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Science-Policy Interfaces for Ocean Protection

**The case of the international negotiations for the conservation and sustainable use of
marine biodiversity of areas beyond national jurisdiction (BBNJ)**

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Science-Policy Interfaces for Ocean Protection

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INFORMATION ON PUBLICATIONS

a) Information on Co-Authorship

All publications for this thesis were written in the framework of the MARIPOLDATA project and co-authored with my first supervisor and principal investigator of the MARIPOLDATA project Assoc. Prof. Alice B.M. Vadrot. My second supervisor Kristina Gjerde was involved in the supervision between 2021 and 2023 in form of written comments, suggestions and feedback. Under the supervision of Assoc. Prof. Alice B.M. Vadrot, I developed the concept for my PhD project and was lead author on all three PhD publications.

b) Individual Contribution

Paper 1

I contributed to the concept of the study and identified the search keywords for the literature review, created the literature sample, analysed all articles in the sample through development of codes and categories in atlas.ti. Finally, I wrote the article, supported by comments and feedback by Assoc. Prof. Alice Vadrot. Paper 1 underwent professional language editing by Roxanne Powell. Figures were designed by myself and operationalised by the university of Vienna Graphic Service, mainly by Mrs. Veit.

Paper 2

I contributed to the concept of the study. Jointly with the MARIPOLDATA research team, I conducted collaborative event ethnography at all IGCs, Intersessional Work by the UN Secretariat and most of the High Seas Dialogues and conducted and transcribed interviews. With oral and written feedback by my two supervisors and additionally by Prof. Pam Chasek and Rolf Lidskog, I finalised data analysis and writing. Figures were designed by myself and operationalised by the Vienna Graphic Service, mainly by Mrs. Veit.

Paper 3

I contributed to the concept of the study. Within the MARIPOLDATA research team, I undertook collaborative event ethnography at all IGCs and Intersessional Work by the UN Secretariat and most of the High Seas Dialogues and conducted and transcribed interviews. With comments and feedback from Assoc. Prof. Dr. Alice Vadrot, I engaged in analysis of the interviews and CEE material and writing.

c) Bibliographic Information on Publications

Paper 1

The Voice of Science on Marine Biodiversity Negotiations: A Systematic Literature Review

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LIST OF ABBREVIATIONS

ABMT	Area-based Management Tool
ABNJ	Areas Beyond National Jurisdiction
ABS	Access and Benefit Sharing
AIS	Automatic Identification Systems
AOSIS	Alliance of Small Island States
APEI	Area of Particular Environmental Interest
ATS	Antarctic Treaty System
BBNJ	Marine Biodiversity Beyond National Jurisdiction
CAMLR Convention	Convention on the Conservation of Antarctic Marine Living Resources
CAO Agreement	Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean
CARICOM	Caribbean Community
CBD	Convention on Biological Diversity
CB&TT	Capacity Building and Transfer of Marine Technology
CEE	Collaborative Event Ethnography
CHM	Clearing-House Mechanism
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Conservation of Migratory Species of Wild Animals
COP	Conference of the Parties
CPPS	Permanent Commission for the South Pacific
COVID-19	SARS-CoV-2 Corona Virus Disease 2019
DOSI	Deep Ocean Stewardship Initiative
EBSA	Ecologically or Biologically Significant Marine Area
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EU	European Union
ERC	European Research Council
FAO	Food and Agriculture Organisation
HSA	High Seas Alliance
ICES	International Council for the Exploration of the Sea
IGC	Intergovernmental Conference

IGO	Intergovernmental Organisation
IIED	International Institute for Environment and Development
ILBI	International legally binding instrument
IMO	International Maritime Organisation
IOC-UNESCO	Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organisation
IPCC	Intergovernmental Panel on Climate Change
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IR	International Relations
ISA	International Seabed Authority
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
IUCN	International Union for Conservation of Nature
IWC	International Whaling Commission
MARIPOLDATA	“THE POLITICS OF MARINE BIODIVERSITY DATA”- Global and National Policies and Practices of Monitoring the Ocean, ERC Research project
MARPOL	International Convention for the Prevention of Pollution from Ships
MEA	Multilateral Environmental Agreement
MGR	Marine Genetic Resource
MSP	Marine Spatial Planning
NEAFC	North-East Atlantic Fisheries Commission
NGO	Non-governmental Organisation
OECD	Organisation for Economic Cooperation and Development
OEWG	Ad hoc Open-Ended Informal Working Group
OSPAR Convention	The Convention for the Protection of the Marine Environment of the North-East Atlantic
PrepCom	Preparatory Committee
PSIDS	Pacific Small Island Developing States
PSSA	Particularly Sensitive Sea Area
RFMO	Regional Fisheries Management Organisation
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice
SEA	Strategic Environmental Assessment
UBC	University of British Columbia

UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNDOALOS	United Nations Division for Ocean Affairs and the Law of the Sea
UNGA	United Nations General Assembly
UNEP	United Nations Environment Programme
UNEP-WCMC	United Nations Environment Programme World Conservation Monitoring Centre
UK	United Kingdom
UNFSA	United Nations Fish Stocks Agreement
USA	United States of America
VME	Vulnerable Marine Ecosystem
VMS	Vessel Monitoring System
WECF	NGO Women Engage for a Common Future
WEO	World Environmental Organisation
WIPO	World Intellectual Property Organisation
WOA I	First World Ocean Assessment
WOA II	Second World Ocean Assessment
WWF	World Wide Fund for Nature

Science-Policy Interfaces for Ocean Protection

The case of the international negotiations for the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction (BBNJ)

ABSTRACT

On March 4th 2023, the United Nations finalised a new ocean treaty. The new legally binding agreement seeks to ensure the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction (BBNJ). The importance of science as a basis for international decision-making to address global environmental problems on our planet is agreed among academics and policy-makers, however there is lack of research on the role of science in the BBNJ negotiations. This thesis is studying science-policy interfaces during the intergovernmental BBNJ negotiations to understand a) the academic output, b) practices of scientific input and c) the use of science within the BBNJ negotiations.

To do so, firstly, a comprehensive literature review on science output related to the negotiations gives an overview of main priority topics and recommendations by academic circles. The sample consists of 140 peer-reviewed publications from 42 journals by 99 first authors that were published in English until 2020. Results show that publication output has a Global North bias and suggestions by the BBNJ scientific community were only incorporated to a limited extent into the draft texts.

Secondly, the thesis provides a comprehensive study of pathways of scientific input into the negotiations by identifying the actors and their practices in science-policy interfaces through collaborative event ethnography. Results demonstrate that a linear view on “science informs policy” is limited and does not hold true to the complexity of science-policy interfaces in the BBNJ negotiations. A variety of actors contribute to the inclusion of science into the political discussions and an empirical case shows that science and policy are intertwined by jointly contributing to science production in the framework of the BBNJ negotiations.

Thirdly, the use of science in the negotiations is explored at the example of one specific scientific concept – the concept of ecological connectivity. The literature review and collaborative event ethnography identified the ecological connectivity concept as an overarching theme for the negotiations that was used by state and non-state actors with different rationales. Results point to a strategic use of science by BBNJ actors and the possibility for scientific concepts to put into question existing legal frameworks. It shows that the use of

science in international negotiations is embedded in value judgements and cannot completely be separated from politics.

Overall, the thesis shows that an interconnected and complex web of actors from science and policy contributed to knowledge generation and scientific input into the BBNJ negotiations. This study embraces the diversity and complexity of science-policy interfaces, accounts for epistemic inequalities and contextualises science integration and use within the negotiations.

This thesis combines the study of scientific output on BBNJ negotiations in form of peer-reviewed literature with an ethnographic deep dive into the science-policy interrelations on site at the conference and in the intersessional period to open the black box of how and by whom science is produced, integrated and used in the BBNJ process, how science and policy interrelate at the sites of agreement-making, and by which factors this relationship is conditioned. This thesis demonstrates, at the example of the negotiations for a new legally binding instrument for marine biodiversity, that science-policy interfaces in intergovernmental negotiations need to be understood as mutual dynamics and epistemic inequalities and limiting conditions have to be accounted for. It thus, contributes to academic literature in environmental governance and provides valuable suggestions for reforming science-policy interfaces at the UN level.

1. Introduction

International negotiations at the United Nations (UN) level can address global problems, including transboundary environmental issues, and set regulations for areas that are beyond the jurisdiction of any state, in which case governance needs to be in cooperation between all nations. In light of the triple planetary crisis of climate change, biodiversity loss and pollution, intergovernmental negotiations at the United Nations have let to, and are in the future envisioned to result in, the adoption of agreements and the creation of institutions to address these environmental concerns.

Legally binding agreements that set legal obligations to Parties are one way to regulate international spaces and enable global governance. The most recent one has been the new legally binding agreement under the United Nations Convention on the Law of the Sea (UNCLOS). Intergovernmental negotiations for the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ) were concluded in March 2023, and adopted in June 2023, after almost two decades of discussions, pre-meetings and intergovernmental conferences.

In order to address global environmental problems, science-policy interfaces are crucial in decision-making. Even though the importance of science is emphasised at UN level (UNEP, 2022), literature has criticised that science in the agreement-making – *before* the agreements are finalised – seems to be generally lacking (Lanchbery & Victor, 1995). States from different regions, including those who have significantly contrasting views on matters, may agree that decisions need to be made on a scientific basis, seeking to integrate science as the uniting factor in negotiations. Yet, portraying science as a one-size fits all approach to address societal challenges is limiting and proves to be quite problematic (Pregernig, 2014).

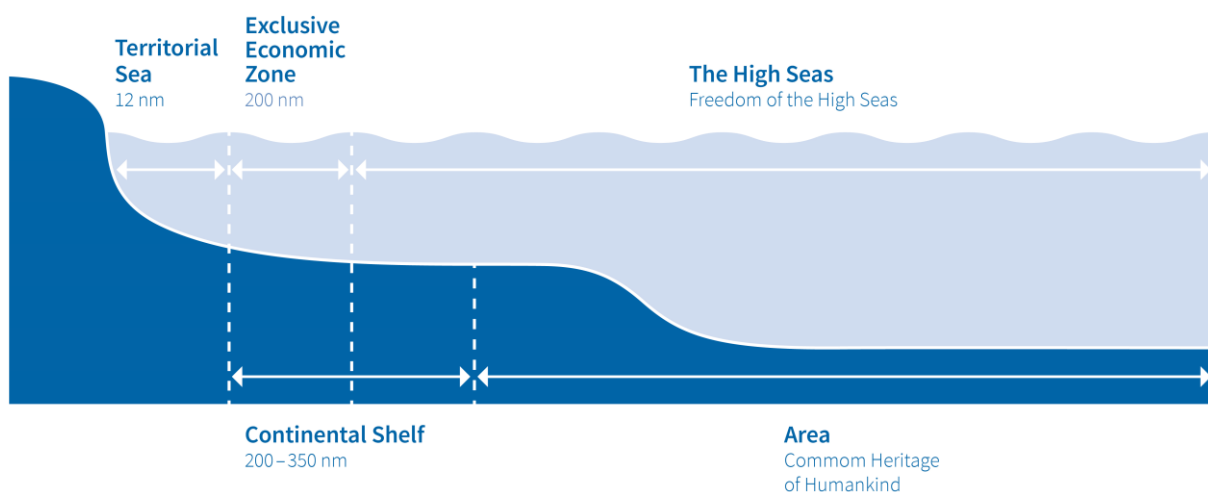
This thesis closely studied the negotiations since the beginning of the intergovernmental conferences (IGCs) – the formal negotiations – and explored science-policy interfaces for ocean protection in agreement-making. To do so, this thesis firstly identified scientific literature on the negotiations with a systematic literature review. Secondly, through collaborative event ethnography (CEE), the thesis explored pathways of scientific input into the negotiations on site and in the intersessional period between conference sessions. Thirdly, it studied how the use of a scientific concept (ecological connectivity) in the negotiations by state and non-state actors was embedded into mutually enforcing dynamics of science and policy.

2. Background and Relevance

2.1 Fragmented Ocean Governance

The ocean makes up around 70% of the Earth's surface (Claudet et al., 2020). As a global carbon sink, it provides for oxygen production and regulates the climate through its currents and temperature exchanges (Levin & Le Bris, 2015). The ocean is home to prestige marine biodiversity and the human population has been living with and using the ocean for centuries, for food security, navigation, trade, as well as cultural and recreational activities. There are many threats to the health of the ocean that largely result from human activities, including marine pollution, resource extraction and ocean acidification (Druel & Gjerde, 2014; Harrison, 2016; Rochette et al., 2014).

The United Nations Law of the Sea Convention (UNCLOS) from 1982 provides the overarching framework for regulations of ocean activities but left areas beyond national jurisdiction with a fragmented framework of responsible sectoral and regional organisations: The maritime zones, established under UNCLOS, separate a state's Territorial Sea, Exclusive Economic Zone (EEZ) and Continental Shelf from *areas beyond national jurisdiction*, including the High Seas (water column) and the Area (seafloor) (See Figure 1). Around two-thirds of the ocean's surface and nearly 95% of the ocean's volume is not under the jurisdiction of any state – areas beyond national jurisdiction (Ardito, Andreone, & Rovere, 2023). In these “international waters”, activities are regulated by a fragmented framework of agreements, while two different regimes govern the water column and the seafloor (Drankier, 2012; Durussel, Soto Oyarzún, & Urrutia S, 2017).



Source: Vadrot, Langlet & Tessnow-von Wysocki (2021)

Figure 1: Simplified Maritime Zones under UNCLOS

Very little knowledge on our ocean and its prestige ecosystems and marine species exist (Rabone et al., 2019), and there are unequal global capacities among states in conducting scientific research, using the ocean and implementing conservation measures (Gjerde, Clark, & Harden-Davies, 2019; Mossop, 2018; Tiller, De Santo, Mendenhall, Nyman, & Ralby, 2020; Warner, 2014). Currently, the ocean is unevenly exploited by different state governments and private stakeholders at unsustainable levels (Lubchenco & Haugan, 2023).

2.2 Negotiating the Future of Marine Biodiversity: The BBNJ Negotiations

The international negotiations for the conservation and sustainable use of marine biodiversity beyond national jurisdiction (BBNJ) are one example of international cooperation to regulate global commons (Vollan & Ostrom, 2010). After first meetings of Ad Hoc Open-Ended Working Group and Preparatory Committee sessions from 2006, formal intergovernmental negotiations for the new treaty started in 2018 and ended in 2023 after being prolonged in the COVID-19 pandemic.

The agreement consists of four main pillars: the question of access, use and sharing of benefits of marine genetic resources (MGRs); the establishment of area-based management tools (ABMTs), including marine protected areas (MPAs); the process for environmental impact assessments (EIAs); as well as the provision of capacity building and transfer of marine technology (CB&TT). Moreover, there are themes that regard all package elements, namely cross-cutting issues. These negotiations constitute fora, where international stakeholders from states, intergovernmental organisations (IGOs), and non-governmental organisations (NGOs) come together to decide upon future regulations for the use and protection of marine biodiversity of areas beyond national jurisdiction.

2.3 Science for the BBNJ Negotiations

The question, hence, arises, whose voice is heard at the negotiation sites and what type of knowledge the future of marine biodiversity is decided upon. Increasingly, there are voices calling for decisions to be taken on the basis of “best-available science”. Still, the question remains who can be the voice of biodiversity in the vastness of values (Takacs, 1996), and, thus, what state representatives perceive as a relevant knowledge base for decision-making over these international areas.

Science plays a significant role for ocean protection by detecting ocean threats and conservation needs and propose effective solutions (Dias et al., 2017; Mossop, 2018; Vadrot, 2022). Science makes aware of environmental problems, such as the cumulative loss of biodiversity, and contributes to the understanding of ecological systems (O'Neill, 2017). To manage human

activities that affect the environment, scientific understanding is essential (Barbier et al., 2018; Miloslavich et al., 2018), as seen in policy-makers' requests for advice on the identification and establishment of High Seas ABMTs, including MPAs (Dias et al 2017; Mossop et al 2018) and environmental impacts assessments (Harden-Davies & Snelgrove, 2020). With scientific information on migration routes, breeding behaviour of marine species, characteristics of ecosystems, and their variation due to climate change, areas in need of protection and activities with adverse impacts on marine biodiversity can be identified. Seafloor data, including information on the depth, shape and character of the seafloor has been identified as a research priority for 2021-2030 by the UN Decade of Ocean Science for Sustainable Development (Levin et al., 2019). The social sciences can contribute with identifying inequalities, conflicts, trade-offs, competing values and interests that undermine inclusiveness, transparency, and the identification of best practices in ocean governance (Vadrot et al., 2022). Direct, year-round observations made over many generations by Indigenous Peoples (Leonard et al., 2022) and other local knowledge (Bernatchez, Fraser, Lefaivre, & Dugas, 2011; Reineman, Thomas, & Caldwell, 2017; Sullivan, Conway, Pomeroy, Hall-Arber, & Wright, 2015) proves beneficial to ocean conservation.

However, it is less clear, who provided such knowledge, over which ways, and how it was used in the negotiations - before an international agreement for the future use and conservation of marine biodiversity was finalised.

3. PhD Outline & Aim

This section introduces the outline of the PhD and discusses the research question that connects the individual publications. This PhD dissertation deals with the role of science in the emergence of the new legally binding agreement to conserve and sustainably use marine biodiversity. While this study defines science as *knowledge obtained through scientific methods* (including all BBNJ relevant natural and social sciences/law), it also accounts for *other forms of knowledge*, namely local and traditional knowledge of Indigenous Peoples and local communities. The case of the BBNJ instrument offers the opportunity to study the emergence of a multilateral agreement in practice and to identify the role of science in the negotiations and its connection to policy.

In order to uncover who the actors are in the science-policy interfaces, over which ways science enters into the negotiations and how actors use science, this thesis focuses on the negotiation stage (intergovernmental conferences and intersessional period) and applies collaborative event

ethnography as a methodology. This PhD, thus, seeks to study the inclusion of science in the BBNJ negotiation stage (See Figure 6), before the agreement was finalised.

The overarching research question that guides the PhD thesis is: **How is science shaping the BBNJ negotiations?** To answer this question, the PhD thesis covers different sub-research questions, which are studied in the individual research papers, as follows:

1. **Science output:** How does the BBNJ scientific community write about the negotiations?
2. **Science input:** How is science integrated into the policy process “on site” in the BBNJ negotiations?
3. **Science use:** How is science used in the negotiations at the example of the scientific concept of ecological connectivity?

The PhD project builds on research on global environmental governance, ocean politics and science-policy interrelations in international negotiation processes within the theoretical framework of constructivism. The contribution of this research is to portray the science-policy interfaces in the BBNJ process, detect limitations and identify opportunities for improvement. It does so by, first, giving an overview of how the scientific community engages with the instrument under negotiation in the literature. A systematic review of scientific literature portrays the authors’ focus topics and recommendations regarding the BBNJ process and identifies the geographic origins of the research. Second, the PhD studies the BBNJ science-policy interrelations on site at the conferences and in the intersessional period, including the actors and pathways over which science is shaping the negotiations, using CEE, including participant observation and semi-structured interviews at the negotiation sessions in New York. Third, the thesis analyses how science was used in the BBNJ process at the example of one scientific concept: the concept of ecological connectivity.

Within this thesis, I use the definition of science-policy interfaces being diverse forms of “exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making” and account for “relations between scientists and other actors in the policy process” (van den Hove, 2007). Focus is, thus, on *practices* by scientists and policy-makers within the BBNJ negotiations. In this way, the dissertation can study 1) *where BBNJ science was produced*, 2) *how, over which actors and under what conditions science entered the BBNJ negotiations*, and 3) *how science was used by negotiators during the negotiation stage*.

4. State of the Art

In this section, I present and analyse the state of the art in the chosen field of research, namely science-policy interfaces in international negotiations in the field of global environmental politics. A variety of scholars engage in research on science-policy interfaces in global environmental governance. Science input is regarded as crucial for decision-making, as environmental topics are often technical and complex (P. M. Haas, 1992; O'Neill, 2017; Weiss, 2003). However, there are different schools of thought regarding the role of science in global governance processes (Lövbrand, 2014) and scholars research the issue from different angles and at distinct negotiation stages (Chasek, 2001a; Young, 1998). A gap in the literature can be identified in researching science-policy interfaces in *ongoing* international negotiations *before* a legally binding agreement is concluded, which is where my research is situated.

4.1 The Role of Science in Global Environmental Governance

In the 1970s, at a time when environmental problems were recognised as having a transboundary character, scholarship on global environmental governance emerged (Lövbrand, 2014). Within international relations theory, realism and neoliberal institutionalism have largely neglected the influence of science in policy-making, arguing that cooperation would only be driven by power and economic interests: With an initial dominance of realist approaches, which did not regard science any role in global politics, scholarly debates then shifted to include neoliberal theories that explained international cooperation among states through their mutual interdependence and, thus, through national (economic) benefits (Lövbrand, 2014). The theoretical school that dedicated more attention to the role of science is constructivism (Ruggie, 1998; Wendt, 1992), namely with work on how ideas and scientific information shape international environmental cooperation (Lövbrand, 2014). Constructivist scholarship is interested in the role of science in governance, by focusing on norms to explain world politics (Armstrong, Farrell, & Lambert, 2012), assuming that the world is constructed by norms and values (Wendt, 1992), which can change with new knowledge. Constructivists claim that the identities and interests of states are formed through social interaction (Lövbrand, 2014). Conventional social constructivists are interested in how states respond to scientific expertise, while critical social constructivists take a rather critical-interpretative perspective by looking at the making and validation of authoritative science (Lövbrand, 2014).

