scale-up IOC efforts to contribute to an ILBI could be extra-budgetary funding for deep-sea biological research activities. However, this would be entirely dependent on IOC Member State contributions.

Despite resources remaining a key issue for IOC, the fact that OBIS now has permanent status under IOC illustrates IOC’s commitment to sustained management of global marine biological data. Nevertheless additional resources for capacity development would be required if OBIS activities were to be scaled-up, at national, regional and global scale, to enhance marine biological data standardisation and sharing under a new ILBI. As stressed by IOC, “*it is crucially important to have a realistic appreciation of the possibilities and limitations within available budgets*” (IOC, 2014).

4.2. Institutional position & visibility

The benefits and drawbacks of IOC’s institutional situation, as a body with functional autonomy within UNESCO, has been a topic of discussion that has gone hand-in-hand with resourcing discussions. On the one hand, advocates have stressed that IOC has independent autonomous carriage over the definition and implementation of its work program and is strengthened by UNESCO as its ‘parent’ organisation.²⁸ On the other hand, some have suggested administrative and bureaucratic difficulties arise from the IOC’s position within UNESCO (IOC, 2008b). For example, Smith (2010) argued that IOC’s lack of a Convention²⁹ and sub-optimal institutional position constrained its effectiveness and policy influence – rendering its decisions as weaker, non-binding inducements. Suggestions for IOC to become more independent or consider moving outside UNESCO have been canvassed throughout the “Future of IOC” process, however, these have not received consensus support

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²⁸ As provided by Article 1(2) of the IOC Statute.

²⁹ E.g. both the World Meteorological Organisation (http://library.wmo.int/pmb_ged/wmo_15-2015_en.pdf acc. 03/05/2016) and the International Hydrographic Organisation (https://www.iho.int/mtg_docs/com_wg/ISPWG/Documents/R11_iho_convention.pdf acc. 03/05/2016) were both founded with Conventions.

to date (IOC, 2008b). There appears to be little appetite amongst Member States to change the status quo. The focus instead is on “*enabling institutional conditions*” within UNESCO (IOC, 2016c).

There have been concerns voiced that the IOC has insufficient visibility at the international level. A 2008 report highlighted the need for mechanisms to “enhance visibility and political commitment to IOC among Member States” (IOC, 2008b). The Capacity Development Strategy 2015-2021 states that elevating IOC’s impact as required is contingent on reinforcing and valuing IOC staff at global and regional levels (IOC, 2016c). IOC programs regularly receive recognition at UNGA resolutions (e.g. UNGA 2014, UNGA 2015b). Nevertheless, enhanced visibility would further support the authority of IOC in contributing to the development of a new ILBI.

4.3. Partnerships

Partnerships enhance IOC’s leadership role in marine science and technology transfer and facilitate the funding and delivery of large-scale marine research projects. The implementation of IOC programs is already largely reliant on collaborations within IOC and with external organisations (IOC, 2014). The need for cooperation between international organisations in marine science has long been recognised, including through the 1969 Agreement on the Inter-Secretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO).³⁰ Existing cooperative initiatives between IOC and other organisations include: the IOC-World Meteorological Organisation Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM); the International Hydrographic Organisation (IHO)-IOC General Bathymetric Chart of the Oceans (GEBCO); and the CLIVAR (Climate and Ocean – Variability, Predictability and Change) project of World Climate Research Program, which involves IOC, International Council for Science (ICSU) and World Meteorological Organisation (WMO). The LOSC article 278 requires cooperation between competent international organisations, such as the International Seabed

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³⁰ ICSPRO was adopted to harmonise actions of FAO, WMO, IMO, UN, UNESCO in marine scientific affairs and take the Commissions’ “requirements into account in planning and executing their own programmes” (IOC 2000).

Authority (ISA) and IOC, in the delivery of Part XIV and XIII.³¹ IOC could further strengthen existing partnerships with UN bodies, international scientific organisations, the international marine biological community and reinforce regional scientific alliances between Member States.