A prominent concept that has been used to describe how science shapes policy-making is through an “epistemic community” (P. M. Haas, 1992). An epistemic community describes

“a network of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area” (P. M. Haas, 1992, p.3). Unlike the broader scientific community, epistemic communities are defined by sharing a “set of normative and principled beliefs”, “causal beliefs”, “notions of validity” and a “common policy enterprise” (P. M. Haas, 1992, p. 3). Such networks have the power to identify “cause-and-effect relationships” and help to “define the self-interests of a state” and “formulate policies” (P. M. Haas, 1992, p. 15). It is argued that such networks can change the understanding of an environmental issue, and, hence, a state’s conception of its interests and therefore constitute an important explanatory factor for international cooperation.

4.2 Conceptualising the Link between Science and Policy in International Policy-Making

Traditionally, the concept of science input into negotiations was seen as a one-way knowledge transfer of neutral and objective facts on which policy-makers can base their decisions, the so-called “linear model” (Koetz, Farrell, & Bridgewater, 2012). Such rationalist perceptions of science draw a clear line between science and policy (Keller, 2009). Scholars that identify a separation between science and policy researched the “push model” of how science pushes itself into international policy-making and the “pull model”, arguing that policy makers underpin their positions with science (Pregernig, 2014). At the same time, literature points to ineffective communication between scientists and policy-makers, owed to the use of technical language by scientists, and their inherently different work cultures, resulting in “two-communities” that are difficult to combine (Pregernig, 2014).

Academic debates have then increasingly challenged these traditional models by considering different values and norms behind the production and interpretation of science, pointing to an interaction among scientific and political domains, actors and practices (Koetz et al., 2012; van den Hove, 2007). Considering the influence of politics on science, research in the field of climate policy shows how national interests can influence the production and interpretation of scientific findings in the climate regime for self-interested goals (Hickmann, 2014). Further, scholars argue that values cannot be separated from science, considering the social value of scientific knowledge in certain policy situations within particular political and cultural settings, and in this way, challenging the idea of neutral science input (Jasanoff, 2004; Lidskog & Sundqvist, 2002). Countering previous assumptions in the literature, that science informs policy-making best, if separated from the policy-making process, science can also be co-produced with actors from policy (Wyborn et al., 2019). Some academic debates criticise terminology such as “sound science”, arguing that this can be used by policy-makers to “deny

need for debate and negotiation” (van den Hove, 2007) and risks the exclusion of certain voices from the decision-making table (Pregernig, 2014; Stirling, 2014). Insights from science and technology studies point to a natural interconnection between science and policy and argue embracing such link can lead to preferred policy outcomes (Jasanoff, 1990; Pregernig, 2014).

Academics also increasingly seek to understand how indigenous communities engage in science-policy interfaces by linking traditional ecological knowledge, western science, and other knowledge systems (Diver, 2017), calling for increased representation of experts from countries of the Global South (Biermann, 2002; Mitchell, Cash, Clark, Dickson, & Gasser, 2006) and indigenous and local and practitioner’s knowledge in environmental policy (Turnhout, Bloomfield, Hulme, Vogel, & Wynne, 2012).

Scholars have empirically studied science-policy interfaces in the framework of international negotiations. Contestations over scientific terminology in assessment bodies were shown to reflect deeper political and social struggles and disagreements over authority and international political order (Hughes & Vadrot, 2019; Vadrot, 2014). Yet, also agreement over scientific terms can embed different interpretations and meanings for actors, supporting conflicting agendas, which are linked to the scientific concept in question (Gray, Gruby, & Campbell, 2014). The fact that empirical studies run counter theoretical assumptions about the clear separation of science and policy demonstrates the need to study the role of science in ongoing negotiations.

4.3 Negotiation Stages

Intergovernmental negotiations are processes of deliberation that generally span several decades of preparation, bargaining and procedural and legal steps for the operationalisation of the agreed commitments. To structure the agreement-making into researchable units, scholars have identified different phases of intergovernmental negotiations, which can be summarised into three stages 1) pre-negotiation, 2) negotiation, and 3) implementation (Chasek, 2001a, pp. 38-51; Young, 1998).

4.3.1 *Pre-Negotiation: Setting the Agenda*

Intergovernmental negotiations begin with the “pre-negotiation stage”, namely a phase of expert input prior to the decision whether or not an agreement needs to be negotiated (Chasek, 2001a; Young, 1998). This stage serves as a time for state Parties to get an overview of the problem at hand, analyse the situation and set the agenda. In this regard, science is crucial for pointing to the problem and its drivers. International negotiations start informally to decide if the problem deserves global decision-making before beginning formal negotiations. In this

regard, expert input on certain problems can significantly shape the agenda-setting and influence how, when and which topics will be discussed by policy-makers (O'Neill, 2017).

4.2.2 Formal Negotiation: Bargaining on the Ground

Following the pre-negotiations, the “negotiation stage” constitutes the formal negotiation process (Chasek, 2001a; Young, 1998). State delegations can learn about other states’ positions, priorities and red lines, and make compromises to ultimately reach consensus. These discussions will pave the way towards drafting a legal text. Scientists can take on a formal advisory role to international organisations, national governments and non-governmental organisations and corporations during the negotiation stage and in this way shape the drafting of the final agreement (O'Neill, 2017).

4.2.3 Implementation: Continued Work after Adoption

The final stage of negotiations is implementation. After adoption of the agreement, states will need to sign and ratify the agreement, which then makes the agreement formally enter into force. Ratification and implementation will require actions on the national level, for which often, national laws need to be adapted. The significance of science for the effective implementation of international agreements can be seen in vast literature on scientific bodies and assessments (Kohler, 2019). In the implementation stage, the measures’ effectiveness will need to be revised and adapted accordingly. With increased understanding of our ecosystems and how human activities affect the environment, previously adopted policies might need adjustments to meet the objectives of the agreement.

4.4 Science-Policy Interfaces in Intergovernmental Negotiations

Scholars have researched science-policy interfaces (Koetz et al., 2012; Matsumoto et al., 2020; van den Hove, 2007) regarding the role of science in environmental agreements (Andresen, 2014; Castells & Ravetz, 2001; Chasek, 2001b; Weiss, 2003), science advice of expert committees or formalised subsidiary bodies (Andresen, Baral, Hoffman, & Fafard, 2018; Kohler, 2019), intergovernmental science bodies, such as the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) (Hughes & Vadrot, 2019; Turnhout, Dewulf, & Hulme, 2016; Vadrot, 2014), and scientific assessments (Selin & Eckley, 2003). A large array of research on science-policy interfaces in international governance, thus, regards science-policy bodies or scientific and technical assistance for the *implementation* of specific agreements (Akhtar-Schuster et al., 2022).

To date, very few scholars look at the *negotiation stage* to study processes and dynamics of science-policy interfaces. Those scholars that study the use of science in ongoing intergovernmental negotiations focus on contestations of specific terminology in intergovernmental assessment bodies (Borie & Hulme, 2015; Hughes & Vadrot, 2019) or consensus-building despite conflicting views (Gray, Gruby, & Campbell, 2014). Science input into international negotiations has been studied regarding the lens of the conditions and factors under which policy-makers regard scientific input as relevant and use it in international negotiations (Lanchbery & Victor, 1995; Rietig, 2014), which types of knowledge matter (Dimitrov, 2006), and the role of consensual information for agreement drafting and implementation of international environmental agreements (Kailis, 2017). Yet, how practices of scientific input over the course of international negotiations play out *in the making* of a new agreement remain understudied.

Existing research on science-policy interfaces in the BBNJ negotiations (Tessnow-von Wysocki & Vadrot, 2020) covers imbalances in academic authorship (Blasiak, Pittman, Yagi, & Sugino, 2016; Tolochko & Vadrot, 2021), politisation of science and uncertainty (De Santo et al., 2019), science cooperation (Harden-Davies & Snelgrove, 2020), stakeholder perceptions on science-based approaches (Gaebel, Baulcomb, Johnson, & Roberts, 2020) and traditional knowledge (Mulalap et al., 2020). The MARIPOLDATA research team studied the BBNJ negotiations in regards to marine social sciences (Vadrot et al., 2022), the negotiations during the COVID-19 pandemic (Langlet et al., 2022; Vadrot, Langlet, Tessnow-von Wysocki, et al., 2021), and individual actors and their relationships (Langlet & Vadrot, 2023a, 2023b).

There is currently a gap in the literature of studies on scientific input and use in ongoing negotiations for new legally binding instruments, as in the case of the BBNJ negotiations. Empirical studies of science-policy interfaces in ongoing intergovernmental negotiations – before conclusion of a legally binding agreement – are therefore a valuable addition to the existing body of literature.

5. Theoretical Framework

The field of International Relations (IR) has long disregarded the role of science in international policy-making (Löfbrand, 2014). Over time, constructivist scholars have increasingly pointed to science in the emergence and implementation of international agreements. The bargaining process, however, has rarely been regarded as an object of study. My work considers the negotiations themselves as an important site of study to understand science-policy interfaces along the way until the ultimate decisions are made and enshrined in legal text. Rather than

studying finalised legal UN documents, or the role of science in implementation of agreements, this work is dedicated to the study of how science-policy interfaces play out in *ongoing* intergovernmental negotiations. Questions of who is participating, how expertise is defined, what practices are used to bring science into the discussions and how environmental problems are framed, are by no means disconnected from IR and require more attention in research of intergovernmental negotiations. My dissertation is therefore interested in how science shapes intergovernmental negotiations by looking into science output on, science input into and science use by actors within the BBNJ negotiations.

This thesis builds on constructivist scholarship on science-policy interfaces, and accounts for a diversity of actors, values in science production and interpretation and mutually influencing dynamics between science and policy. My research goes beyond the response of states to science in the negotiations, and also accounts for where the science originates from, practices by actors to bring science into the negotiations, and rationales for science use within the discussions for inclusion into the legal text. While being interested in how science enters the negotiations, this work adds to conventional constructivist scholarship by unpacking “the science” and approaches a deeper understanding of where and how science was generated and integrated into negotiations. In this way, the thesis leans on scholarship of structural forms of critique concerning a gap between the Global North and the Global South, and resulting epistemic inequalities. The use of science is embedded into the theoretical lens that perceptions of relevance of the scientific findings can differ among actors with different political, social, economic or cultural contexts and who hold different values and world views. Interpretation, validation and legitimisation of science is, thus, a crucial area of scholarship, which has so far been largely missing from international relations literature on intergovernmental negotiations.

If assumed that science is generated to different extents across the globe and political relevance of scientific findings are perceived differently across nations and societies, this gives utmost importance to science-policy interfaces in intergovernmental negotiation settings, where decisions are supposedly taken “based on the best available science”. The information and data that are available to decision-makers and perceived as relevant to include as a basis for global decision-making have a direct impact on what is regarded an environmental problem, how solutions are framed and what will be implications of policy responses for different regions, states, population groups and the planet. The following section embeds the thesis into its theoretical framework.

5.1 Knowing how to govern the Ocean: Science in BBNJ

Knowledge about the ocean is regarded as a prerequisite for its governance. Governing the ocean requires knowledge on its “structures, functions, international processes, the resources and services they provide, as well as their carrying capacities, stressors and triggers of change” (Hornidge, 2023, p. 25) and what we know about the ocean is in direct connection to how we govern it (Campbell et al., 2016).

Yet, science cannot portray the full picture in a neutral way, which is in part due to restrictions (technological, financial), lack of data and the fact that “what scientists (and scientific collaborations) see [...] is influenced by what they look for” (Campbell et al., 2016, p. 523). How scientists make “a priori decisions about what factors matter, how they probably interrelate, and how to bound the analysis” (Lélé & Norgaard, 1996, p. 356) is demonstrated by the following example: how to measure the productivity of a forest could be done by looking at the rate of photosynthesis, annual increment of timber, or the increase in protein content of edible plants or animals, which prediction would necessitate different models in their own contexts and results would speak to different users of the forest (Lélé & Norgaard, 1996). It is, thus, not only a scientific question of which model to use, but rather a social aspect of who uses the model and whom it serves (Lélé & Norgaard, 1996). The judgement of what is important to measure is likely to differ between “people with different upbringings, disciplinary backgrounds, or positions in the social order”, which makes the choice of models, variables, and frameworks contentious to address complex environmental problems that are impacting different regions, people and groups differently in our “highly fragmented, changing, and unequal social order” (Lélé & Norgaard, 1996, p. 356). Scholarly work on the need to consider the diversity of values and effects in environmental policy-making point to the subject and value-laden choices of scientists regarding their world views, models, scales, variables and the interconnectedness of these choices with social structures and cultures (Lélé & Norgaard, 1996).

In-depth research, but also local and indigenous knowledge, is seen as the basis for ocean use, management and governance (Hornidge, 2023). A large body of literature is addressing the importance of different knowledge systems (scientific, local, traditional and Indigenous) and integration in decision-making (Hornidge, 2023). Scholars emphasise the value of integrating different forms of knowledge, including Indigenous and traditional knowledge, traditional local knowledge and local ecological knowledge (Poto et al., 2022), the latter representing “the accumulated knowledge about species, environments, and their interactions accrued and passed down over multiple generations” (Drew, 2005, p. 1291).

5.2 Epistemic Inequalities

Academic literature points to epistemic inequalities among countries (Tolochko & Vadrot, 2021) and argues that it hinders “coordinated or collaborative ocean governance” at the global level (Hornidge, 2023, p. 27). Epistemic inequalities are hereby referred to as “disproportional institutional representation” of data (Piper & Wellmon, para. 52), which can regard the prestige of universities, but also geographical imbalances and recognition (or lack thereof) of different forms of knowledge.

Scholars problematise the fact that with differences in funding opportunities and hierarchies in knowledge production, “specific knowledge systems and traditions shape ocean sciences and its research priorities”, which in turn leads to “international asymmetries”, gaps in the knowledge of the ocean and a lack of “global intellectual and cultural diversity”, leaving the power over “what we know, how we know, and what is done with that knowledge” to dominant actors, serving their “interests and agendas” (Hornidge, 2023, p. 30).

Apart from epistemic inequalities across world regions in knowledge production, there are also differences in the extent to which ideas spread, leaving some researchers and institutions “far more influential than others” (A. C. Morgan, Economou, Way, & Clauset, 2018, p. 1). This can get to the extent that some are given advantage over others to communicate their knowledge, resulting in an underrepresentation of knowledge of marginalised groups in the collective pool of knowledge (Byskov, 2021, p. 2). Science-policy interfaces and their knowledge governance practices that define diversity, integration and uptake, shape the way “how and why we know the ocean” (Hornidge, 2023, p. 41). Insights from sustainability studies point to a need for greater inclusivity of disciplines and actors in the production of science “to expand the knowledge base for sustainable outcomes” (Wyborn et al., 2019, p. 329).

5.3 Science in Decision-Making: A Matter of Value

This thesis builds on literature that assumes that scientific facts are always put into context and are subject to interpretation, which defines its relevance for the observer. Not the scientific fact alone, but rather the direct relevance of the consequences within the societal and political realities matter when it comes to perceiving science relevant for decision-making.

Traditionally, conventional constructivism has focused on epistemic communities to produce consensual knowledge separated from politics (P. M. Haas, 1992). Yet, this assumption was elaborated on by more recent theories that through social interactions and learning shared causal beliefs and norms are negotiated, contested and transformed (Lövbrand, 2014, p. 167).

Social and cultural contexts differ and bring with it locally embedded ways of seeing and knowing nature (Jasanoff & Martello, 2004), recognising that “there is always more than one perspective and that each perspective embodies a particular set of values” (Lövbrand, 2014, p. 174). With different values connected to biodiversity, “tensions are guaranteed to arise through this struggle to speak for nature” (Takacs, 1996, p. 5). The production, validation and legitimisation of science is thus, not entirely separated from politics (Betsill, 2014) and perceptions of the relevance of scientific findings for decision-making and judgements over who constitutes an expert differ (Miller, 2004).

Simply by having a value-based policy process, the scientific knowledge used in policy is automatically value-laden (E. Morgan, 2014). If values in science and values of the policy actor overlap, the actor is expected to use science to support a political position (E. Morgan, 2014). Scholars have pointed to NGOs using science in intergovernmental negotiations to alter governments’ interests and, in this way, seeking to shift their positions (Betsill & Corell, 2008, p. 23). The use of science in policy is argued to be influenced by “availability, value character and value overlap” (E. Morgan, 2014, p. 45). Scholars emphasise that “values will be a part of science, especially in areas such as sustainability, which is inherently a value-based concept”, as “world views and values seem to be integral to the concept of sustainability” (Lélé & Norgaard, 1996, p. 355). Cash et al., (2002) structured conditions for linking science and policy with their framework of “salience, credibility and legitimacy”. Only when decision-makers perceive science as “salient, credible and legitimate”, it will be regarded as relevant and has the potential to be used in policy-making (Cash et al., 2002).

Suggestions to strengthen science-policy interfaces oftentimes encourage science that is addressing social needs (Büger & Gadinger, 2007) – as in the case of the United Nations Decade of Ocean Science for Sustainable Development (Ryabinin et al., 2019). International relations can in this way build on concepts that stem from sustainability studies. The theoretical framing of co-production emphasises the improved usability of science in cases where it is jointly produced by scientists and practitioners (Wyborn et al., 2019). Studies have looked into cases where joint scientific production led to an increased perception of relevance of the findings for policy-making (Dilling & Lemos, 2011).

In global environmental governance, diverse and even competing ideas, discourses and norms influence how the environment is represented and policies implemented (Lövbrand, 2014). Conceptualising sustainable development as a discourse, it is recognised that some issues are made visible, while others get neglected, some experts and knowledge claims are empowered

and practices and techniques supported over others (Death, 2010). Environmental politics is, thus, not a “product of nature” but rather “constituted through distinct representational practices” (Lövbrand, 2014, p. 171).

This also means that structures are not seen as the “limits of possible” and can be transformed with human agency through the continuous contestation of social and political practices (YalÇın, 2019). Social constructivism emphasises a subjective dimension of human activity, rather than rationality, and allows for the consideration of social constructs, such as culture, identity, ideology – not solely material interest (Bobulescu, 2011). Thus, structure is not seen as a given “pre-existing reality [...] to condition human action”, destined to stay fixed, but can be transformed (Bobulescu, 2011, p. 52). What differentiates social constructivists from other schools of thought in international relations is that they consider not only regulatory rules but also constitutional rules (Bobulescu, 2011, p. 56). Territoriality and the perceptions of borders – on land or in the sea – are seen by constructivists as a constitutional rule on which further actions, UN institutions and regulations are set, however, they are not taken as reality, but rather as a socially and politically constructed entity that was commonly agreed upon: collective intentionality (Bobulescu, 2011). In contrast to observational facts that exist regardless of agreement over their existence (such as mountains, population size or gravity), “social facts”, are socially constructed (including money, sovereignty, property rights) (Bobulescu, 2011; Ruggie, 1998). People’s realities and environments are more than products of hypothesis testing and empirical positivism – namely “processes of meaning-construction and sense-making” (Hornidge, 2023, p. 26).

6. Methodological Approach

The methodology centres the *process* of negotiations and the *site* of the intergovernmental conference sessions in understanding science-policy interfaces. Collaborative event ethnography can capture practices and dynamics of science-policy interfaces and serves to open the black box of intergovernmental negotiations “in the making”, accounting for social interactions during the negotiation stage (Langlet, Leiter, Tessnow-von Wysocki, & Thew, 2023). Conceptually, the methodology of event ethnography seeks to understand practices and meanings in the negotiations. By not only participating in the negotiations, but rather by *becoming part* of the BBNJ actors over time during the field work, the underlying dynamics of the negotiation space could be explored, actors identified and practices of science-policy interactions studied. Insights from semi-structured interviews offered additional information on

the science-policy interfaces in the intersessional period, namely the time in-between the negotiation sessions.

To comprehensively address the sub-research questions, I applied a range of methods to study the BBNJ science-policy interrelations (See Table 4): First, a systematic literature review was valuable to map the science output regarding the negotiations. Collaborative event ethnography, including participant observation and semi-structured interviews, served to study the BBNJ negotiations in practice in regards to science-policy interrelations on site. Complementary, BBNJ treaty draft texts were used as material to identify the use of science in the legal documents over time in the case of ecological connectivity and participation lists served to match actors and their affiliations. The following section describes the methodological approach of my dissertation.

6.1 Systematic Literature Review

A systematic literature review of BBNJ publications identified key issues discussed in the academic literature. Focus of the review was on BBNJ priority areas and recommendations for the development of the new instrument, published in English language in the timeframe 2004-2020. A three-stage process, following the PRISMA-P guidelines (Moher et al., 2015) was used to generate the final sample of 140 publications from 42 journals by 99 first authors, including academic articles and book chapters.

The literature review gives an overview of main challenges facing the current ocean governance framework and overarching topics across package elements to consider in the negotiations in order to meet the objectives of the instrument, mentioned by BBNJ authors. Moreover, the review provides for each of the BBNJ package elements: (a) a compilation of scientific findings and identified priority areas, (b) suggested guiding principles, approaches and recommendations, (c) references to existing law, (d) best-practice examples and lessons learnt, and (e) recommended institutional entities for implementation. Finally, gaps in BBNJ literature were identified. Tracing the research institutions of all first authors of the 140 publications provides an overview of where the publications originated from. As the first (and up to this date only) systematic literature review on the BBNJ negotiations, it was valuable to identify main debates and priority topics within the scientific community and point to potential for future research in the field.

- “BBNJ”
- “biodiversity beyond national jurisdiction”
- “marine biodiversity” AND “ABNJ”
- “marine biodiversity” AND “areas beyond national jurisdiction”
- “marine biological diversity” AND “ABNJ”
- “marine biological diversity” AND “areas beyond national jurisdiction”
- conservation and sustainable use of biological diversity in areas beyond national jurisdiction
- conservation and sustainable use of biodiversity in areas beyond national jurisdiction
- “biodiversity” AND “beyond national jurisdiction”
- “biological diversity” AND “beyond national jurisdiction”
- “biodiversity” AND “ABNJ”
- “biological diversity” AND “ABNJ”
- “biological diversity” AND “beyond national jurisdiction”

Table 1: Keywords for Web of Science Search

Firstly, the sample was created on the basis of a keyword search (See Table 1) in Web of Science in May 2020, including all available records.

Secondly, titles, abstracts and keywords of all publications were screened, on which basis articles were systematically included in or excluded from the sample. Those articles mentioning the BBNJ negotiations, or with direct relation thereto, were included. In all other cases, full texts were read for the final decision on inclusion or exclusion. Using the snowball method, additional publications on the topic were added that fell through the sample due to the use of different terminology, such as “beyond national *boundaries*” (instead of the legal description “beyond national jurisdiction”).

Thirdly, a collaborative and iterative coding process followed, in which all articles of the sample were qualitatively analysed, using the research software atlas.ti. After, first, developing overall categories, codes were grouped under each category. In a second step, the titles, abstracts, keyword and full texts of the entire sample of 140 publications were re-coded to generate the comprehensive list of categories and codes (See Table 5).

6.2 Collaborative Event Ethnography

The method of event ethnography is increasingly recognised to study multilateral political processes (Hughes, Suiseeya, & Vadrot, 2019; Hughes et al., 2021; O'Neil & Haas, 2019; Paterson, 2019; Vadrot, 2020; Witter et al., 2015). Adding to studies of regime theory, which have centred states as main actors in multilateral negotiations, CEE serves to understand the

multiplicity of actors and dynamics of treaty-making processes (Hughes & Vadrot, 2023). By not limiting the analysis to state actors and their influence in the negotiations, event ethnography grasps the engagement of non-state and other actors (Marion Suiseeya & Zanotti, 2023), such as the role of chairs and UN staff, and the importance of spaces outside the formal negotiations. New approaches, like CEE, are required to study the complexity of agreement-making and to develop an understanding of the negotiators and multiple actors that shape the process towards a new multilateral treaty (O'Neill & Haas, 2019).

Several scholars have studied international negotiations and meetings in practice to make sense of a variety of research problems, including the politics of biodiversity conservation at the Tenth Conference of the Parties (COP10) to the Convention of Biological Diversity (CBD) (Campbell, Hagerman, & Gray, 2014; Gray et al., 2014), the concept of trade-offs at the Fourth World Conservation Congress (Brosius & Campbell, 2010), or the influence of Indigenous Peoples in shaping global environmental governance (Marion Suiseeya & Zanotti, 2019; Witter et al., 2015).

In order to portray the role of science in the BBNJ process, the negotiation sites themselves offer a crucial space to study the practical science-policy interrelations (Vadrot, 2020). This includes the ways in which science and policy interact in the negotiations, considering the actors that are the communicators of science or accredit science an important role, as well as interactions between the scientific community and decision-makers and the production of science *during* the negotiation stage or even *at the site* of the intergovernmental conferences. The PhD thesis was written within the MARIPOLDATA¹ project. Access to the intergovernmental conferences was funded by the project (except one conference session that restricted NGO participation due to COVID-19) and permission to use the generated CEE data was granted by the UN Secretariat and agreed by the European Research Council.

6.2.1 The Study Sites

A significant part of the PhD research studied the BBNJ negotiation process in practice to analyse science-policy interfaces. Studying international negotiations involves understanding the negotiators and participants (O'Neil & Haas, 2019) through on-site research at the conferences. Rather than solely observing and documenting the occurrences in international negotiations, event ethnography serves to critically reflect on “the transformation in meaning

¹ MARIPOLDATA stands for “THE POLITICS OF MARINE BIODIVERSITY DATA”- Global and National Policies and Practices of Monitoring the Ocean and is a research project, financed by the European Research Council and led by Assoc. Prof. Alice Vadrot, based at the University of Vienna, Austria: www.maripoldata.eu

and governance” that the negotiations represent (Corson, Campbell, & Macdonald, 2014). It includes observations at the conference sessions, but also beyond the formal negotiations, at side events (Bansard, 2023), coordination meetings and informal gatherings. As part of the MARIPOLDATA team, we took fieldnotes at the intergovernmental conferences, which included participant observation of the negotiators and participants in the room, their arguments and positions in interventions, side event presentations and other public announcements. The collaborative event ethnographic research team consisted of 2-3 on-site participants and at times additional 1-3 digital ethnography colleagues in the Vienna office. In this way, comprehensive data collection throughout all IGCs could be ensured. Moreover, digital CEE provided a way to follow online informal exchanges.

6.2.1.1 Intergovernmental Conferences at UN Headquarters, New York

All IGCs were held at the UN headquarters in New York, United States of America. Participants increased over time at the BBNJ negotiations, with approximately 800-1,100 participants from state delegations, IGOs, and NGOs. The main negotiation room was the plenary, located in the main building (See Paper 2, Supplementary Material 8.2.2.ii), but also parallel informal working group sessions took place in smaller meeting rooms. While most sessions were accessible to observers and broadcasted live on the UN Web TV², in some instances closed sessions were held to which observers were not granted access (Bach & Martin, 2023).

Between sessions, after the end of the day and on the weekends, side events were held, which brought together different stakeholders on various topics in an informal conversation-style format. In the building, the negotiation was not confined to the negotiation room, but informal conversations continued in the hallways and various cafés and restaurants across the UN campus and beyond (Bansard, 2023). While conversations in these instances could of course not be used as our official data, it often served to confirm main conflict lines in the negotiations, identify important actors and approach new interviewees to elaborate on these issues in a formal interview.

6.2.1.2 Online Informal Exchanges

When in 2020 the COVID-19 pandemic prevented in-person meetings, the conference that was mandated to be the final conference was postponed (Langlet et al., 2022). While the UN Secretariat initiated virtual informal exchanges, these conversations had no legal weight and progress on the draft text could not formally be made (Vadrot & Ruiz Rodríguez, 2022). It was a platform on Microsoft teams, where all participants who were registered for the upcoming

² See: <https://media.un.org/en>

conference could access and comment in written form. The UN Secretariat chose topics related to the draft text to which delegates were encouraged to submit posts – as opposed to official proposals. From the ethnography point of view, this was a significantly interesting development, as in this format, not only was there no order in which delegates could post their comments (in contrast to the formal discussions, where there is a speaking order of 1) regional groups, then 2) states, then 3) IGOs, lastly, 4) NGOs), it was also possible to react on certain comments with emojis of support or disagreement.

Even before the Secretariat engaged with the intersessional work, a number of states and non-state actors initiated the so-called High Seas Treaty Dialogues, a virtual platform for conversation of BBNJ topics that were proposed by the organisers. The format was again different – mainly verbal conversations with the use of a laptop or phone camera that did not only reveal the delegates face expressions and reactions, but also gave the entire dialogue a much more informal atmosphere – by essentially having this conversation in the delegate’s living room, rather than the United Nations meeting spaces with no windows and detached from the personality of individual negotiators.

The MARIPOLDATA team engaged in digital ethnography (Vadrot & Ruiz Rodríguez, 2022) to comprehensively cover all themes, posts by delegates and the verbal conversations exchanged during the High Seas Dialogues and Intersessional Work. Data was anonymised accordingly and no contents were linked to individual actors where Chatham House Rules applied.

6.2.2.3 Systematic Collaborative Fieldnote-Taking

As the research team MARIPOLDATA, we developed a systematic, consistent and harmonised way to take fieldnotes that can be compared over time (different IGCs) and sessions (within the same conference). The “matrix” consists of different columns in an excel sheet, where we documented the different categories *actor*, *observation* (verbal and non-verbal), *comment* (content of observation), *date*, and *time* (moment when observation occurs) and left room for additional notes, where applicable (See Table 2 and methodology in: Vadrot, Langlet, & Tessnow-von Wysocki, 2021).

<i>type_obs</i>	<i>actor</i>	<i>observation</i>	<i>comment_obs</i>	<i>package</i>	<i>section_title</i>	<i>sub_section</i>	<i>issue_detail</i>	<i>option_detail</i>	<i>pro_contra</i>	<i>issue_specific</i>	<i>language</i>	<i>date</i>	<i>time</i>	<i>negotiation_format</i>	<i>side_main</i>	<i>formal_informal</i>	<i>author</i>
Type of observation	Actor doing the activity	activity summarised	Detailed activity, e.g. spoken intervention	Thematic package element of intervention	Title of the topic discussed in draft text	Subsection of the topic discussed in draft text	Paragraph /word in draft text	Specific option	Intervention for/against option detail	Reference to science	Language of intervention	Date of activity	Time of activity	Format of negotiation session	Main negotiation or side event	Formal or informal negotiation session	team member taking notes

Table 2: Simplified Matrix for MARIPOLDATA Fieldnote-Taking

Different MARIPOLDATA team members contributed to this data collection and combined in-person and digital ethnography (both live and retrospective from UN Web TV). In this way, the database that served for my analysis, was comprehensive over the entire period of the negotiation stage – including the intersessional period during COVID-19. In case of parallel sessions, the team was able to cover all topics and sessions in a harmonised format. Also, side events, including sessions at lunchtime, in the evenings and on weekends where different thematic areas of the agreement were discussed, could be covered with this systematic fieldnote-taking. The fact that this documentation was nearly identical to what was being said, it also neutralises, to a certain extent, possible different understandings of the negotiation content across team members. Interpretation of the data was done in a collective manner, upon return to the office in Vienna (Gray et al., 2023).

6.2.2.4 Personal Fieldnotes

Besides the systematic data collection within the team, I collected my personal observations and interpretations. I did so in summaries of the individual days, which included descriptive, methodological and analytical fieldnotes. Those notes incorporated important issues discussed, actors seen/met, comments on how the event ethnography strategy worked out, and general sense-making reflections on the dynamics in the negotiations. It served to reflect on the BBNJ process, make sense of the dynamics while being on site, remember actors and their affiliations and compile main take-aways of the day that served the understanding of the negotiation dynamics but were not official statements, and thus, did not appear in the matrix. As agreement-making sites go beyond the formal negotiations (Bansard, 2023), I also reflected on my conversations in the hallways and around the venue, as well as took note of regional meetings happening on site (e.g. coordination meetings that were indicated to take place, but were closed to non-state actors).

6.2.2 Semi-Structured Interviews

I conducted interviews at the negotiation sites, as well as virtually throughout the BBNJ negotiation stage. Interviewees included government delegates, representatives from NGOs and IGOs, as well as natural scientists and researchers from the social sciences and law, working on BBNJ treaty topics. The interviews had the style of semi-structured interviews (Magnusson & Marecek, 2015), where the researcher is not obliged to stick to the pre-formulated questions but can flexibly adjust them in the course of the interview, allowing for addressing additional questions that might emerge (Lamnek, 2005; Stier, 1999). The interviews served to gain insights into the science-policy interfaces from the perspectives of representatives of states, non-governmental and intergovernmental organisations and scientists to understand to what extent

and over whom scientific input was included and how science was used throughout the negotiations. The interviews contributed to the identification of how science shaped BBNJ treaty-making by understanding the perceptions of BBNJ actors on practices of scientific input, the relevance and use of science in the negotiations and key actors in knowledge production and dissemination.

Tasks

<i>Preparation</i>	• Collaborative preparation in the research team • Study of the draft texts • Identification of main issues and research questions of the project (MARIPOLDATA) • Gathering and adjustment of necessary documents: project overview; interview guide; ethical approval; consent form • Translation of the material into different languages, as applicable (English, French, German, Spanish) • Identification of potential interviewees • Contacting first interviewees via email
<i>Interview</i>	• Access to interviewees through conference venue • Interview techniques • Consent form signature
<i>After the interview</i>	• Adequate data storage • Transcriptions • Data analysis and check of different interpretations of data in a collaborative manner in the team • Confirming transcriptions with interviewees, where applicable

Table 3: Process of Conducting Interviews

The research team collaboratively prepared, conducted, transcribed and analysed the interviews (See Table 3). In the preparation phase, aims of the interviews in relation to the work packages of MARIPOLDATA and individual research questions of the team members were discussed and the material (consent forms, project overview and interview guides) prepared. Information on the project (See Appendix 16.2.1) and the consent form template (See Appendix 16.2.2) were previously agreed upon with the European Research Council at the start of the ERC project by the Principal Investigator (See Section 7 on Ethical Considerations). Interview guide (See Appendix 16.2.3) was continuously adapted throughout the research process and translated into different languages, where necessary.

We studied the draft texts prior to each IGC and identified potential interview partners beforehand. Where applicable, we contacted potential interviewees before the session to schedule an interview. In all other cases, I either identified my interview partners through recommendations by other interviewees, or on site. Large screens displayed the faces of intervening BBNJ actors and their delegation names in plenary sessions, and in some informal working group sessions, where technical infrastructure allowed so. This was particularly helpful for identifying relevant interviewees. In many cases, I reached out to delegates who mentioned particular issues in their statements that were of my research interest (e.g. science-policy interfaces; ecological connectivity), which could then be elaborated on in an interview.

The research team conducted interviews in English, French, German and Spanish on site at the conference venue and online as follow-ups, to allow interviewees to respond in their native languages, where possible. The sample of interviewees included actors involved in the BBNJ process, representing states, NGOs, IGOs and scientists in the negotiations, spanning differences in geographical regions, gender, age groups and level of experience in the field.

After the interview, recordings and consent forms were securely stored on the university servers, following ERC guidelines for adequate data storage (Vadrot & Hughes, 2023). Transcripts were generated – first manually and over time with the assistance of an artificial intelligence program (otter.ai), when this technology became available. In the latter case, recordings were run through the program, and re-listened while reading the transcripts. Additional information on actors, programs and organisations mentioned by the interviewees were provided with weblinks and the atmosphere of the interview was portrayed by a description (e.g. laughs, hesitates). In this way, the written material could be analysed more accurately over the time of the PhD project. Upon request, interviewees confirmed the final transcripts via email before our analysis and publication of quotes and content. For use in publications, the quotes were simplified, grammatically corrected and revised (by the interviewee) to facilitate the flow of reading and ensure their correct interpretation.

6.2.2.1 Coding

Interview material from the expert interviews was coded and thematically structured. The interview transcripts were analysed following “thematic analysis”, including categorisation of data (classifying the codes into thematic groups) and reorganisation of the data into thematic representations (interpreting) (Roulston, 2010, p. 150).

In this process, first, “codes”, which can be described as “labels that researchers apply to sections of data” (Roulston, 2010, p. 151) were generated. The codes can be derived directly

from words or sentences of the interviewee “in-vivo”, created by the researcher, or a mixture of the two (Roulston, 2010, p.151). The researcher then organises the generated codes into “categories” (Roulston, 2010, p. 153). Within the CEE team, the codes and categories were discussed. It involved an iterative process of making sense of the data set and included re-visiting codes and categories, requiring organisation into thematic representations for interpretation.

6.2.2.2 Reflection on Interviews

While interviews provide a valuable method to address qualitative research questions, it is focused on individual responses. These responses depend on the interviewees’ previous experiences, how they understand the question, and what kind of information they are willing to share. For this reason, it is useful to combine the method of qualitative interviews with other methods. The interview material was a valuable addition to the CEE fieldnote-taking dataset and was combined with a literature review and document analysis to put the individual responses and opinions into context. Interviewing as a method requires deeper reflection than may be necessary in other methods (Yamineva, 2023). This is due to the fact that researchers not only need to reflect on themselves when collecting and interpreting the material, but additionally how they could impact the data that is obtained (Briggs, 1986).

Firstly, the researcher has an impact on the data generated by selecting the interviewees. In our case, choosing the interviewees was straight forward: the CEE team had a clear idea of who the experts were that we were interested to interview and my sample included a range of interviewees from different delegations, with diverse experience levels and gender groups. Being on site with multiple researchers of the CEE team, we made a list of potential interviewees and divided the interviews among ourselves.

Secondly, apart from the interviewee sample chosen for interviews, there are further things to consider, including how my person and background influenced the data generated (Briggs, 1986): How likely is it that interviewees are opening up to me with their insights and opinions? What kind of information are they sharing with me and what might be a barrier? I am reflective of being a young, white, female, European researcher who was funded by the European Research Council, affiliated with the University of Vienna and how this could have impacted the kind of data that I obtained through my interviews. In this regard, the fact that the research team participated with the badge of the International Studies Association and we were affiliated with the University of Vienna might have played a role. In other cases, event ethnographers would attend conferences as a representative of a state delegation or an environmental activist

group, which could skew the data obtained, in cases where interviewees might respond differently regarding politically sensitive information.

Interpretation of interview data requires reflection of own experiences and possible pre-judgements. Beliefs of the researcher, “about the world and how it should be understood and studied” naturally guide interpretation (Denzin, 2008). Sharing the transcripts and the quotes embedded in the context used for publication with the interviewee is therefore a way to avoid misinterpretation of the data.

By using interviews as a method, the researcher, therefore, directly influences the data by a) selecting the interviewees, b) being perceived and understood in a certain way by the interviewee and c) interpreting the results. As part of a research team, my colleagues included a young male student and an established female professor, whose interview data I could additionally use, and data analysis was discussed collaboratively, which reduced the above-mentioned risks of bias.

6.3 Supporting Document Analysis

To complement the data, supporting document analyses of final documents of the Ad Hoc Open-Ended Working Group, Preparatory Committee meetings and the Intergovernmental Conferences (IGCs), were undertaken to trace the (dis-) appearance of the scientific concept of ecological connectivity in legal draft texts of the treaty over time (Allan & Chasek, 2023). This analysis was used to identify the concept’s inclusion into different parts of the continuously changing draft texts, including the shifting of the concept between articles and resulting implied legal obligations or lack thereof. Participant lists of the sessions served as additional sources to match actors to their affiliations and identify publishing scientists who attended the negotiations.

<i>Identification of science in the BBNJ process</i>	<i>Methods</i>	<i>Sources</i>
<i>Science Output</i>	• Systematic Literature Review	• BBNJ publications (2004–2020)
<i>Science Input</i>	• Event ethnography (IGC2–5.2) • (participant observation and semi-structured interviews) • Digital Ethnography IGC1 & IGC4 & Intersessional Period	• MARIPOLDATA Fieldnotes • interview transcripts • Side event material • Participation Lists
<i>Science Use</i>	• Event ethnography (IGC2; 3; 5.1; 5.2) • (participant observation and semi-structured interviews) • Digital Ethnography IGC1 & IGC4 & Intersessional Period • Document Analysis	• MARIPOLDATA Fieldnotes • interview transcripts • Side event material • UN draft texts

Table 4: Methods and data for the identification of science in the BBNJ process

7. Ethical Considerations

As this PhD research was part of the MARIPOLDATA project³, any research activities were under current EU guidelines and ethical statements have been approved by the Ethics Committee of the University of Vienna and by the European Research Council. The research was carried out in line with the highest ethical standards and the applicable EU, international and national law on ethical principles, as required by the European Research Council to ensure informed consent of all participants in the study and appropriate data collection and storage⁴. This implies, that data was collected only with the consent of the UN Secretariat and in cases of personal statements (outside of the formal sessions) consent forms were used to ensure that participants (interviewees) understood the research and agreed to contribute with their insights.

³ The research is part of the ERC project MARIPOLDATA and received funding from the European Research Council. I was employed in the MARIPOLDATA project during the time of my PhD (2019–2023).

⁴ See requirements of the ERC and the University of Vienna:
<https://erc.europa.eu/manage-your-project/ethics-guidance>
<https://www.qs.univie.ac.at/en/services/ethics-committee/>

In discussions under Chatham House Rules (on site and online), I did not link the names of actors to individual statements and never attended closed meetings.

7.1 Access to the Field Site

The conference was open to registered participants from all stakeholder groups. Still, access to the field site required some preparatory steps. Conference attendees could register as members of a state, an IGO or an NGO delegation, while the latter included in the BBNJ negotiations non-state actors from advocacy groups, scientific institutions and the private sector. Generally, attendance was also granted when an individual was previously registered for a similar UN conference (such as the UN Ocean conference), as the personal profile stays within the UN system and can be used for multiple conference registrations.

Access to the field site was granted through registration with the International Studies Association as part of the MARIPOLDATA research team. Falling under “non-governmental organisation” access was permitted to the main building from 8am (later than state delegates) and generally all meetings that were not specifically closed to observers (such as regional coordination meetings of states or restricted “informal informal” sessions).

As part of the MARIPOLDATA research team, I attended the following conferences in-person as a scientific observer: IGC3; 5; 5.2 and undertook digital event ethnography data collection retrospectively for IGC1 and comprehensively and “live” for IGC4 (See Figure 5). I also conducted CEE throughout the intersessional period, including by taking fieldnotes of the informal online exchanges, organised by the UN Secretariat, and the High Seas Treaty Dialogues between 2020-2023. Reflective of being an early-career, white, female, European researcher from the University of Vienna, Austria, who was employed in a research project that was funded by the European Research Council, I am aware that my experience of easily and quickly getting registration and visa approved to attend the conferences might not be shared by all (Yamineva, 2023).

For participation on site and online, it was important to follow ethical standards (Hughes et al., 2021), which included ethics approval of the European Research Council and the Ethics Committee of the University of Vienna. Prior to attending the conferences, the principal investigator of the MARIPOLDATA team got the approval of the UN Secretariat for undertaking the research with full transparency about the research project. Individual registration for the separate conferences was still necessary.