Stronger connectivity between marine biological research, natural products chemistry and other scientific disciplines will be needed to access and use MGR in ABNJ - marine science alone will not be sufficient. The IOC could take a lead role in providing the multi-disciplinary scientific advice needed for the ILBI. This could be achieved by establishing an IOC led reference group that links with intergovernmental and non-governmental organisations involved in marine science as well as international networks and Learned Academies in science, technology and engineering. Examples include: INDEEP; Inter-Academy Panel, (IAP); ICSU; International Council for the Exploration of the Seas (ICES); and Scientific Committee on Oceanic Research (SCOR). This could have flow-on benefits for developing national MGR research capacity, strengthening international cooperation, facilitating regional approaches and building consensus support for ILBI measures in the global scientific community. It could also help to identify and address concerns in the scientific community that the ILBI could impose bureaucratisation and restrict the freedom of scientific inquiry in ABNJ (DOSI, 2016).

IOC is uniquely well-placed to assist in developing approaches for non-monetary benefit sharing of MGR, capacity development and marine technology transfer. However, IOC does not have the mandate, expertise, or capacity to address all governance challenges of MGR in ABNJ. For example, monetary benefit sharing issues, such as intellectual property, are far beyond the remit of IOC and more appropriately addressed by other international organisations, such as the World Intellectual Property Organisation. Partnerships between IOC and other international organisations will therefore be critically important for the development of an ILBI.

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³¹ A memorandum of understanding between the IOC and the ISA concerning the promotion and development of marine scientific research in the international seabed area was signed in May 2000.

4.4. A role for IOC in a new ILBI?

The IOC has the potential to play a pivotal role in supporting the development of a new ILBI, although its place in the institutional framework for the implementation of the ILBI is unclear at this stage. IOC Member States, other UN agencies and the global marine science community are demonstrably comfortable with the IOC playing a role that coordinates and promotes international marine scientific research and marine technology transfer. The IOC's long established link with the marine scientific community – important architect of a new regime – strongly position it to facilitate scientific engagement to galvanise support for the development of pragmatic solutions. Furthermore, the ILBI should arguably promote and not undermine (UNGA, 2015a) the role of the IOC in marine scientific research and technology in the UN system in accordance with UN resolution 69/292 (UNGA, 2015a).

Strong political will from Member States will be the most important factor in maximising the potential contribution of IOC to the ILBI. The IOC has delivered an ambitious portfolio of activities despite ongoing resource constraints persisting for more than a decade. The ongoing process of the “Future of IOC” suggests that the IOC is still thwarted by uncertainty about its future direction and has disparate driving influences on its programs. The ILBI provides a timely opportunity for renewed leadership from IOC Member States, Executive and Secretariat, to realise IOC's vision for global marine science, capacity development and technology transfer. Integrating the ILBI into the “Future of IOC” discussions provides an opportunity to boost IOC's global leadership role in governing ABNJ, the last global commons.

The decision by the IOC Executive Council to establish an intersessional working group on the possible contribution of the IOC to the ILBI PrepCom (decision EC-XLIX/4.3.3, Paris, 9 June 2016) and the contributions made by IOC via interventions to PrepCom2 are promising signs of IOC playing an increasingly proactive role in supporting member States in the development of the ILBI. Continued coordination and communication will be critical to ensure swift identification of the potential contributions and implications for IOC in the context of ILBI and share IOC's experience in marine science, technology transfer and capacity development before the conclusion of the PrepCom process in 2017.

5. CONCLUSION

Marine scientific research must form the cornerstone of efforts to address all elements of the ILBI. The interlinkages between marine technology transfer and non-monetary benefit sharing of MGR highlight the importance of marine scientific research. The IOC is a key actor due to its mandate, international and regional governance architecture, operational functions and experiences. IOC has a potentially pivotal role in the development of the ILBI to:

1. Enable open-access to data, information and biological samples from ABNJ;
2. Facilitate international cooperation in marine scientific research;
3. Promote capacity development and marine technology transfer; and
4. Support member states in marine scientific research governance.

However, resource and capacity constraints pose obstacles that, unless overcome, could hinder IOC's contribution to the development and implementation of the ILBI. The institutional capacity development needs identified by IOC must be considered to ensure that expectations of IOC's potential role are realistic. Further strengthening the capacity of IOC would require strong political will from Member States, support from the international scientific community and strengthened partnerships with international organisations. The development of the ILBI offers a timely and unique opportunity to enhance IOC's visibility at the international level and improve the implementation of technology transfer and capacity development as provided for by LOSC Parts XIII and XIV. The international community could re-invigorate the role of IOC in global ocean governance to enhance technology transfer and ensure that the outcomes of marine scientific research in ABNJ benefit all humankind.

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