Session formats varied across and within IGCs. Generally, meetings were open to registered participants, or even broadcasted to the public. Meetings that invited registered participants included the plenary, which united all conference participants and was broadcasted on UN Web TV, and informal working group sessions, which were thematic focus groups, generally smaller in size and only open to registered participants. Another format was the so called “informal informals”, which aimed at having even smaller group discussions in an informal atmosphere, held under Chatham House Rules. Informal informals constituted the smallest meetings, which were in some cases only accessible to state delegates. In cases where meetings were closed to non-state actors, I never attended. In rare cases, meetings were not officially closed to non-state actors, but the group jointly agreed not to attend in order not to disturb the policy-making process of small informal groups of states in sensitive negotiation topics. In these instances, I also refrained from attending out of sensitivity to political high-level discussions. In other cases, participation of non-state actors was limited, due to space restrictions in small meeting rooms, which were used for the informal informal discussions and access was coordinated among all non-state actors. Respect towards the other participants and the rules of the UN Secretariat were of utmost importance throughout the entire research process.

7.2 Ethical Considerations for Interviews

Interviews constituted an important part of the data collection for this dissertation. Interviewees included official participants of the BBNJ negotiations from government, intergovernmental and non-governmental organisations, academia and private sector representatives. When conducting interviews, it is important that the interviewee participates voluntarily and is informed about and understands the research project, including its objectives and methods (Hughes & Vadrot, 2023). In many cases, the interviewees requested to see all notes and the transcripts of their interviews, which were sent to them for individual approval and potential edits and additions, prior to any publication of its content. The interviewee could also decide on the format in which to be cited or quoted (See Appendix 16.2.2).

7.3 Data Storage

Research institutions in the European Union context have to comply with data protection laws under the General Data Protection Regulation 2016/679 (GDPR) (Vadrot & Hughes, 2023). Generated data within the framework of the MARIPOLDATA project was stored on a secure university cloud shared-folder, only accessible to members of the MARIPOLDATA team, as identified in the ERC ethics regulations. Interview data was anonymised and the reference number of the interview was stored separately with a link to the person and their affiliation and

contact details. In case interviewees requested changes to the original interview data, these were made prior to publication of the results and updated accordingly in the stored data.

7.4 Publication of Data

Privacy of the delegates and interview partners was ensured at all times. In cases, where public documentation of the event was prohibited, data on the actors and their statements was not shared. This included refraining from sharing information in written or image format for social media posts, blog articles or scientific publications. No sensitive data about delegates were shared at any time.

In publications, including blog articles and scientific papers, the data was only connected to actors where it was permitted to do so, i.e. in official, open negotiation sessions. This did not include informal sessions as part of the IGCs, and Informal High Seas Treaty Dialogues in the intersessional period. All interview data was anonymised, and only connected to the actor in cases where the interview partner gave their voluntary consent in writing.

8. Publications

To understand how science shaped the BBNJ negotiations, three individual research papers study the a) science output, namely what has been published on BBNJ; b) science input, researching different pathways of how science entered the negotiations, and c) science use, exploring BBNJ actors' rationales for including science into the legal text (See Figure 2). Within MARIPOLDATA, I contributed to the preparations of the fieldwork of all sessions, starting from IGC3 in 2019, data collection in all IGCs (including retrospectively with recorded UN Web TV sessions) and the intersessional period (virtually and in-person), data curation and data analysis. This section presents the three publications of my dissertation.

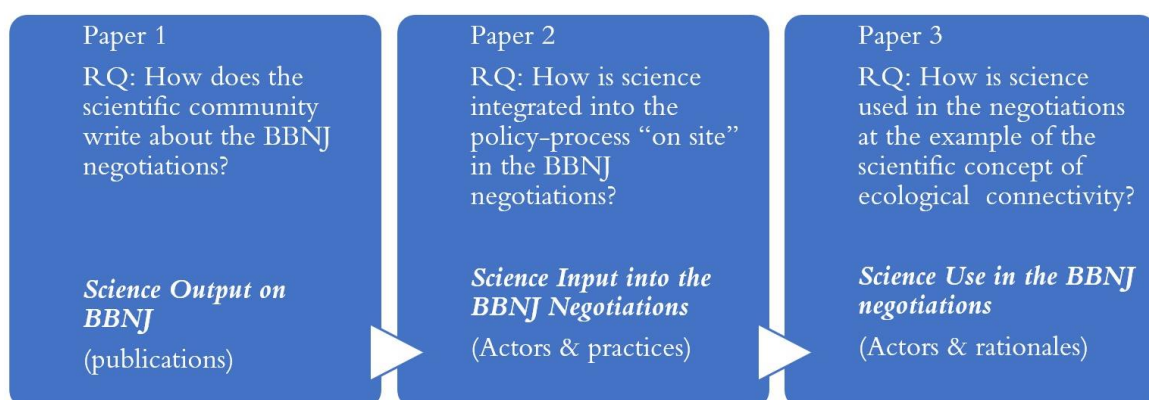


Figure 2: Overview of Papers

8.1. Science Output

Before diving into how science was integrated and used in the BBNJ negotiations, an understanding is needed of *what science* was published, on *which themes* and *by whom* – in short, the science output. In order to get a sense of the scientific landscape on the topic of marine biodiversity beyond national jurisdiction, my first PhD contribution is a systematic literature review of all academic articles on the BBNJ negotiations and BBNJ governance at large (2004-2020). It constitutes an overview of main recommendations for international policy-making, an identification of gaps in the literature and a study of the composition of the growing and constantly changing BBNJ scientific community. The following article, published in December 2020 is a systematic literature review of 140 publications on the BBNJ negotiations and governance, starting with the first publication on the topic, covering the time period 2004-2020.

The findings are of relevance to inform the negotiations, contribute to scientific debates and encourage readers from a wide array of scientific disciplines to connect their research to the BBNJ process. The value of this review is providing an overview of the state of the art covering all elements of the BBNJ treaty and connecting the different BBNJ topics. While portraying the existing science output, the paper also points to literature gaps and global geographical inequalities in science production.

8.1.1 Paper 1: The Voice of Science for Marine Biodiversity Negotiations

A Systematic Literature Review

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The Voice of Science on Marine Biodiversity Negotiations: A Systematic Literature Review

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Keywords: International negotiations, marine biodiversity, ocean protection, BBNJ, ABNJ, science-policy interfaces, transformative change

Abstract

Over one hundred governments are currently negotiating a new legally binding instrument for the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction (BBNJ). The new agreement is to address four broad themes: marine genetic resources (MGRs); area-based management tools (ABMTs), including marine protected areas (MPAs); environmental impact assessments (EIAs); and capacity building and the transfer of marine technology (CB&TT). Although a large corpus of scientific BBNJ literature exists, a comprehensive overview and critical analysis of the academic debate is currently missing. This systematic review seeks to fill this gap by examining the main priority topics and recommendations in a sample of 140 multidisciplinary, geographically diverse publications. As an up-to-date summary and analysis, it is intended for researchers from diverse academic disciplines in the natural and social sciences, policy-makers, and practitioners. It untangles the complex BBNJ negotiations, highlights the policy relevance of existing work, and facilitates links between science, policy, and practice. It presents recommendations made in the literature sample for each of the four package elements of the future treaty and identifies four overarching themes: ocean connectivity, institutional design, the role of science, and digital technology. This paper identifies two important gaps that need to be addressed if we are to conserve marine biodiversity in international waters: the science-policy interfaces and the need for transformative change.

Introduction

Marine biodiversity and ecosystems are facing threats from various sources, including shipping, fishing, climate change, and emerging human activities, such as bioprospecting and deep-sea mining (Rayfuse, 2012; Druel and Gjerde, 2014; Rochette et al., 2014a; Ma et al., 2016). Moreover, scientific and technological innovations introduced since the adoption of the United Nations Convention of the Law of the Sea (UNCLOS) have created legal uncertainty for

stakeholders regarding the exploration and exploitation of marine genetic resources (MGRs). The ocean, as a global commons, belongs to, and can be used by all (Ranganathan, 2016). Problems of overexploitation of the global commons can be prevented or reversed by international multilateral agreements setting global rules, regulations, and standards under which states change their behavior accordingly (Keohane, 1982; Oberthür, 1997; Volla and Ostrom, 2010).

A new legally binding agreement on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ), whose pre-negotiations started in 2006, is currently being negotiated among UN member states. This “BBNJ treaty” is an attempt to preserve vulnerable marine ecosystems, use the ocean and marine species in a sustainable manner, legally regulate access to and benefit sharing of marine genetic resources in international waters, and strengthen ocean science and marine technology around the globe. The negotiations are a response to the fragmented framework of ocean governance, including four “package elements”: marine genetic resources (MGRs); area-based management tools (ABMTs), including marine protected areas (MPAs); environmental impact assessments (EIAs); and capacity building and marine technology transfer (CB&TT).

The first academic publications on BBNJ started before the pre-negotiations and a corpus of academic literature has emerged in the past decades, addressing different aspects of the future ocean treaty. BBNJ authors have addressed the closing up of governance gaps regarding the exploitation of MGRs (Scovazzi, 2016; Blasiak et al., 2018, 2020; Humphries et al., 2020), the effective conservation of marine ecosystems (Sander, 2016; Davies et al., 2017; De Santo, 2018; Dunn et al., 2018, 2019; Johnson et al., 2018; O’Leary and Roberts, 2018; Warner, 2018; Crespo et al., 2019; Gownaris et al., 2019; Popova et al., 2019; Maxwell et al., 2020), and capacity building and the strengthening of scientific research in international waters (George and George, 2018; Collins et al., 2019; Harden-Davies and Gjerde, 2019; Rabone et al., 2019).

This article systematically considers all peer-reviewed literature related to the BBNJ process, covering 140 multidisciplinary, geographically diverse publications in the time frame 2004–2020 (hereafter “the BBNJ literature”). As an up-to-date summary and analysis, it is intended for researchers from diverse academic disciplines, policy-makers, and practitioners, untangling a complex issue, highlighting the policy-relevance of existing work, and facilitating links between science, policy, and practice.

After a section on the methodological approach, followed by a description of the sample of BBNJ publications that this systematic review is based on, this paper first examines the main challenges facing the current ocean governance framework identified in the BBNJ literature. Secondly, the review provides for each of the BBNJ package elements: (a) a compilation of scientific findings and identified priority areas, (b) suggested guiding principles, approaches and recommendations, (c) references to existing law, (d) best-practice examples and lessons learnt, and (e) recommended institutional entities for implementation. Thirdly, the review elaborates on overarching topics across package elements named by BBNJ authors, which need to be taken into account in the negotiations if objectives are to be met. These include: ocean connectivity; the relationship between BBNJ and existing instruments, and institutional design; the role of science in BBNJ; and digital technology. Finally, we identify two important gaps in the current BBNJ literature: science-policy interfaces; and a connection between the BBNJ process and the need for “transformative change” (Diaz et al., 2019).

Methods and Literature Sample

The review is of academic literature dealing with the BBNJ negotiations and process at large. Systematic reviews are valuable to prevent replication of research effort, provide new insights into established areas of research through the comparison or combination of existing evidence, as well as to discover gaps in the literature and future research potential (Dacombe, 2018). Systematic reviews are particularly relevant in the “early stages of development of a policy,” and when “a general overall picture of evidence [...] is needed to direct future research efforts,” both of which is the case in light of the ongoing BBNJ negotiations (Petticrew and Roberts, 2005, p. 21). The aim of this review is to analyze the corpus of BBNJ literature to identify main debates and priority areas within the scientific community and to discuss research needs and future trajectories for the study of BBNJ related issues.

Data Collection and Sample

We collected data and created our sample in a three-stage process, being aware of the PRISMA-P guidelines (Moher et al., 2015). First, we developed keywords and undertook a search in the Web of Science database to obtain a comprehensive sample of publications on BBNJ.

The keyword search in Web of Science was undertaken in May 2020, including all available records, with the following search words:

- “BBNJ” (36 results)
- “biodiversity beyond national jurisdiction” (38 results)
- “marine biodiversity” AND “ABNJ” (29 results)
- “marine biodiversity” AND “areas beyond national jurisdiction” (52 results)
- “marine biological diversity” AND “ABNJ” (15 results)
- “marine biological diversity” AND “areas beyond national jurisdiction” (24 results)
- conservation and sustainable use of biological diversity in areas beyond national jurisdiction (31 results)
- conservation and sustainable use of biodiversity in areas beyond national jurisdiction (55 results)
- “biodiversity” AND “beyond national jurisdiction*” (135 results)
- “biological diversity” AND “beyond national jurisdiction*” (51 results)
- “biodiversity” AND “ABNJ” (50 results)
- “biological diversity” AND “ABNJ” (26 results)
- “biological diversity” AND “beyond national jurisdiction*” (51 results)

After removing duplications, the original sample stood with 172 publications. In a second step, we screened titles, abstracts and keywords of all publications to follow a systematic inclusion and exclusion before the coding process. Criteria for inclusion were that the publication either dealt with the BBNJ negotiations directly by mentioning the agreement or process; or with direct relevance to the BBNJ negotiations. The third step involved an assessment for eligibility of all full texts of publications that were not already immediately included in the sample. Publications which did not meet the aforementioned criteria, were excluded from the sample⁵. The sample was complemented by the inclusion of further relevant publications, obtained during the research process, using the snowball method⁶. The final sample contains 140 publications from 42 journals by 99 first authors, including academic articles and book chapters, all of which were published in English and underwent peer review⁷.

While we acknowledge the existence of a significant body of literature that is relevant to BBNJ topics without directly referring to the political process, this review maps out the academic literature that explicitly refers to the agreement—i.e., draws explicit links between research and

⁵ 11 publications, i.e., publications concerning particular local cases without direct connection to BBNJ; two books, as only relevant book chapters were included for qualitative analysis, 14 inaccessible publications.

⁶ Use of snowball method: Inclusion of 17 additional relevant publications cited in the reference lists of articles in the sample which were not found through the Web of Science search (due to e.g., use of different terminology: *beyond national boundaries*).

⁷ See the PRISMA flow diagram and the final sample in the Annex.

the future BBNJ treaty, presents original research on the process itself, or comments on different aspects of the agreement, making concrete recommendations and proposing solutions. Since we exclusively focused on marine biodiversity in areas *beyond* national jurisdiction and the current BBNJ negotiations, remaining articles go beyond the scope of this study.

Data Analysis

The articles from the sample were then qualitatively analyzed, using the atlas.ti research software for computer-based qualitative analysis. Firstly, the sample was coded “*in vivo*” and categories were created. These categories were further developed and codes grouped under each category following an iterative and collaborative process. Secondly, after having obtained the final list of categories and related codes, we systematically re-coded the whole sample, including titles, abstracts, keywords, and full texts (See Table 5).

<i>Categories</i>	<i>Codes</i>
Topic	FOCUS (MGRs, ABMTs, MPAs, EIAs, CB&TT, MSR, fisheries, EBSAs) ASSUMPTION KEYWORDS
Contribution	TYPE METHOD ORIGINAL DATA NORMATIVE/DESCRIPTIVE/ANALYTICAL
Standpoint	THEORY SUPPORTIVE/NEUTRAL/NEGATIVE
References	LEGAL REFERENCE REFERENCE TO SCIENCE REFERENCE TO HISTORY CONCEPTS

Table 5: Categories and codes for the coding process

According to our analysis, most publications from the sample either address (1) one of the four package elements of the future BBNJ treaty, (2) the general BBNJ process, or (3) links between the treaty and existing frameworks. For the purpose of our literature review, we classified all publications and analyzed their content to get an overview of the state of the art in relation to each of the groups (see Table 6).

<i>Group</i>	<i>Number of publications</i>
ABMTs/MPAs	45
MGRs	27
EIAs	7
CB&TT	6
BBNJ	26
Framework interplay	10
Fishing/Fisheries	8
Institutional arrangements	5
Other	6
Whole sample	140

Table 6: Overview of number of publications per group in the literature sample

In the following, we describe the results of the review, firstly, structured according to the common issues contained in the four package elements, namely the challenges facing the current ocean governance framework and the potential of the BBNJ agreement to overcome them. Secondly, we present overarching themes that authors addressed across the BBNJ package elements.

Overcoming the Failings of the Ocean Governance Framework

The BBNJ literature points to the fact that the ocean governance framework is too fragmented and incomplete to effectively conserve and sustainably use marine biodiversity. Prior to the start of formal intergovernmental conferences (IGCs) on BBNJ, academic literature pointed to gaps in the current framework and published recommendations (Pecot, 2005; Warner and Rayfuse, 2008; Gjerde, 2012; Gjerde and Rulska-Domino, 2012; Freestone et al., 2014; Töpfer et al., 2014). All authors in the comprehensive sample of BBNJ literature, without exception, are in favor of a new legally binding BBNJ instrument. Around 60% of the sample publications (85 papers) deal with one particular package element, with a majority focusing on ABMTs/MPAs and MGRs, with 45 and 27 publications, respectively (see Table 2).

This section gives an overview of the scientific debates regarding the deficiencies of the current ocean governance framework and the potential of individual package elements. It presents priority areas identified by BBNJ authors, as well as references to existing law, best-practice examples, lessons learnt, recommendations, and official entities in charge of implementation.

Lack of Regulation of Marine Genetic Resources

Literature from our sample identifies several issues regarding MGRs that are problematic under the existing ocean governance framework. While minerals in ABNJ fall under the concept of the common heritage of humankind (regulated under UNCLOS) and genetic material *within* areas of national jurisdiction fall under the authority of the relevant state party (regulated under the Convention on Biological Diversity), there is legal uncertainty about the access to and use of MGRs in ABNJ (McLaughlin, 2010; Tvedt and Jørem, 2013). Regulations under UNCLOS do not include activities related to MGRs and divergent views exist on the concepts to build on regarding the access to and sharing of benefits of MGRs (Scovazzi, 2016).

The potential economic value of MGRs is still unclear (Harden-Davies, 2017b; Tiller et al., 2019, 2020; Yu, 2019); nonetheless, the literature detects an increasing interest in their exploration and exploitation among various stakeholders (McLaughlin, 2010; Nurbintoro and Nugroho, 2016; Van Dover et al., 2016; Becker-Weinberg, 2017). Considering the freedom of the High Seas under UNCLOS and the almost limitless opportunity to collect biological material from ABNJ, BBNJ authors emphasize the fact that this status quo increases inequality between developed and developing countries: they mention the advantage enjoyed by developed nations when it comes to scientific research and profit from the development of products derived from ABNJ marine genetic material (Merrie et al., 2014; Nurbintoro and Nugroho, 2016; Scovazzi, 2016; Broggiato et al., 2018; George and George, 2018). The BBNJ agreement, thus, faces the task of establishing a fair and equitable regulatory regime for MGRs in international waters, and to prevent biopiracy by few nations or companies (Merrie et al., 2014; Heffernan, 2020).

The main areas discussed in the BBNJ literature on MGRs are as follows: convergence and divergence in BBNJ negotiations (Leary, 2019); definitions of MGRs and related terms (Jorem and Tvedt, 2014; Blasiak et al., 2020); the relationship between MGRs and marine scientific research (MSR) (Broggiato et al., 2014; Jorem and Tvedt, 2014; Merrie et al., 2014; Scovazzi, 2016; Rabone et al., 2019); and MGRs and intellectual property rights (Drankier et al., 2012; Chiarolla, 2014; Jorem and Tvedt, 2014). In this regard, the BBNJ literature identifies potential responsible entities and points to best practices and lessons learnt; it also makes suggestions for a clearing-house mechanism to share data (see Table 3; see section Institutional Arrangements). The overarching, most discussed topic, however, concerns options for an access and benefit sharing (ABS) system for MGRs, including discussions on the inclusion of monetary and non-monetary benefits, obligatory vs. voluntary benefit sharing, and benefit

sharing for the conservation of biodiversity (Tvedt and Jørem, 2013; Yu, 2019). Some BBNJ authors discuss the concept of common heritage of humankind regarding the access to, and benefit sharing of MGRs in ABNJ (Becker-Weinberg, 2017; Peña Neira, 2017; Ridings, 2018).

Relationship between MGRs/ABS / IPR / Legal & scientific challenges / building and marine technology transfer and fish	Recommendations for international legally binding instrument	Identified responsible entities	References to law	Best practices/lessons learnt
Definitions of MGRs/ABS / IPR / Legal & scientific challenges / building and marine technology transfer and fish Relationship between MGRs/ABS / IPR / Legal & scientific challenges / building and marine technology transfer and fish	Cataloguing of MSR in ABNJ: activities, monitoring of impacts and sharing of research results (Hassanali, 2018) Open access to MGR data (Rabone et al., 2019) Common ex situ collection (Tvedt & Jorem, 2013) Facilitate cooperation through international scientific networks (INDEEP, DOSI) (Harden-Davies, 2017) Strengthen best practice in MGR Access, Sharing, and Transparency (Rabone et al., 2019) Duty of care when collecting MGRs (Voigt-Hanssen, 2018); Code of conduct for responsible sampling (Yu, 2019) Benefit entire global community (Nurbintoro & Nugroho, 2016); Common heritage of mankind for MGRs in ABNJ (Becker-Weinberg, 2017) Inclusive innovation (Collins et al., 2019); Inclusion of developing countries in: cruises, laboratory work, product development (Voigt-Hanssen, 2018) Importance of non-monetary benefits for utilization of MGRs to reduce technological gaps between states (Rabone et al., 2019; Yu, 2019; Collins et al., 2020) Legal certainty and stability, enforceability, implementation, inclusiveness (Sun, 2019) A tiered approach (Humphries et al., 2020) Institutional model for MPAs to also include MGRs (Tiadi, 2019) Mare Geneticum (Broggiato et al., 2018) Extended embargo period (Broggiato et al., 2018; Voigt-Hanssen, 2018; Yu, 2018) Suspended obligation (Tvedt & Jorem, 2013; Voigt-Hanssen, 2018) International royalty system (McLaughlin, 2010) Identifying the key actors registering patents involving MGRs (Blasiak et al., 2018)	Clearing House Mechanism IOC (Voigt-Hanssen, 2018); International Oceanographic Data and Information Exchange (IODE) Program of IOC-UNESCO (Rabone et al., 2019) Obligatory Prior Electronic Notification (OPEN) (Broggiato, 2018) ABNJ Activity Notification and Monitoring System (ANeMONE) (Humphries et al., 2020) Facilitated Information and Sample Sharing Hub (FISSH) (Humphries et al., 2020) Ocean Biogeographic Information System (OBIS) (Harden-Davies, 2017) Genbank for DNA and protein sequencing (Harden-Davies, 2017) UN Register of BBNJ Activities under UNDOALOS (George & George, 2018) Ethics committee (Hassanali, 2018) ABS entity ISA (Voigt-Hanssen, 2018; Tvedt & Jorem, 2013) ILBI Secretariat (Voigt-Hanssen, 2018) CBD (Tvedt & Jorem, 2013); Not CBD (Humphries et al., 2020) Marine Genetic Resources Body (Voigt-Hanssen 2018; Tvedt & Jorem 2018) World Environmental Organization (WEO) or a global genetic resources ombudsman (Tvedt & Jorem, 2013) International Organization (Harden-Davies 2017) Working group under CPPS for a regional framework for MGRs access, use, and benefit-sharing (Durussel et al., 2017) Scientific and Technical Body Scientific and technical committee (Tiadi, 2019) Funding Mechanism Biodiversity Fund (Voigt-Hanssen, 2018; Broggiato et al., 2018; Tvedt & Jorem, 2013); Trust Fund (Ridings, 2018)	CBD Ecosystem approach, sustainable use and protection of the environment (Drankier et al., 2012) Nagoya Protocol Art.10 for the establishment of a multilateral benefit-sharing mechanism (Drankier et al., 2012)	United Nations Office for Outer Space Affairs with its "1962 UN Register of Objects Launched into Outer Space" (George & George, 2018) ATS (Drankier et al., 2012) FAO (Drankier et al., 2012) ITPGRFA (Voigt-Hanssen, 2018) CBD and Nagoya Protocol (Peña Neira, 2017) TRIPS (Chiarolla 2014; Drankier et al., 2012; Nurbintoro & Nugroho, 2016) Plant Treaty and PIP framework under WHO (Humphries, 2018) Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge Folklore under WIPO (Nurbintoro & Nugroho, 2016; Medaglia & Perron-Welch, 2019)

Table 7: MGR BBNJ Literature

In order to effectively regulate access to and benefit sharing of MGRs, the BBNJ literature points to the need for a responsible entity. Such an authorized body would need to provide legal certainty to stakeholders and consider the types, size, and timing of benefits, the cost of benefit sharing, be enforceable, implementable and inclusive (Sun, 2019), and be competent to negotiate permits on a case-by-case basis (Voigt-Hanssen, 2018). BBNJ research analyzes international law regimes, including the International Seabed Authority (ISA) (Tvedt and Jørem, 2013; Voigt-Hanssen, 2018), the Convention on Biological Diversity (CBD) and its Nagoya Protocol (Harden-Davies, 2017a; Medaglia and Perron-Welch, 2019; Humphries et al., 2020), the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) (Drankier et al., 2012; Voigt-Hanssen, 2018; Medaglia and Perron-Welch, 2019), the Food and Agriculture Organization (FAO) Treaty (Drankier et al., 2012), the Antarctic Treaty System (ATS) (Drankier et al., 2012), and UNCLOS and regional agreements (Medaglia and Perron-Welch, 2019).

The ISA is already responsible for granting rights for the exploration and exploitation of mineral resources from “the Area⁸” and could take on additional responsibilities related to the ABS scheme (Tvedt and Jørem, 2013; Voigt-Hanssen, 2018). In this respect, the principle of “due regard for the rights and legitimate interests of the relevant coastal states,” which applies to mineral resources found in the Area that straddle the limits of national jurisdiction, could also be applied to MGRs in ABNJ (Becker-Weinberg, 2017).

While one idea for a potential ABS entity is the CBD with its Nagoya Protocol (Tvedt and Jørem, 2013; Peña Neira, 2017), more recently other authors have warned against tasking institutions responsible for genetic resources transactions in *national* jurisdictions, such as the CBD or the ITPGRFA (Voigt-Hanssen, 2018) with the regulation of MGRs in ABNJ because conditions *beyond* national jurisdictions are inherently different and such existing ABS schemes are therefore not applicable to MGRs in ABNJ (Harden-Davies, 2017a; Tladi, 2019; Humphries et al., 2020). In the ABNJ case—given the absence of a provider state to grant access and share benefits—an international organization could serve as the responsible entity for overseeing prior informed consent and mutually agreed terms (Harden-Davies, 2017a).

Multilateral institutions with existing ABS schemes are identified in the literature that could potentially serve as blueprints for a future ABS scheme of MGRs. The FAO Treaty is another

⁸ “Area” means the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction (UNCLOS Art. 1).

example of how the international community has been able to create a multilateral system for handling (plant) genetic resources (Drankier et al., 2012). The ATS provides legal mechanisms for ABS that ensure the sharing of scientific knowledge generated by biological prospecting (Drankier et al., 2012). While ATS instruments do not include MGRs, provisions regarding environmental protection and scientific research, such as the preservation and conservation of living resources (Antarctic Treaty), the comprehensive protection of the Antarctic environment (Protocol on Environmental Protection), and the conservation of Antarctic marine living resources and its rational use (CAMLR Convention) can serve as best-practice examples for the ABS of the new instrument (Johnson, 2017).

An alternative option would be to task the BBNJ Secretariat with ABS regulation (Voigt-Hanssen, 2018), to create a World Environmental Organization (WEO), set up a global genetic resources ombudsman (Tvedt and Jørem, 2013), or establish a separate Marine Genetic Resources Body (Tvedt and Jørem, 2013; Voigt-Hanssen, 2018). More recently, a “tiered approach” has been recommended for MGR governance to reconcile states' positions on ABS while strengthening scientific research on samples and data, protecting traditional and local knowledge, promoting consistency with existing ABS frameworks in national jurisdictions, and taking conservation concerns into consideration (Humphries et al., 2020).

An Ocean in Need of Protection: Area-Based Management Tools

Many papers from our sample refer to and emphasize an increasing number of threats to marine biodiversity in ABNJ, including climate change and other anthropogenic stressors, such as overfishing, destructive fishing practices, shipping, and pollution (Ban et al., 2014b; Rochette et al., 2014a; Warner, 2018; O'Leary et al., 2020). It pinpoints emerging human activities that affect marine biodiversity, evaluates management options, and calls for urgent action on biodiversity loss (Gjerde et al., 2016; Dias et al., 2017; O'Leary and Roberts, 2018; O'Leary et al., 2020). There is an overall consensus within the scientific community that marine protected areas (MPAs) constitute an important biodiversity conservation tool by preventing overexploitation and limiting adverse human impact on marine ecosystems (Evans et al., 2015; Tladi, 2015; Wright and Rochette, 2017; O'Leary and Roberts, 2018; Smith and Jabour, 2018; Popova et al., 2019; Wang, 2019; Blasiak et al., 2020). Apart from MPAs, also other area-based management tools can be used to govern the conservation and sustainable use of marine life.

Currently, however, there is no official global body in charge of the identification and management of area-based management tools on the High Seas (Van Dover et al.,

2016; Becker-Weinberg, 2017; De Santo, 2018; Elferink, 2019). As a result, such conservation and sustainable use measures are currently implemented within a fragmented framework by regional and sectoral organizations with different management competences (See Figure 1) (Drankier, 2012; Durussel et al., 2017). At the regional level, regional fisheries organizations (RFMOs) can manage fishing in spatial and/or temporary closure areas, for instance by protecting vulnerable marine ecosystems (VMEs) (Durussel et al., 2017; De Santo, 2018). Moreover, regional instruments, including OSPAR, Noumea, and CAMLR, and the UNEP Regional Seas Program can introduce tools within their respective mandates (Ardron et al., 2014).

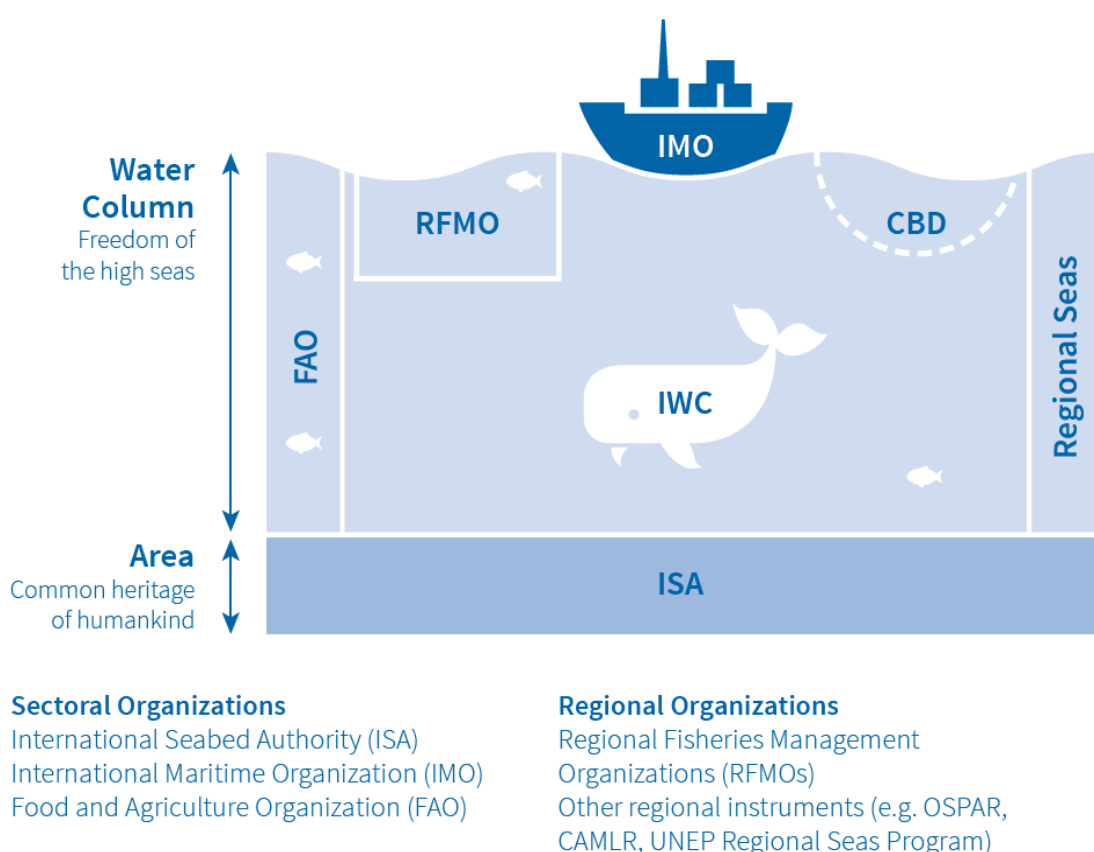


Figure 3: Patchwork of sectoral and regional organizations in ABNJ

At the global level, the International Maritime Organization (IMO) can establish Particularly Sensitive Sea Areas (PSSAs) and Special Areas under the International Convention for the Prevention of Pollution from Ships (MARPOL), while the International Seabed Authority can designate Areas of Particular Environmental Interest (APEIs), and the International Whaling Commission (IWC) has a mandate to establish sanctuaries and other ABMTs regarding cetaceans (Durussel et al., 2017; De Santo, 2018). The FAO can develop technical guidelines

on MPAs for fisheries management, including closed seasons and areas reserved for selected fisheries (Gjerde and Rulska-Domino, 2012). All of the above-mentioned bodies can implement conservation and sustainable use measures in ABNJ within their specific mandates. However, there is no centralized responsible entity to date.

The Aichi targets under the CBD aim to put 10% of the ocean under protection and under the CBD, Ecologically or Biologically Significant Marine Areas (EBSAs) were identified and their descriptions adopted by the Conferences of the Parties (Dunn et al., 2014; Dunstan et al., 2016; Gjerde et al., 2016; Van Dover et al., 2016; Warner, 2016, 2017, 2018; Durussel et al., 2017; Friedman, 2017; Laffoley and Freestone, 2017; Ribeiro, 2017; Shirayama et al., 2017; De Santo, 2018; Johnson et al., 2018). The CBD, in this way, actively promotes marine protected areas in ABNJ, however does not have the mandate for their designation and management (Ardron et al., 2014). The BBNJ treaty has the potential to remedy this lack of an official global body in charge of the identification and management of ABMTs in ABNJ. Other relevant conservation agreements with a potential future role for BBNJ are the Convention on the Conservation of Migratory Species of Wild Animals (CMS), which seeks to protect habitat and remove obstacles to migration but has been focused on areas within national jurisdiction and, similarly to the CBD, lacks regulatory competence; and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which has no area-based management element, but deals with restricting trade of endangered species, increasingly including marine species (Ardron et al., 2014).

Deficiencies of the current framework are identified as an important reason why there is a need for the potential new instrument to fill the gaps (Gjerde et al., 2019). The place of the new instrument in the existing governance framework has been intensively discussed in the strand of literature discussing what the principle of not undermining existing institutions involves (Ardron et al., 2014; O'Leary and Roberts, 2017; Quirk and Harden-Davies, 2017; Scanlon, 2018; Friedman, 2019), as well as in research on regional initiatives and cooperation (Rochette et al., 2014b; Warner et al., 2014; Durussel et al., 2017; Wright and Rochette, 2017). The literature discusses potential models for the new ocean governance framework, including the notions of ocean connectivity and climate change impacts (O'Leary et al., 2012; Ban et al., 2014b; Evans et al., 2015; O'Leary and Roberts, 2017; De Santo, 2018; Johnson et al., 2018; Hofman, 2019; Popova et al., 2019).

Policy recommendations based on experience with past international agreements, including the CBD and the United Nations Fish Stocks Agreement (UNFSA), emphasize the need for the BBNJ agreement to apply a long-term ecosystem-based approach and mention requirements such as: a precautionary and science-based approach, the concept of compatibility, mechanisms for international cooperation, and the duty to cooperate (Gjerde et al., 2019). Various BBNJ publications refer to already-identified **EBSAs** as a potential basis for MPA and marine spatial planning (MSP) implementation on the High Seas (see Table 4). These include criticisms of evidence gaps within EBSAs that are due to “political” reasons (Johnson et al., 2019b). A large body of BBNJ literature explicitly recommends an ecosystem-based approach for the effective conservation of BBNJ, including a representative network of MPAs (see section Overarching Themes Across All Package Elements) (Gjerde and Rulska-Domino, 2012; Cordonnery et al., 2015; Johnson et al., 2018, 2019a).

Recommendations for international legally binding instrument	Identified responsible entities	References to law	Best practices/lessons learnt
Potential Models: Regional, Hybrid, and Global (Quirk & Harden-Davies, 2017; Eiferink, 2019; Gjerde et al., 2019; Scott, 2019); Global-Hybrid Model (Vithanage, 2017) Improve potential of RFMOs (Scanlon, 2018) MPAs to be based on transparent, best-available science (Gownaris et al., 2019; Dias et al., 2017; Gjerde et al., 2019; Ban et al., 2009b; O'Leary et al., 2012; Evans et al., 2015) Consideration of Marine ecological connectivity, Circulation connectivity, Migratory and cultural connectivity (Popova et al., 2019; O'Leary & Roberts, 2017; DeSanto, 2018; Hofman, 2019; Ban et al., 2009b; O'Leary et al., 2012; Evans et al., 2015); Full protection of MPAs (O'Leary & Roberts, 2018; Gownaris et al., 2019) Identification: Using pelagic birds to identify MPAs (Dias, 2017); Designation of EBSAs based on occurrence of Tropic Seamounts (Ramiro-Sanchez, 2019); biogeographic classifications (Rice et al., 2011); Consider climate change in MPA design (Johnson et al., 2018; Dunn et al., 2019; Warner, 2018) Long-term, precautionary and ecosystem approach (Johnson et al., 2018; Marchiniak, 2017; Gjerde et al., 2019), setting aside more extensive areas and limiting human uses and/or adopting high protection thresholds (Johnson et al., 2018); Integrated management (Goodman & Matley, 2018; Becker-Weinberg, 2017); Importance of MSP in ABNJ (Alvater, 2019); Near real-time tracking data, considering ethical responsibilities to inform policy-makers (Sequeira et al., 2019); Unique deep-sea locations (Lost City) should be ruled as 'of limits' (Johnson, 2019) Dynamic marine spatial management for MPA designation and administration (Sequeira et al., 2019); Mobile MPAs (Maxwell et al., 2020) Global network of MPAs (Rochette et al., 2014a; Cordonnery et al., 2015; Gjerde et al., 2016; Dias et al., 2017; Wright and Rochette 2017; O'Leary and Roberts, 2018; Gjerde et al., 2019); MPA network needs adaptive management, reducing endogenous stressors, with a focus on protection of ecological function rather than key species (Johnson et al., 2018) Monitoring, control and surveillance for compliance (Dunn et al., 2018; DeSanto, 2018); Need for VMS and AIS satellite tracking on ships, and via optical or radar satellites to monitor illegal, unreported and unregulated (IUU) fishing vessels (De Santo, 2018)	RFMOs (Tiadi, 2015) Secretariat (DOALOS) (Tiadi, 2015) LSTC (Tiadi, 2015) COP for adoption (Marchiniak, 2017); decision-making body (Gjerde et al., 2016; Gjerde et al., 2019; Tiadi, 2015) Involvement of all relevant sectors (DeSanto, 2018), including the fisheries industry and scientific community, in monitoring, control and surveillance activities through e.g. data collection and sharing (Blasiak et al., 2016)	UNCLOS: Duty to "protect and preserve the marine environment" (Tiadi, 2015) Art. 194}; Legal basis for the establishment of MPAs in ABNJ, but no provision regarding procedures for their designation and management (Eiferink, 2019) <i>Due regard and adjacency:</i> "provides the general benchmark for addressing the relationship between coastal States and States carrying out activities in ABNJ (necessary for BBNJ), otherwise not consistent with UNCLOS); <i>"adjacency"</i> only in the context of the regime for fisheries (Eiferink, 2018) UNFSA: "Duty to cooperate" to influence organizations without undermining them; "ecosystem approach"; "precautionary approach"; "science based approach" (Art.5); mechanisms for international cooperation (Part III) (Gjerde et al., 2019) <i>Compatibility and adjacency of Article 7:</i> ensuring that measures for the high seas "do not undermine the effectiveness" of measures adopted by coastal State; <i>"compatibility"</i> elaborates on rights and obligations of States to cooperate in relation to straddling fish stocks and highly migratory fish stocks (Eiferink, 2018) Adoption of additional measures/agreements recognized in Art. 44, acknowledging that States parties may conclude agreements modifying or suspending operation of provisions of UNFSA under three conditions, and upon notification of other States parties (Gjerde et al., 2019) FAO: International Guidelines for the Management of Deep-sea Fisheries in the High Seas (2009) define <i>vulnerability</i> as: "related to the likelihood that a population, community, or habitat will experience substantial alteration from short-term or chronic disturbance, and the likelihood that it would recover and in what time frame." (Johnson et al. 2018) FAO guidelines assist RFMOs and States in identifying VMEs on the basis of the best available scientific knowledge and expert judgment (measures to protect VMEs, sustainably manage bottom fisheries) (Johnson et al. 2018) CBD: "Global instrument with most relevance to MPAs in ABNJ" applicable to parties "[i]n the case of processes and activities, regardless of where their effects occur, carried out under its jurisdiction or control". Including ABNJ (Eiferink, 2018) Preamble recognizes the "intrinsic value" of biodiversity and the "ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values of biological diversity and its components, including its importance for evolution and for maintaining life sustaining systems of the biosphere" (Gjerde et al., 2019) Art. 5 requires cooperation among Parties in ABNJ "for the conservation and sustainable use of biological diversity" (for the implementation of Art. 8 on <i>in situ</i> conservation, including the establishment of MPAs (Eiferink, 2018; Gjerde et al., 2019) Art.6 provides an example of a way to encourage biodiversity action at the sectoral level (Gjerde et al., 2019) 10 % of coastal and marine area to be protected by 2020; provides a foundation for conservation decisions (Evans et al., 2015; Blasiak & Yag, 2016); provides broad ABM obligations for States to establish a system of protected areas (Durussel et al., 2017) OSPAR commission signed statement for establishment of "ecologically coherent, representative network of well-managed MPAs" with main assessment criteria being adequacy/viability, representatively, replication, and connectivity" (Evans et al., 2015)	Capacities of regional organizations vary (Mossop, 2018; Ribeiro, 2017; De Santo 2018) Limited geographical coverage of ABNJ through existing instruments: Abidjan Convention (Ribeiro, 2017; Dias et al., 2017), Cartagena Convention (Ribeiro, 2017); abyssal regions in OSPAR MPAs (Evans et al., 2015); no coverage of South American Atlantic waters (Dias et al., 2017) Limited powers of OSPAR and NEAFC to prosecute individuals and need commitment of commercial industries, such as fishing and shipping (Evans et al., 2015) Failure of South Orkney Islands MPA, which leaves several pelagic bioregions and geomorphic zones unrepresented and adjacent regions with highest conservation value unprotected in order not to interfere with krill fishery (Smith & Jabour, 2018) OSPAR NEAFC/OSPAR MoU (Scanlon, 2018); OSPAR's register of MPAs and an expert group (ICG-MPA) (Johnson et al., 2019) Sargasso Sea Project illustrates the value of a global approach for strengthening the current regional/sectoral approach (Gjerde et al., 2019); ICCAT's collaboration with the Sargasso Sea Alliance (Scanlon, 2018) EBSAs to inform ABMT/MPA processes in ABNJ (Alvater et al., 2019; Drankler, 2012; Dunn et al., 2014; Dunn et al., 2019; Dunstan et al., 2016; Durussel et al., 2017; Gjerde et al., 2019; Gownaris et al., 2019; Johnson et al., 2018; Johnson et al., 2019; Laffoley & Freestone, 2017; Ramiro-Sanchez et al., 2019; Van Dover et al., 2016; Voigt-Hanssen, 2018; Warner, 2018; Warner et al., 2014; Warner, 2016) under existing institutional frameworks, including CMS, ISA, IMO, RFMO and UNESCO, and provide scientific input for ABMTs/MPAs and EIA (Ribeiro, 2017) ATLAS standardized protocols for predictive mapping of species and habitats for marine spatial planning (MSP) consideration (Johnson et al., 2018) Regional Governance (Durussel et al., 2017; Quirk & Harden-Davies, 2017; Rochette et al., 2014b; Ribeiro, 2017) Lessons to be applied to other regional seas programs when establishing a network of MPAs in ABNJ (Smith & Jabour, 2018)

Table 8: ABMT/MPA BBNJ Literature

Measuring the Human Footprint on the High Seas: Environmental Impact Assessments

Human activities are affecting marine biodiversity and ecosystems; their impacts can be predicted, reduced and even prevented through environmental impact assessments, if a strong legal framework is in place. EIAs can evaluate likely adverse impacts on the environment of proposed activities, serve as a basis for decisions in this regard and ensure monitoring of unexpected impacts (Durussel et al., 2017). Definitions differentiate between EIAs and SEAs (strategic environmental assessments); the latter incorporate a more holistic, overarching, long-term environmental protection, including whole sectors of activities or geographical areas, whereas the former are often site-specific and limited in time (Warner, 2012). EIAs are a well-established environmental protection tool and various international agreements, including UNCLOS (and its UNFSA) and the London Protocol, include obligations to assess the potential impacts of human activities in the marine environment (Warner, 2012).

There is criticism that EIAs in ABNJ are not comprehensively and effectively carried out (Ma et al., 2016). While legal and institutional frameworks for EIAs are well-established in areas *within* national jurisdiction, collaborative structures and mechanisms for EIAs in areas *beyond* national jurisdiction are fragmented and underdeveloped (Warner, 2018); no global institution is in charge of the development of best-practice standards for EIAs and SEAs or the monitoring of their implementation (Gjerde and Rulska-Domino, 2012; Warner, 2012; Scott, 2019). Many ABNJ activities, including oil and gas exploration, marine scientific research, survey activities, marine geoengineering, deep-sea tourism, and military activities are not subject to any EIA process (Warner, 2012). Currently, the IMO is responsible for opening new shipping routes; however, it lacks an enforcement mandate and relies on national legislation by contracting parties (O'Leary et al., 2020). Analyses of regional experiences show that, in most cases, Regional Seas Conventions do not include ABNJ within their geographical scope and therefore do not require EIAs by member states, which calls for a more comprehensive institutional coverage (Warner, 2012). The main EIA gap in the Southeast Pacific concerns the implementation of the ecosystem approach in fisheries management (Durussel et al., 2017).

During BBNJ negotiations, EIAs have been acknowledged as a valuable tool for the conservation and sustainable use of marine biodiversity (Elferink, 2019; O'Leary et al., 2020). Despite voices against making EIAs compulsory for submarine cable operations (Friedman, 2017) and marine scientific research (Broggiato et al., 2018) on the High Seas, arguably owing to their minimal impact, human activities can inherently affect the marine environment, disturb processes, and destroy prestige ecosystems (Warner, 2018). The BBNJ literature portrays the

negative impact of fisheries and deep-seabed mining (see section It Is One Ocean- It Is One Planet), and calls for mandatory EIAs on the basis of the precautionary principle prior to new and emerging activities, including new shipping lanes, marine bioprospecting, and deep-sea tourism (Ma et al., 2016). Human activities being discussed during BBNJ negotiations for which EIAs may become mandatory are, among others, submarine cable operations, high-seas aquaculture, and offshore power generation (Friedman, 2017).

Analyses of EIAs under existing instruments present best practice examples and lessons learnt to inform the BBNJ agreement (see Table 5) (Gjerde and Rulska-Domino, 2012; Warner, 2012, 2014; Marciniak, 2017). The BBNJ literature includes reviews of existing EIA provisions at regional and global levels, including specialized EIA instruments, references to EIAs in UNCLOS, and biodiversity and sectoral applications (Sander, 2016), as well as recent EIA developments regarding the deep-sea mining of mineral resources (Shirayama et al., 2017).

With the exception of one publication, the BBNJ literature on environmental impact assessments consensually points to the need to consider cumulative impacts and integrate climate change issues into discussions regarding EIAs and SEAs (Warner, 2014, 2017, 2018; Gjerde et al., 2016; Ma et al., 2016; Sander, 2016; Marciniak, 2017). Regarding the importance to notify adjacent states at the stage of proposals for activities, literature points to the term “potentially affected States” as being more appropriate (Mossop and Schofield, 2020).

	Recommendations for international legally binding instrument	Identified responsible entities	References to law	Best practices/lessons learnt
EIAs and fisheries/Cumulative impacts and SEAs/ EIAs and climate change/ Institutional arrangements	Identification of anthropogenic activities in ABNJ and their environmental impacts (Ma et al., 2016) Accounting for a broader analysis of what to protect and cumulative impacts (Marciniak, 2017) Incorporating climate change impacts into EIAs in ABNJ (Warner, 2018) Articulate best practice standards for EIAs, SEAs and MSP (Gjerde et al., 2016); Development of standards and a default system of EIA for all activities that are currently not subject to EIA in ABNJ (Warner, 2016) International legal obligations to conduct EIAs and SEAs (Sander, 2016) Integrated ecosystem-based ocean governance on the high seas with global rules on basic requirements in UNCLOS and CBD for EIAs relating to existing and emerging activities (Warner & Rayfuse, 2008) Link between fisheries and EIAs (Barnes, 2016) Arctic EIA Guidelines (Warner, 2012)	Arctic working group to ensure adoption and implementation (De Lucia, 2017) COP - as decision-making body to consider EIAs, review reports and assess progress, serve as basis for SEAs, and broader-scale regional planning and integrated management initiatives; coordinating role by ensuring prior notification, consultation, transparency, participation, and inclusive planning, and support the goals of other conservation bodies (CITES, CBD, and CMS) (Gjerde et al., 2016; Gjerde et al., 2019) - adopting special rules for the Arctic on the basis of scientific recommendation by the Scientific and Technical Body (De Lucia, 2017) Institutional working groups in the South East Pacific (Durrussel et al., 2017) Regional committees in charge of overseeing the performing of SEAs and evaluating EIAs (Hassanali, 2018) Reporting system for the notification of potential risks, identified through EIAs (Mossop, 2018) Rehabilitation/Liability fund for reparation (Long, 2019)	Special Arctic Provision modeled on UNCLOS Art. 234 and Art. 211 (De Lucia, 2017) Minimum EIA requirements adopted under the CBD to be implemented by all RFMOs (Durrussel et al., 2017) Espoo Convention model to list activities requiring EIAs (Marciniak, 2017) UNFSA Art. 5 c; Art. 6; Annex ii: Requirements for Applying a Precautionary Approach (Gjerde et al., 2019) Protocol on Environmental Protection to the Antarctic Treaty (Annex VI) on liability (Long, 2019)	CBD to inform rules, standards, and recommend practices and procedures with respect to ABMTs and EIAs (Gjerde et al., 2019) CBD guidelines for biodiversity-inclusive EIAs and SEAs to reflect environmental, social, and governance conditions in marine areas, including ABNJ, and provide practical and precautionary advice for operating in ABNJ (Gjerde & Rulska-Domino, 2012; Warner, 2014) Scientific/technical data from RFMOs and from the Census of Marine Life and other scientific initiatives, to inform the conduct of EIAs and SEAs (Warner, 2014) Regional Seas Conventions often do not cover EIAs in ABNJ, limited implementation and institutional coverage of ABNJ (Warner, 2012) UNEP principles: minimum requirement for how to conduct EIA in all zones of the Arctic Ocean; biodiversity assessments according to the CBD (Sander, 2016) EIA obligations (UNCLOS Art. 204-206; UNFSA) Risk assessment processes requirements (London Protocol) (Warner, 2012) Madrid Protocol to the Antarctic Treaty as a best practice with its complex screening process, including a preliminary assessment, initial environmental evaluation, and comprehensive environmental evaluation (Warner, 2012). Japan's Initiatives for EIAs (Shirayama et al., 2017) 2003 Protocol on SEA to the Convention on EIA in a Transboundary Context (Kiev Protocol): the main instrument including SEA obligations, otherwise limited impact at the global level (Warner, 2012) Liability Court Case of Costa Rica and Nicaragua (Long, 2019) Civil liability and compensation mechanism (IMO), draft regulatory code on seabed mining, the EU Environmental Liability Directive, national regimes including the United States Resources Act.186 (Long, 2019)

Table 9: EIA BBNJ literature

An Imbalanced World—An Unequal Ocean: Capacity Building and Transfer of Marine Technology

The BBNJ literature on capacity building and marine technology transfer (CB&TT) points to inequality between regions of the world when it comes to conserving and using the ocean and its resources. Marine technology transfer is a major gap in UNCLOS owing to fragmentation and lack of coordination (Harden-Davies, 2016; Sun, 2019). Even though UNCLOS lists requirements for CB&TT, developing states have a limited capacity to study, protect, and benefit from the marine environment and its resources (Gjerde et al., 2019). ABNJ biodiversity is remote and often inaccessible for countries lacking required technology (Campbell et al., 2013). The UN Assessment of the Ocean names global uneven research capabilities as the primary source of inequity among states and of disparities in accessing resources *in situ*, which calls for capacity development regarding MGR exploitation (Broggiato et al., 2018).

Only very few countries have the institutional, human, financial, and technological resources, as well as the molecular and oceanographic means, to conduct deep-sea research (Nurbintoro and Nugroho, 2016), publish in international databases, and access open data (Bax et al., 2018), let alone develop marine biotechnologies (Broggiato et al., 2014). Moreover, studies demonstrate that developing states are underrepresented in BBNJ negotiations and related meetings, while 97% of the authorship of academic literature on BBNJ topics originates from Organization for Economic Cooperation and Development (OECD) member states (Blasiak et al., 2016). Asymmetry also exists between powerful industries and developing states as regards information access and policy influence, for which CB&TT may offer a solution (De Santo et al., 2019).

The resulting disadvantage for developing states is particularly evident in the case of access and utilization of MGRs but, also, across all package elements. Indeed, research depicts poverty as “by far the greatest barrier to the conservation and sustainable use of marine biodiversity in the South Atlantic,” leading to ineffective measures (Ribeiro, 2017). With a lack of financial capacity to protect their own biodiversity, some countries will not be able to implement ambitious measures of the future treaty without CB&TT (Peña Neira, 2017). Due to a lack of expertise, only a few countries have the capacity to effectively set up and manage MPAs (Wang, 2019). Developing states often lack the resources and capacity to participate fully in RFMOs and effectively implement their obligations (Warner, 2014), which hinders compliance (Pecot, 2005). For the implementation of complex measures, such as ABMTs, including MPAs, the ecosystem approach, and EIAs, developing states require CB&TT (Ribeiro, 2017). Coastal states—especially developing ones—face the challenge of obtaining information about the

biodiversity on their extended continental shelves given that MSR in the deep sea is costly and most research is conducted by developed states (Mossop, 2018; Tiller et al., 2020).

BBNJ literature on CB&TT emphasizes the potential to rebalance the unequal financial, technical, and scientific capacities among states and ensure the participation of developing and geographically disadvantaged states in ABNJ research, commercial use, and management (Durussel et al., 2017) and, hence, contribute to inter- and intra-generational equity (Harden-Davies, 2016; Blasiak et al., 2018; Collins et al., 2019; Harden-Davies and Gjerde, 2019; Yu, 2019). Various papers in the sample jointly address the topic of CB&TT with benefit sharing of MGRs (Harden-Davies, 2016, 2017b, 2018; Collins et al., 2019; Harden-Davies and Gjerde, 2019; Yu, 2019; Tiller et al., 2020) and MSR to identify different forms of scientific and technological capacity building (Harden-Davies, 2017b; Harden-Davies and Gjerde, 2019; Rabone et al., 2019). CB&TT and access to MGRs can ensure that marine biodiversity beyond national jurisdiction can “be enjoyed and benefit not only a handful of nations, but the entire global community” (Nurbintoro and Nugroho, 2016).

In this regard, apart from monetary benefits, CB&TT also includes non-monetary benefits such as training, education programs, knowledge transfer, and access to equipment and long-term support for infrastructure to provide all states with fairer opportunities in terms of capability to utilize MGRs from ABNJ (Collins et al., 2019), as well as research collaborations (Harden-Davies, 2017b). The strengthening and growth of scientific networks, as well as linkages between bio repositories and databases, are necessary to guarantee open access to MGRs in ABNJ (Collins et al., 2019).

BBNJ authors also analyze international legal instruments concerning genetic resources (Nagoya Protocol and ITPGRFA Treaty), examining the role of capacity building as a form of benefit-sharing, and explore the role of technology transfer (Harden-Davies, 2018; Harden-Davies and Gjerde, 2019).

Overarching Themes Across All Package Elements

The BBNJ negotiations' objective is to agree on future regulations to remedy the above-mentioned failings of the ocean governance framework for the High Seas. With 49 publications, 35% of publications in the literature sample focus on the overall BBNJ process and cross-cutting issues (see Table 2). Research in this regard includes: analyses of discussions *before* (Campbell et al., 2013; Houghton, 2014) and *during* formal IGCs (Vithanage, 2017; Tiller and Nyman, 2018; Mendenhall et al., 2019; Tiller et al., 2019; De

Santo et al., 2020); the role of NGOs in the negotiations (Blasiak et al., 2017); summaries and relevance of workshops and meetings concerning the BBNJ negotiations (Rochette and Bille, 2008; Houghton and Rochette, 2014; Goodman and Matley, 2018; Sun, 2019); and publications on current or recommended positioning or the role of certain states and country blocks in the negotiations, such as China (Zhu, 2009; Yu, 2014; Ma, 2018), Brazil (Barros-Platau et al., 2019), and the Caribbean Community (CARICOM) (Hassanali, 2018).

Cross-cutting literature can be categorized according to the following topics: fisheries, eight publications (see section Implications for Fisheries Management in Connected Ecosystems), framework interplay, 10 publications (see section BBNJ Within an Ocean Governance Patchwork), and institutional arrangements, 5 publications (see section Institutional Arrangements). The following section reviews four overarching BBNJ themes that extend beyond individual package elements.

It Is One Ocean- It Is One Planet

Ocean Connectivity

Authors in our sample point to the interconnectivity of the world's ocean, a notion that concerns all package elements. Scientific papers show ecological and environmental connections throughout the water column as well as between the water column and the seafloor (O'Leary and Roberts, 2017, 2018; Popova et al., 2019). They show that the exploitation of the water column is expected to produce a significant and widely distributed footprint in the deep-sea. Several authors (O'Leary and Roberts, 2018; Popova et al., 2019) emphasize the importance of considering such vertical connectivity when striving to protect highly migratory fish stocks, explaining that traditional MPAs would not be effective in international waters. Therefore, it is recommended to focus MPAs on surface-to-seabed protection, coupled with a precautionary approach to protect ecosystems (Ban et al., 2014a; De Santo, 2018; O'Leary and Roberts, 2018; O'Leary et al., 2020).

Besides the ecological connectivity between seabed and surface, the oceans are also connected horizontally and constitute the habitat of migratory species. Some authors (Dunn et al., 2019; Maxwell et al., 2020) review the concept of migratory connectivity, arguing that measures to conserve critical species failing to take it into consideration will have limited effect and that connectivity knowledge (gained from e.g., animal tracking) needs to be included in decision-making on the design and management of ABMTs. Dynamic ABMTs including MSP and MPAs take into consideration the movements of marine species to offer more effective protection (Sequeira et al., 2019; Maxwell et al., 2020).

Moreover, apart from such “active,” the ocean has also “passive” connections, as papers on circulation connectivity discuss, indicating that the level of exposure to influences in ABNJ varies between countries and coastlines are thus unequally affected (Popova et al., 2019). Ocean modeling can be used to quantify the connectivity of ABNJ to the coastal zone and identify areas in urgent need of protection according to their potential impacts on the coastal populations of least developed countries (Popova et al., 2019).

In addition to vertical and horizontal ecological connectivity, authors point to cultural and historical ocean connectivity, calling for ABNJ governance to take into consideration the cultural and ceremonial importance of highly migratory species for coastal and island nations (Popova et al., 2019).

BBNJ authors contribute to the debate by pointing out existing law and best-practice examples and lessons learnt, as well as by recommending responsible entities and the inclusion of relevant stakeholders in the process. Connectivity research and experience gained on existing bodies could serve to advice negotiators and improve implementation success. Results of studies of the different forms of connectivity are of value to policy-makers involved in BBNJ negotiations because they inform the access and benefit sharing system for MGRs (Broggiato et al., 2018), the identification and creation of ABMTs, including MPAs, and the EIA process. Not only natural scientists but, also, increasingly, social scientists are calling for a precautionary approach and surface-to-seabed protection within MPAs (De Santo, 2018; O’Leary and Roberts, 2018; Dunn et al., 2019). Interdisciplinary BBNJ publications point to the importance of ecologically connected networks of MPAs when striving to provide comprehensive ocean protection in international waters (see Table 4). Lessons drawn from the experience of existing bodies can be used to support such networks in regional seas programs (Smith and Jabour, 2018).

Implications for Fisheries Management in Connected Ecosystems

The BBNJ literature identifies fishing as one main factor affecting marine biological diversity (Blanchard et al., 2019; Elferink, 2019). It shows that the greatest ecological benefits are achieved through no-take marine reserves that offer full protection and that fishing the water column will limit those benefits (O’Leary and Roberts, 2018; Gownaris et al., 2019). There is, hence, an overlap between biodiversity conservation and sustainable fisheries management (Crespo et al., 2019; Haas et al., 2020b). On the basis of studies on linkages between upper-ocean communities and seabed ecology and biogeochemistry, authors prove that the exploitation of resources in the water column will likely affect the deep-sea environment

(O'Leary and Roberts, 2017). Marine species interact among each other and with the environment, but single species management does not consider such connectivity, which discredits the concept of maximum sustainable yield (Hofman, 2019). The literature points to the counterproductive fact that MPAs increasingly focus on seabed protection while the water column remains open to fishing (O'Leary and Roberts, 2018). Splitting marine areas into different zones and only partially protecting ecosystems will fail to adequately conserve marine life and safeguard the ocean's goods and services (O'Leary and Roberts, 2018).

The BBNJ sample includes studies on the impact of the future treaty on fisheries (Barnes, 2016), its relationship with the mandates of RFMOs, and potential solutions to avoid conflicts with these organizations (Tladi, 2015); insights into the benefits and challenges of taking a regional approach to ABMTs by looking at the example of the UNFSA (Blasiak and Yagi, 2016; Gjerde et al., 2019); and ideas to improve the regional governance of fisheries and biodiversity conservation (Warner, 2014).

Some studies assess the effectiveness of RFMOs regarding the conservation and sustainable use of marine biodiversity beyond national jurisdiction (Bell et al., 2019; Haas et al., 2020b), while other studies focus on their capacity to fulfill their mandates concerning the impact of climate change on the marine environment (Pentz et al., 2018). Literature reviews on the effectiveness of RFMOs show that, despite arguments that RFMOs have the legal mandate and competence to manage fisheries, they have failed to safeguard fish, are often limited to certain species, establish measures only for member states, and do not cover all areas of the ocean (O'Leary and Roberts, 2017; De Santo, 2018).

There are significant geographical and taxonomic gaps in the current fisheries governance framework, resulting in an incomplete coverage of marine biodiversity impacted by fisheries (Warner, 2016; Crespo et al., 2019). The FAO's Deep Sea Fishing Guidelines do not apply to all high seas fishing and aquaculture activities, but only to bottom fishing activities and rely on flag state compliance (Warner, 2012). Lessons learnt show that ABMTs, including MPAs are often introduced in fisheries only when other measures have failed and that regarding closures scientific advice has been ignored (De Santo, 2018). Successful examples of ABMTs through cooperation with RFMOs include mitigation of bycatch in fishing gear (Dias et al., 2017) and the integration of fisheries into marine spatial planning by comparing the economic value of fishing with the ecological value of diversity, and developing mutually agreeable spatial plans (Johnson et al., 2019b).

Nonetheless, there is strong resistance to including fisheries in the BBNJ agreement (Elferink, 2019). Potential conflict between fisheries and mechanisms for the creation of High Seas MPAs have been studied extensively in the BBNJ literature (Cordonnery et al., 2015; Tladi, 2015; Barnes, 2016; Warner, 2016). Analyses suggest that traditional fishing states see MPAs as a threat, as made visible in their opposition to MPA proposals in Antarctica; resistance is also expected in further areas beyond national jurisdiction in the absence of a BBNJ instrument (Cordonnery et al., 2015). BBNJ authors criticize the fact that regardless of the consequences of the exploitation of mesopelagic fish for the wider ecosystem, economic interests are prevailing as regards these species (O'Leary and Roberts, 2017). A case study of a CAMLR MPA shows that political agendas and fishing interests in the Southern Ocean have been “the major contributing factors to MPA opposition” (Smith and Jabour, 2018). While the BBNJ literature concedes that excluding fish from the definition of MGRs might be politically desirable, such an exclusion from marine biodiversity would need to be explained (Marciniak, 2017; Leary, 2019). Moreover, if fish was not included in the agreement, the impact of fisheries on non-fish biodiversity and fish species that do not fall under existing instruments would be excluded from new BBNJ regulations (Crespo et al., 2019), and access to and sharing of RFMO information would remain unregulated (Blanchard et al., 2019).

Climate—Ocean Interaction

Scientific studies point to the interconnections between the ocean and the climate, and the need to take this into account in policy-making (Johnson et al., 2018; Warner, 2018; Maxwell et al., 2020). Findings in the BBNJ literature sample show the importance of marine biodiversity for climate regulation. Scientific evidence on ecological connectivity reveals that mass migration of mesopelagic fish influences climate regulation by promoting carbon uptake and storage (O'Leary and Roberts, 2017). Furthermore, authors also point to the adverse impacts of climate change on marine biodiversity, which may arise across large distances and different maritime zones (Warner, 2018) by affecting migration routes; this, in turn, influences the effectiveness of MPAs (Dunn et al., 2019; Maxwell et al., 2020). Scientists have an increasing understanding of the variation of megafauna movements caused by environmental changes (Sequeira et al., 2019). Conservation planning requires climate models with a 20–50 years time horizon, incorporating oceanographic variables applied to the full water column and seafloor (Johnson et al., 2018), baseline information on migratory connectivity under future climate change scenarios (Dunn et al., 2019), and information on the nature and extent of climate change impacts (Warner, 2018).

Johnson et al. (2018) and Warner (2018) point to the importance of incorporating climate change issues into the development of ABMTs and EIAs in international waters. Warner (2018), for instance, reviews existing international law and policy frameworks for EIAs in ABNJ and discusses such options, including MPAs and MSP that could reduce climate-induced changes to habitats by protecting migratory corridors and facilitating connections between fragmented environments. There is a need to acknowledge and account for the full range of impacts, including climate change, on marine ecosystems and species over time at the screening and scoping phase of EIAs (Johnson et al., 2018; Warner, 2018), as well as for baseline studies and, even, during monitoring after approval of an activity (Warner, 2018). Besides biodiversity considerations, including species habitats and ecosystems, climate change vulnerability, such as ocean warming, deoxygenation, and acidification also need to be assessed (Warner, 2018).

BBNJ Designs Its Place in Ocean Governance

Many scholars of our sample have researched the institutional interplay between the future BBNJ agreement and existing legal instruments, and made design recommendations for the agreement itself. Ways to meet BBNJ objectives are often coupled with recommendations for responsible entities. Around 10% of the BBNJ literature dedicates itself to specifics of the current ocean governance framework and potential institutional arrangements under the future BBNJ agreement (see Table 2). Authors have studied possible institutional arrangements, including a Conference of the Parties (COP), a Scientific and Technical Body, a clearing-house mechanism (CHM), a financial mechanism, and made recommendations regarding compliance and implementation.

BBNJ Within an Ocean Governance Patchwork

The BBNJ's institutional framework is largely emphasized in the literature. Since UNCLOS already includes the duty for states to both individually and collectively “protect and preserve the marine environment” (Tladi, 2015, p. 657), and several organizations are adopting ABMTs in ABNJ, the merits of a new institution vs. enhancing coordination among existing instruments have been analyzed (Barnes, 2016). BBNJ authors emphasize the need for an official body in charge of implementing ABMTs in international waters (Gjerde et al., 2019), and for a clarification of the role of actors in cases where MPAs are located both within and beyond national jurisdiction (Becker-Weinberg, 2017). The interplay between frameworks receives much attention, namely: between the future BBNJ agreement and the existing fisheries framework (Matz-Luck and Fuchs, 2014; Marciniak, 2017), UNCLOS (Gjerde et al., 2019), and the ATS (Johnson, 2017; Li, 2018). Other issues include how the BBNJ agreement can enhance the performance of existing governance frameworks in the southern hemisphere

(Warner, 2017), the special circumstances of the Arctic and implications for the BBNJ agreement (De Lucia, 2017; Kraabel, in press), “forum shopping” in institutions (Tsuru, 2017), the role of coastal states in BBNJ, and adjacency and due regard (Elferink, 2018; Mossop, 2018; Mossop and Schofield, 2020).

Three institutional models have been envisaged for BBNJ within existing mechanisms and organizations: Regional, Hybrid and Global (see Table 4). Leaving identification, establishment, implementation, and enforcement to existing regional and sectoral organizations, the regional model eliminates the need for any BBNJ decision-making or scientific body (Gjerde et al., 2019) and is cost effective (Elferink, 2019). The global model would require at least the creation of a decision-making body, a scientific and technical body, and a secretariat—e.g., to establish High Seas MPAs or approve EIAs (Gjerde et al., 2019). The hybrid model lies half-way between the regional and global approaches; it would entail consultation, along with regional and global cooperation (Friedman, 2019).

Although implementation can be improved through better cooperation and coordination among existing regimes (Ardron et al., 2014) and a case study of the UNFSA shows how existing structures could contribute to the establishment of MPAs under the BBNJ agreement (Blasiak and Yagi, 2016), it has been noted that without a global instrument, ocean protection would depend on existing organizations, whose capacities vary, which do not cover all areas of the ocean (Dias et al., 2017; Mossop, 2018), and would fail to establish a representative global network of MPAs (Elferink, 2019). Past resistance and the slow progress of MPA designation in international waters demonstrate the restrictions of relying on existing instruments, leading to calls for a long-term, global approach that nevertheless does not undermine current mandates (Cordonnery et al., 2015; Tladi, 2015; Scott, 2019). Experience gained by the UNFSA provides principles for managing straddling and highly migratory fish stocks; however, review mechanisms lack decision-making power regarding regional organizations (Elferink, 2019).

All BBNJ authors writing on framework interplay would prefer the future BBNJ agreement to play a role in establishing ABMTs; some underline the importance of additionally strengthening regional and sectoral bodies for implementation and regional cooperation, without a narrow interpretation of “not undermining” (Warner et al., 2014; Durussel et al., 2017; Wright and Rochette, 2017; Scanlon, 2018).

Institutional Arrangements

Descriptive contributions to the corpus of BBNJ literature on the ongoing negotiations summarize the states' positions on possible institutional arrangements, including the role and

functioning of the Conference of the Parties (COP), the Scientific and Technical Body, the clearing-house mechanism (CHM), and a financial mechanism (Becker-Weinberg, 2017; Hassanali, 2018; Tiller et al., 2019, 2020; De Santo et al., 2020).

A Conference of the Parties (COP) is envisaged as the decision-making body for all BBNJ package elements (Tladi, 2015; Gjerde et al., 2016, 2019). To enhance compliance, recommendations concerning ABMTs and MPAs would involve interaction between the secretariat of the COP (DOALOS) and the secretariat of the RFMOs or similar organizations and state parties, as well as the submission of MPA proposals to the COP by states, RFMOs, and other organizations (Tladi, 2015).

International law contains requirements for scientific evidence as a basis for policy decisions (Gjerde et al., 2019). Recognized scientific experts or bodies could provide advice on a potential MPA network in international waters (Gjerde et al., 2019). A Scientific and Technical Body could help “foster a strong epistemic community around BBNJ” (De Santo et al., 2019). The BBNJ literature defines the role and characteristics of a legitimate, new scientific body and existing bodies serve either as models or as potential responsible entities (see Figure 2). However, while the literature supports the establishment of a new body to contribute to the BBNJ science-policy interface (Ban et al., 2014a; Marciniak, 2017; Blanchard et al., 2019; Gjerde et al., 2019; Tladi, 2019; Maxwell et al., 2020), a comprehensive analysis of appropriate institutional and representative aspects of the scientific body is lacking. In ongoing negotiations, questions remain about the role of such a body, ranging from advisory to decision-making (De Santo et al., 2019).

Conference of the Parties (COP)	Scientific and Technical Body	Clearing House Mechanism	Funding Mechanism	Compliance Committee/ Liability Fund
• Decision-making entity (Gjerde et al., 2019) • Establish High Seas ABMTs/MPAs (Gjerde et al., 2019; Tladi, 2015) • Review/assess EIA progress, support the development of standards and environmental practices and coordinate, ensure prior notification, consultation, transparency, participation, and inclusive planning and support the goals of other conservation conventions, including CBD, CITES, and CMS (Gjerde et al., 2016; Gjerde et al., 2019) • Address legal issues concerning coastal states and the different responsible entities in governance regimes (shipping, seabed mining, fishing, pollution, migratory species) (Gjerde et al., 2016) • Secretariat of the COP (DOALOS) to interact with secretariat of the RFMOs or similar organizations regarding ABMT/MPAs (Tladi, 2015). • RFMOs and other organizations to submit MPA proposals to the COP to enhance the likelihood of compliance (Tladi, 2015) • ABMT/MPA criteria can be included or annexed to the treaty text or alternatively be adopted by the COP (Marciniak, 2017)	• Recommendation body to the COP • to establish MPAs • on access to and benefit sharing of MGRs in ABNJ (Tladi, 2019) • Approve EIAs; review proposals, advise on implementation, maintain repository of conducted EIAs (Blanchard et al., 2019; Gjerde et al., 2019; Marciniak, 2017; Maxwell et al., 2020; Tladi, 2015) • Scientific experts or bodies could advise on a potential MPAs network in ABNJ (Gjerde et al., 2019) • Inclusive, open to a variety of actors, independent, geographically representative (De Santo et al., 2019) • Consider implications for activities of all relevant, potentially affected sectoral organizations (Tladi, 2015) • Possible responsible entities • IOC and the IPCC and IPBES as potential models (De Santo et al., 2019) • IOC to provide technical criteria for scientific research, standards and guidelines for collection, curation, and data and knowledge-sharing (Harden-Davies, 2016)	• Data collection and sharing platform • to strengthen scientific research capacity and knowledge exchange (Blanchard et al., 2019; Broggiato et al., 2018; Collins et al., 2019; Harden-Davies, 2017; Rabone et al., 2019; Ridings, 2018) • Free and open access to MGRs data to facilitate marine scientific research and innovation (Collins et al., 2019; Rabone et al., 2019) • Information on activities: research, extraction, use of marine biodiversity, information on MGRs, including where they are extracted and what they are used for (Ridings, 2018) • Additional ethics committee responsible for granting approval prior to planned activities to avoid harmful activities by MSR in ABNJ (Hassanali, 2018) • Possible responsible entities • IOC or similar bodies (Voigt-Hanssen, 2018) • CBD as host to ensure access to information and technology regarding data and knowledge on connectivity (Popova et al., 2019) • UN Register on BBNJ Research Activities for information about BBNJ research activities, collaboration and transparency in BBNJ marine research governance (George & George, 2018)	• Biodiversity Fund • Revenues from the exploitation of MGRs in ABNJ (Broggiato et al., 2014; Peña Neira, 2017; Ridings, 2018; Tvedt & Jørem, 2013; Voigt-Hanssen, 2018) • Transfer benefits to stakeholders, including state and non-state actors at the national, regional and global levels, involved in conservation projects, such as research on understanding biodiversity and the establishment of MPAs (Tvedt & Jørem, 2013) • Possible models • OBIS when provided with additional resources to increase the scope and functionality for BBNJ (Harden-Davies, 2016) • Global Environmental Facility (GEF) (Harden-Davies, 2017; Hassanali, 2018) • UNESCO-IOC Capacity Development Fund (Harden-Davies, 2017) • Addis Ababa Action Agenda (Harden-Davies, 2017) • Green Climate Fund for climate finance, to mobilize funds from national governments and multilateral organizations, as well as private donors and public-private partnerships (Hassanali, 2018; Long, 2019)	• Compliance committee to deal with lack of compliance reported by States, and a third-party beneficiary committee (on the model of best practice FAO Treaty) (Drankier, 2012; Gjerde et al., 2019) • Regional working groups (Durrussel et al., 2017) • Rehabilitation/ Liability Fund for compensation payments to enshrine the no-harm and polluter-pays principles in law in case of non-compliance (Long, 2019)

Figure 4: Recommendations for institutional arrangements in BBNJ

Moreover, a clearing-house mechanism is recommended as a data collection and sharing platform to strengthen scientific research capacity and knowledge exchange. Authors make suggestions for its functions and structure (Harden-Davies, 2017b; Broggiato et al., 2018; Ridings, 2018; Blanchard et al., 2019; Collins et al., 2019; Rabone et al., 2019) and

provide overviews of existing, emerging, and new data-sharing platforms as well as proposals for possible responsible entities (see Figure 5).

To guarantee the avoidance of harm through scientific research in ABNJ, an ethics committee could be in charge of the prior approval of planned activities (Hassanali, 2018). It is recommended to set up international scientific networks (Harden-Davies, 2017b), intra-regional and inter-regional platforms (Blasiak and Yagi, 2016), and regional marine scientific and technological centers (Hassanali, 2018), as well as build on existing bodies and examples provided by international law (See Tables 3, 6). Drawing inspiration from the UNFSA (Art. 5; Art. 14) and UNCLOS (Art. 244; Art. 242; Art. 202), the BBNJ agreement could elaborate on the obligations to cooperate in scientific research and to publish or share data for CB&TT with developing states (Gjerde et al., 2019).

	Recommendations for international legally binding instrument	Identified responsible entities	Best practices/lessons learnt
Imbalance in capacities between States / CB&TT and MSR / digital technology	Clearing House Mechanism (Ridings, 2018; Blanchard et al., 2019; see Table 2) Financial Mechanism for BBNJ (Hassanali, 2018) GEF, UNESCO-IOC Capacity Development Fund and the Addis Ababa Action Agenda (Harden-Davies, 2017b) Scientific and Technical Body: IOC (De Santo et al, 2019; Harden-Davies, 2016); Created on the model of IPCC and IPBES and building upon the role of the current IOC (De Santo et al., 2019)	1992 Rio Declaration on the need for States to ‘cooperate to strengthen endogenous capacity-building for sustainable development by improving scientific understanding through exchanges of scientific and technological knowledge, and by enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies’ (Durussel et al., 2017) 2012 ‘The Future We Want’ document (Durussel et al., 2017) UNCLOS: Obligations regarding CB&TT on the protection of the marine environment (Part XII), on the Area (Part XI), on marine scientific research (Part XIII), and on marine technology transfer (Part XIV) (Durussel et al., 2017) Art. 82: example for a benefit-sharing model from the exploitation of minerals in ABNJ to fulfill a CB&TT obligation (Blaškiak & Yagi, 2016) Art. 143 (3) contains principles for international cooperation, including encouragement of personnel from different countries and of the Authority to participate in marine scientific research, programs developed through the Authority or any other international organization for the benefit of developing countries and technologically less well-developed states to strengthen their research capabilities, research techniques and applications and encourage qualified personnel doing research in the Area and dissemination of research results and analysis when available through the ISA or any other international channel (George & George, 2018) Art. 202: Scientific and technical assistance to developing States (Gjerde et al., 2019) Art. 242: Duty to cooperate in scientific research, including through competent international organizations (Gjerde et al., 2019) Art. 244: Duty to publish and share data (Gjerde et al., 2019) Based on Art. 276, suggestion for regional marine scientific and technological centers to facilitate coordination of access to CB (Hassanali, 2018) UNFSA: Technical and scientific cooperation obligations with regard to the conservation and management of straddling and highly migratory fish stocks (Durussel et al., 2017) Art. 5: Requirements for data collection and sharing by coastal states and states fishing on the high seas; duty to collect and share, in a timely manner, complete and accurate data concerning fishing activities, to promote and conduct scientific research, and to develop appropriate technologies in support of fishery conservation and management (Gjerde et al., 2019) Art. 14: Obligation for States to “ensure that fishing vessels flying their flag provide such information as may be necessary in order to fulfill their obligations under this Agreement”; Art. 14 (3): Further elaboration on obligation to cooperate in strengthening scientific research capacity for the benefit of all (Gjerde et al., 2019) Annex i: Requirements for data collection and sharing (Gjerde et al., 2019) CBD: Technical and scientific cooperation obligations regarding the conservation of biodiversity (Durussel et al., 2017) Nagoya Protocol (non-monetary benefits definition) (Harden Davies, 2019) Art. 22: Provision on capacity building with regard to the access to and benefit sharing of genetic resources (Durussel et al., 2017) FAO: Soft law FAO International Plans of Action (IPOAs), FAO Code of Conduct for Responsible Fisheries, and the legally binding FAO Compliance Agreement: capacity building with regard to fisheries (Durussel et al., 2017)	IPCC and IPBES and IOC as examples for Scientific and Technical Body (De Santo et al., 2019) Arctic Council: Scientific Cooperation Agreement and CAO Fisheries Agreement with scientific cooperation provisions (Kraabel, 2020) Arctic Observatory Network: submarine communication cables (Norway- US West Coast- Japan) for ocean monitoring (Kraabel, 2020)

Authors emphasize that funding for ocean management is needed (Durussel et al., 2017; Harden-Davies, 2017b; Bax et al., 2018; Hassanali, 2018) and propose potential entities (see Figure 2). A biodiversity fund fed by revenues from the exploitation of MGRs in international waters (Tvedt and Jørem, 2013; Broggiato et al., 2014; Peña Neira, 2017; Ridings, 2018; Voigt-Hanssen, 2018) could constitute a way to transfer benefits to stakeholders—including state and non-state actors at the national, regional, and global level—involved in conservation projects, such as research on biodiversity and the creation of MPAs (Tvedt and Jørem, 2013).

One part of the BBNJ literature detects the challenges of compliance and provides recommendations for an effective implementation of the agreement (Ma et al., 2016; Li, 2018; Long, 2019). Authors examine geopolitical considerations surrounding BBNJ (Kaye, 2004), point to the difficulties of conducting EIAs in ABNJ (Ma et al., 2016), and argue that compliance can be achieved through economic incentives (Blasiak and Yagi, 2016). Academic output deals with the economic benefits of MPAs when spillover effects for fisheries spurring self-interested implementation (Blasiak and Yagi, 2016), as well as the commercial and ecological benefits of MGRs—the “ocean genome” (Blasiak and Yagi, 2016; Blasiak et al., 2020).

Apart from incentives, monitoring and control are identified as crucial for compliance (Blasiak and Yagi, 2016; Altvater et al., 2019). To deal with non-compliance, the literature discusses the possibility of a compliance committee (Drankier et al., 2012; Durussel et al., 2017; Gjerde et al., 2019). It also recommends compensation payments into a rehabilitation or liability fund to enshrine the no-harm and polluter-pays principles in law (Long, 2019).

The Role of Science

Science has a significant place in each of the package elements of the future BBNJ treaty. Knowledge about the ocean and its ecosystems is still limited, with a majority of marine species being new to science (Rabone et al., 2019). Marine research is therefore needed in order to understand the world's ecosystems (Rochette and Bille, 2008). Moreover, marine genetic compounds have been used to develop products for the pharmaceutical, biofuel, and chemical industries (Blasiak et al., 2018). It is widely argued that scientific and other forms of knowledge ought to contribute to decision-making and the implementation of policies (Van Dover et al., 2016; Gjerde et al., 2019; Gownaris et al., 2019) and that scientific cooperation is needed (Harden-Davies and Gjerde, 2019; Rabone et al., 2019).

Marine Scientific Research for Exploration and Exploitation

Marine scientific research (MSR) is intrinsically linked to marine genetic resources, which can either be part of samples or the object of study. UNCLOS guarantees the “freedom of scientific research” on the High Seas (UNCLOS, Art. 87) under certain environmental standards and restrictions. Despite uncertainty concerning monetary benefits from MGRs (Blasiak and Yagi, 2016; Harden-Davies, 2017b; Yu, 2019), most of the literature expects promising economic gains to be derived from MGRs (Nurbintoro and Nugroho, 2016; Scovazzi, 2016; Van Dover et al., 2016; Becker-Weinberg, 2017). Current literature on the relationship between MSR and MGRs is biased toward a preference for keeping the status quo, i.e., allowing free and open access to MGRs in order not to impede scientific research and developments of new products. A small share of the literature mentions access to otherwise restricted areas through MSR in the ATS case (Li, 2018), and the threat of overexploitation of marine biodiversity—including MGRs—through (or in the name of) research (Kaye, 2004). It recommends introducing a “duty of care when collecting MGRs” and restricting access to vulnerable marine ecosystems, such as EBSAs and MPAs (Voigt-Hanssen, 2018), or “standards and criteria for responsible sampling activities, e.g., in form of a code of conduct” (Yu, 2019).

Many scholars, however, emphasize the opportunity provided by the BBNJ agreement to strengthen best-practice MGR access, sharing, and transparency (Brogiato et al., 2014, 2018; Collins et al., 2019; Rabone et al., 2019). The sharing of information regarding planned research activities (type, purpose, scope, and timeline) and the monitoring and regulation of impacts, as well as the sharing of research results, are viewed as useful tools to prevent environmental harm, as is reporting on research and exploration activities in international waters (Hassanali, 2018).

Science-Policy Interfaces for Ocean Protection

As much as science is needed to explore and exploit the marine environment, it also lays the foundation for efficient ocean protection, including the identification and creation of High Seas ABMTs, including MPAs (Dias et al., 2017; Mossop, 2018). Scientific evidence can inform effective MPA establishment to maintain and restore populations, increase resilience of the ecosystem, and provide socio-economic benefits (Gownaris et al., 2019). A literature review by Gownaris et al. (2019) shows that such benefits can only be achieved if “MPAs are appropriately sited, strongly protected and effectively managed.” Given that their establishment has, in the past, not always relied upon best available science, the quality of MPAs varies significantly (Gownaris et al., 2019). Large scale MPAs, larger than 30,000 km², seek to meet quantitative global targets set by the CBD and Sustainable Development Goal 14.5, however,

their contribution to biodiversity conservation has been debated (Davies et al., 2017). It has been argued that “quality” goals, including equitably and effectively managed, well-connected, and ecologically representative networks of MPAs, will not be met (O’Leary and Roberts, 2018).

Since the “best available science” is needed to identify MPAs, various scientists have published their findings with the aim to contribute to effective MPA establishment (O’Leary et al., 2012; Ban et al., 2014a; Selig et al., 2014; Evans et al., 2015; Dias et al., 2017; Gjerde et al., 2019; Gownaris et al., 2019). Their publications contribute to the BBNJ process by providing guidance on suitable sites for MPAs, i.e., those with a high biodiversity value that—regardless of their well-known prestige ecosystems—are lacking in comprehensive MPA coverage (Selig et al., 2014; Dias et al., 2017). Scientific studies highlight the policy relevance of biogeographic classifications (Rice et al., 2011; Gjerde et al., 2016), point to certain deep-sea habitats in need of protection (Johnson, 2019), and to over 76 million km² of unprotected ABNJ that have already been identified as important and could act as a starting point for the BBNJ process (Gownaris et al., 2019). A geospatial analysis of existing ABMTs in deep-sea environments seeks to inform ecosystem-based management on the High Seas (Menini and Van Dover, 2019). BBNJ authors point out that the 1972 World Heritage Convention does not include international waters, but science has identified various sites in need of protection (Laffoley and Freestone, 2017). To prevent the designation of MPAs in areas of low biodiversity value and support conservation, objective criteria must be used, such as the presence of pelagic seabirds, which indicate greater marine biodiversity (Dias et al., 2017), or the occurrence of prestige sponges on tropical seamounts (Ramiro-Sanchez et al., 2019). A combination of VME taxa records and predictive habitat models can provide scientific evidence to support sustainable management, avoid the adverse impacts of exploitation, and suggest new sites for MPAs, serving as the basis for EBSAs and large VMEs nomination (Ramiro-Sanchez et al., 2019).

One part of the BBNJ literature examines lessons learnt and best-practice examples of the use of “best available science” in decision-making. Case studies of the OSPAR and CAMLR scientific committees show that scientific advice is often disregarded or wrongly implemented and that input from social science is completely missing, although it is regarded as essential for the design of effective conservation measures (De Santo, 2018). Thus, advocates of giving strong decision-making powers to a future BBNJ Scientific and Technical Body call for a “politically highly influential” design (De Santo, 2018). Increasingly, there are calls to include other forms of knowledge into policy-making across all package elements, including traditional knowledge of Indigenous Peoples and Local Communities (Dunstan et al., 2016; Ridings,

2018; Voigt-Hanssen, 2018; Johnson et al., 2019a; Scott, 2019; Humphries et al., 2020) and the perspectives of resource managers, interest groups (De Santo, 2018), civil society actors, and the private sector (Kraabel, in press). This part of the BBNJ literature points to existing instruments (see Tables 4, 5), including: the Aarhus convention, with its general principles and approaches of public participation, transparency, and information availability (De Santo, 2018); the FAO's 2009 International Guidelines for the Management of Deep-sea Fisheries in the High Seas criteria for VME identification based on the best available scientific knowledge and expert judgment (Johnson et al., 2018); the CAMLR Scientific Committee (De Santo, 2018); scientific advice for decision-making in OSPAR and the North-East Atlantic Fisheries Commission (NEAFC) by the International Council for the Exploration of the Sea (ICES) (De Santo, 2018); and the Permanent Commission for the South Pacific (CPPS) with its climate-related scientific research across the region (Durussel et al., 2017).

Scientific Cooperation

Scientific expertise, combined with capacity building, supports the global community's understanding of how the ocean is changing (Bax et al., 2018). Scientific research may be seen as a “vehicle for benefit-sharing through scientific and technological capacity building” (Harden-Davies and Gjerde, 2019). It is argued that capacity development and technology transfer toward sustainable ocean use have to focus on “actionable information”, requiring emphasis on “elements of the ocean that are most relevant to the global community, such as fisheries and living habitat” (Bax et al., 2018).

Research on science diplomacy grants science an opportunity to give way to more pragmatic discussions of scientific capacity development and technology transfer, rather than to focus on an ideological divide in the negotiations (Harden-Davies, 2018), and to engage actors on Arctic issues (Kraabel, in press). Under the future BBNJ agreement, international marine scientific research can generate knowledge; technology transfer can be used to share this knowledge; and capacity development enables the application of knowledge in practice (Harden-Davies, 2018). Suggestions include participation in research programs and the exchange of scientists (Ridings, 2018).

The sharing of knowledge about activities that affect marine biodiversity in areas beyond national jurisdiction, including research and extraction, is crucial for the conservation and sustainable use of BBNJ (Ridings, 2018), can give greater access to patented genetic resources, and strengthen research capacity and support the conservation of wild stocks (Humphries, 2018). Scientific capacity building enables global monitoring, management and adaption to

ocean change (Bax et al., 2018; Mossop, 2018). Research on the BBNJ negotiations highlights the link between the CB&TT element and all other treaty topics: MGR access and utilization, monitoring and enforcement of ABMTs, and the evaluation of EIAs (De Santo et al., 2020). New instruments of the Arctic Council, namely the Scientific Cooperation Agreement and the Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (CAO), include key provisions for scientific cooperation and can be regarded as best-practice examples (Kraabel, in press).

Digital Technology for Implementation of the BBNJ Agreement

Digital technology plays a role for each of the package elements. Advances in technology and increased demand have added stressors on the marine environment (O'Leary and Roberts, 2017), resulting in biodiversity loss as well as the destruction of prestige marine ecosystems (O'Leary and Roberts, 2018; O'Leary et al., 2020). Scientific research on MGRs is heavily dependent on new technology to take samples in the deep sea (Broggiato et al., 2018) and retrieve genetic sequence data (Rabone et al., 2019). Online databases provide worldwide access to data and genetic material, including for developing countries that were not initially involved in the access of the MGRs “*in situ*”, namely, at sea.

Simultaneously, digital technology can support ocean conservation measures by identifying marine biodiversity occurrences and threats. Novel genetic technologies offer opportunities to conserve the ocean genome (Blasiak et al., 2020). It therefore plays a significant role as regards ABMTs and MPAs. Satellite tracking, combined with open and near real-time accessibility, will assist the protection of highly migratory marine vertebrates (Sequeira et al., 2019). Marine and aerial autonomous systems, satellite-based remote sensing, telemetry, and systems combining Automatic Identification Systems (AIS) with satellite tracking can predict high-seas fishing effort and assess the potential exposure of coastal regions to adjacent fishing pressure (Popova et al., 2019). BBNJ authors also examine the spatial ecology and drivers of the global distribution of the high-seas long-line fishing fleet by using newly available AIS data to predict fishing effort distribution (Crespo et al., 2018). As regards the interconnectedness of the ocean, one way to identify MPAs that take into account migratory connectivity is to establish mobile MPAs informed by satellite data (Maxwell et al., 2020). Partnerships with the military, or industries with access to crucial technologies to study or manage remote ocean areas, including remote sensing technologies, can provide new resources for the conservation and monitoring of ABNJ (Gjerde et al., 2016).

Technology will also be needed for MPA surveillance purposes and compliance with the BBNJ agreement (Rochette et al., 2014a; Rowlands et al., 2019). Studies by BBNJ authors that are based on monitoring, control and surveillance mechanisms used by RFMOs argue that the new instrument could be an opportunity to introduce AIS technology for monitoring, control and surveillance on the High Seas, which would improve biodiversity conservation and management in international waters and enhance compliance (Dunn et al., 2018). Digital technology allows for near real-time monitoring of fishing vessels (Popova et al., 2019). New technologies include vessel tracking systems, e.g., the vessel monitoring system (VMS) and AIS, which facilitate the surveillance and monitoring of marine fisheries even in remote waters (Crespo et al., 2018). BBNJ authors point out that currently not all vessels are required to carry AIS devices, and regulations vary according to vessel type, size, nationality, and fishing location (Crespo et al., 2018). MPAs larger than 100,000 km² require improvements in satellite monitoring to detect violations (Rowlands et al., 2019).

The role of technology in the implementation of the BBNJ agreement underscores the importance of the CB&TT package. Technology transfer can facilitate access to satellite databases such as AIS to track the location of fishing activities and increase the management capacity of states and RFMOs (Dunn et al., 2018). In this way, it can support developing states in managing and monitoring fishing activities and impacts (Bax et al., 2018). For an effective implementation of High Seas ABMTs, the involvement of a range of stakeholders will also be crucial, including the fisheries industry and scientific community; for instance, data collection and sharing might demonstrate the added value of MPAs and generate self-interest in their implementation (Blasiak and Yagi, 2016). With the help of AIS data, governance gaps can be identified, ABMTs monitored, and the states' and RFMOs' management capacity strengthened (Dunn et al., 2018).

Discussion and Conclusion

The following section discusses the results of the BBNJ literature review; it also offers some critical reflections on the corpus and the authors' findings and recommendations. We identify two important gaps that will need to be addressed in future research on the effective conservation of marine biodiversity in ABNJ: Firstly, research on science-policy interfaces in BBNJ governance, and secondly, linking the BBNJ process to the need for transformative change.

Closer Interplay Between Science and Policy Is a Must

The findings and recommendations from the scientific community publishing on BBNJ issues show that there is a need for a stronger interplay between science and policy, and a systematic identification of “windows of opportunities” for a more efficient uptake of science into the BBNJ process and, later, treaty implementation (Rose et al., 2017). This encompasses the need for (1) formalized processes to facilitate science-policy interfaces in the BBNJ negotiations and, (2) an independent international expert body representing multiple scientific disciplines, expertise from various regions and diverse knowledge forms to ensure the inclusion of science and knowledge for the implementation of the treaty.

This literature review has revealed the willingness of the “BBNJ scientific community” to contribute to the negotiations and shape their outcome, as shown by its readiness to provide relevant scientific data and recommendations concerning the new instrument. Our findings indicate that the community is concerned about how the new treaty might shape the conservation and use of BBNJ. The corpus of normative papers mostly calls for a strong and ambitious agreement. Concretely, the “voice of science” in BBNJ affairs is calling for a more holistic, ecosystem-based, and precautionary perspective to ocean governance that takes into account ocean connectivity and climate change impacts. While the BBNJ scientific community is pointing to marine biodiversity threats and offering possible solutions, some of these calls are opposed by policy-makers involved in the BBNJ negotiations. The current draft of the BBNJ treaty—with only one further IGC planned—has, so far, only incorporated the requirements defined by the BBNJ scientific community to meet the treaty's objectives to a limited extent. Moreover, parallel political international processes on ABNJ-related issues (such as climate and biodiversity Conferences of the Parties (COPs) or negotiations of the ISA) will also have to be connected if a holistic solution is to be found.

Our findings also indicate, that the BBNJ scientific community needs to expand and diversify. The literature sample of this review mainly consists of academic output by authors affiliated with Europe (46%), Oceania (21%), and North America (20%), but lacks input from Asia (8%), Latin America (4%), and Africa (1%). While authors have a variety of academic backgrounds, law is the most prevalent discipline throughout the sample with more than half of BBNJ authors from that discipline. Information from participant lists and side-event programs of BBNJ negotiations shows that 35 of the 99 authors were directly involved—attending at least one of

the three intergovernmental conferences (IGCs)⁹, either as observers from universities or non-governmental organizations, or at the negotiation table within national delegations, which influences the interrelation between negotiations and academic output. With the limitation of looking explicitly at peer-reviewed academic literature in English, the main “voice of science” is that of authors and research institutes from the Global North, providing scientific findings, as well as suggestions regarding the emergence, development and implementation of the agreement. Given that our sample only includes scientific literature explicitly referring to the BBNJ process, there is a large body of marine and climate science literature missing from this analysis that may be relevant for the negotiations.

This reveals the need to further encourage links between marine scientific research and the ongoing BBNJ process. Recent science and knowledge should be brought to the decision-makers' negotiating table, such as research on deep-sea environments and the characteristics of marine species. In this regard, potential communication barriers need to be bridged to identify the significance of the findings, and results need to be connected to the political realities at hand for the policy-makers to perceive science as relevant. This could inform policy-making regarding access to, and utilization of MGRs, the identification of ABMTs, including MPAs, and the need for EIAs. Since there is a shortage of BBNJ research originating from the Global South, we recommend facilitating cooperation to guarantee their inclusion in the scientific community. The CB&TT element of the negotiations can significantly contribute to this aim. Scientists working on topics related to areas further than 200 nautical miles away from the shore, on marine species migrating into those areas, or on genetic material from these areas, are encouraged to link their research to the political BBNJ process to make their work policy-relevant and engage in the science-policy interfaces. Moreover, policy-makers are encouraged to reach out to experts working on the above-mentioned topics even if these are not aware of, or involved in the political process. In this way, the BBNJ scientific community could grow and include other forms of knowledge relevant for the BBNJ negotiations.

In this regard, science and knowledge can notably shape the applicability of treaty provisions, regarding the processes of how to govern MGRs, establish ABMTs, including MPAs, conduct EIAs, and ensure CB&TT. Yet, we need future research on designing science-policy institutions by identifying the social relevance of science and knowledge for the international community when seeking to regulate global commons. Research on effective science-policy interfaces

⁹ Information on affiliation, academic background and BBNJ involvement only concerns the first author and disregards collaborations.

emphasize the need for “salient, credible and legitimate” information-base in policy-making (Cash et al., 2003). However, perceptions of saliency, credibility and legitimacy can differ in “certain political situations within particular political and cultural settings” (Lidskog and Sundqvist, 2002). This underlines the importance of understanding the different values and norms behind the production and interpretation of science and knowledge (Jasanoff, 2004), especially in international negotiations where representatives from around the world are expected to jointly agree on the way forward. While literature exists on such “social relevance” in the climate and biodiversity fields (Beck et al., 2014; Vadrot, 2020a), research on effective science-policy interfaces in BBNJ in this regard is still lacking and constitutes significant potential for the protection of marine global commons.

Transformative Change for BBNJ Objectives

While literature in our sample exemplifies the need for an ambitious BBNJ treaty, based on precaution, and recognizes the need for a holistic, ecosystem-based approach to ocean governance, it tends to limit itself—with a few exceptions—to a narrow interpretation of the Law of the Sea. While the BBNJ Treaty will indeed be an implementing agreement of UNCLOS and should “not undermine” its provisions, the dramatic acceleration of environmental degradation in the ocean should encourage us to think beyond existing legal and institutional structures and to acknowledge that the institutions we have established to tackle the loss of marine biodiversity are embedded in political and economic contexts. Literature from our sample seems to recognize the need for transforming the institutional and legal conditions for ocean protection, however, no connections have yet been made to the ongoing debate on transformative change within the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). Authors of the first global IPBES assessment concluded that global biodiversity loss could only be reversed by addressing both direct and indirect drivers, and by introducing transformative change into our societies (IPBES, 2019). The underlying—economic, sociocultural, demographic, political, institutional, and technological—indirect drivers behind the direct drivers are the root causes of biodiversity loss in our societies (Diaz et al., 2019). Transformative change would entail a “fundamental, system-wide reorganization across technological, economic, and social factors, making sustainability the norm rather than the altruistic exception” (Diaz et al., 2019).

Using this ambitious framework—which already guides debates within the CBD—to govern BBNJ affairs would open up a new pathway toward the effective conservation and sustainable use of marine biodiversity. Thus, we propose that future research by the BBNJ scientific

community should concentrate on exemplifying the kind of transformative change that would be needed and how indirect drivers of marine biodiversity loss can be considered in the new BBNJ treaty and its implementation. As scientific findings on ocean connectivity and the interaction between the ocean and the climate show, existing political and legal structures cannot guarantee the conservation and sustainable use of marine biodiversity. The traditional way of drawing borders in the marine environment and the desire to privatize and nationalize marine space and resources does not account for such interconnections and is failing to ensure governance aims for marine biodiversity.

Academic literature from the social sciences may help us bring together the ongoing BBNJ debate and transformative change (Vadrot et al., 2018). This includes research on our international system, economy, politics, and structural factors that led to the current state of the oceans in need of protection and regulation. Especially the politics behind some of the tensions that we see in the negotiations would benefit from research on the negotiation dynamics themselves, including struggles over environmental knowledge (Vadrot, 2020b). While the ocean lays mostly outside of national jurisdiction, still, states are the actors that will decide on the future of marine biodiversity. As shown in the literature, political and economic interests have in the past prevented marine protection in spaces that from an ecological point of view were identified as vulnerable. A change in these structures would require a critical view on the status quo of international negotiations, the critical appraisal of the limits and the future of multilateralism, consideration of diverse knowledge forms, and the imagination for new ways of governing areas that belong to all (Vadrot, 2020b). Alternative ideas (Wyborn et al., 2020) on using and sharing ocean resources, including other forms of knowledge—such as local and indigenous knowledge and philosophical insights into the question of humankind's right to “own” the ocean and its resources—could help us arrive at alternative solutions that have so far not been sufficiently considered. These could greatly enrich international policy-making options and broaden the scope of debate.

Given its focus on the potential economic value of MGRs and its aim to counterbalance inequalities between the Global North and the Global South, the BBNJ literature has failed to consider the intrinsic value of marine biodiversity. Although conservation and sustainable use are discussed at length in the debate on how the ocean's resources may be efficiently used and how an equitable sharing of benefits may be guaranteed, the fact that biodiversity has a value in itself—without being monetized—is only touched on by few authors (Gjerde et al., 2019; Harden-Davies et al., 2020). Ethical considerations whether and how to explore and

exploit marine life and reflections on who has decision-making power to govern ocean activities fall short in current scientific debates, as well as in the negotiations themselves. These ethical questions, however, need to be addressed in the light of governing a global commons.

BBNJ Outlook

The BBNJ literature is quickly growing and we observe a significant increase in publications while we approach the next—planned to be final—negotiation round of BBNJ. Recent publications—only accessible to us after completion of the systematic review—cover important and timely issues related to diverse elements of the BBNJ Treaty. Regarding the package element MGRs, this includes valuable insights on stakeholder perspectives on access and benefit sharing for MGRs (Collins et al., 2020) and the consideration of digital sequence information as a marine genetic resource (Lawson and Rourke, 2020). Concerning the ABMTs package and more specifically, marine protection, recent publications include the identification of priority areas for protection in ABNJ (Visalli et al., 2020), the importance of the protection of High Seas coral reefs (Wagner et al., 2020), scientific and legal considerations for dynamic ABMTs (Crespo et al., 2020) and a network of seamount MPAs (Marsac et al., 2020). As regards to EIAs, new research evaluates the prospects for effective environmental assessment under the new instrument and proposes a standard against which to measure the environmental assessment process being developed in the BBNJ negotiations (Doelle and Sander, 2020). Recent publications considering the CB&TT package include the link between marine technology transfer and MSR (Harden-Davies and Snelgrove, 2020), synergies between policy agreements and the BBNJ agreement (Vierros and Harden-Davies, 2020) and an analysis of global and regional collaboration networks in marine biodiversity research (Tolochko and Vadrot, in press).

Furthermore, research discusses overarching themes such as convergence and divergence in the negotiations (Humphries and Harden-Davies, 2020; Wang and Chang, 2020), ocean resilience to climate change and other human activities (Yadav and Gjerde, 2020), science-policy interfaces (Gaebel et al., 2020), the interplay between institutional frameworks (Balton, 2019; Clark, 2020; Gardiner, 2020; Haas et al., 2020a; Nickels, 2020; Papastavridis, 2020), dispute prevention and settlement (Payne, 2020; Shi, 2020), pathways for strengthening monitoring, control and surveillance in ABNJ (Cremers et al., 2020), the relevance of traditional knowledge (Mulalap et al., 2020) and first ideas to grant non-state actors rights to represent the interests of humanity (Payne, 2020) and nature rights on its own on the global scale (Harden-Davies et al., 2020) when governing the global commons.

Also in the political sphere—despite the postponement of the fourth and planned to be last IGC—there is a significant willingness of stakeholders, including state and non-state actors- to keep the momentum and stay engaged in discussions around BBNJ. This can be seen in extensive and active participation by state delegates in online webinars and dialogues organized by individual state actors and civil society, as well as in semi-formally organized intersessional work by the UN Secretariat to engage delegations in diving deeper into unresolved issues in all package elements. Involvement in discussions on textual work, interest in clarifications on BBNJ issues, and collaboration among BBNJ stakeholders over the past months show the motivation of state delegations to be engaged in the multilateral dialogue and offer hope for the upcoming formal negotiation round - that will decide over the future of marine biodiversity—to take the calls from the scientific community into account.

Ongoing intersessional work and engagement with scientists and the civil society until the next IGC can serve consensus-building among state representatives, insofar as it grants more time to discuss contentious issues and let the voice of science and civil society play a more central role. It is also in this regard that our systematic literature review may enrich ongoing negotiations and serve stakeholders interested in the BBNJ process and its diverse elements to navigate smoothly through the already existing research and recommendations that cover a broad range of issues and ideas. Scientists may identify new avenues for research and policy-makers may find novel approaches already circulating among the BBNJ community. While intersessional online meetings and final multilateral discussions at the upcoming IGC indeed offer the opportunity to design an ambitious agreement fit to fulfill its objectives, it remains to be seen to what extent the voice of science will be heard during the BBNJ negotiations.

Data Availability Statement

The original contributions presented in the study are included in the article/Supplementary Material, further inquiries can be directed to the corresponding author/s.

Author Contributions

ITvW data collection, data analysis, and drafting and writing. AV: design of study, contribution to data analysis, and drafting and writing. All authors contributed to the article and approved the submitted version.

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Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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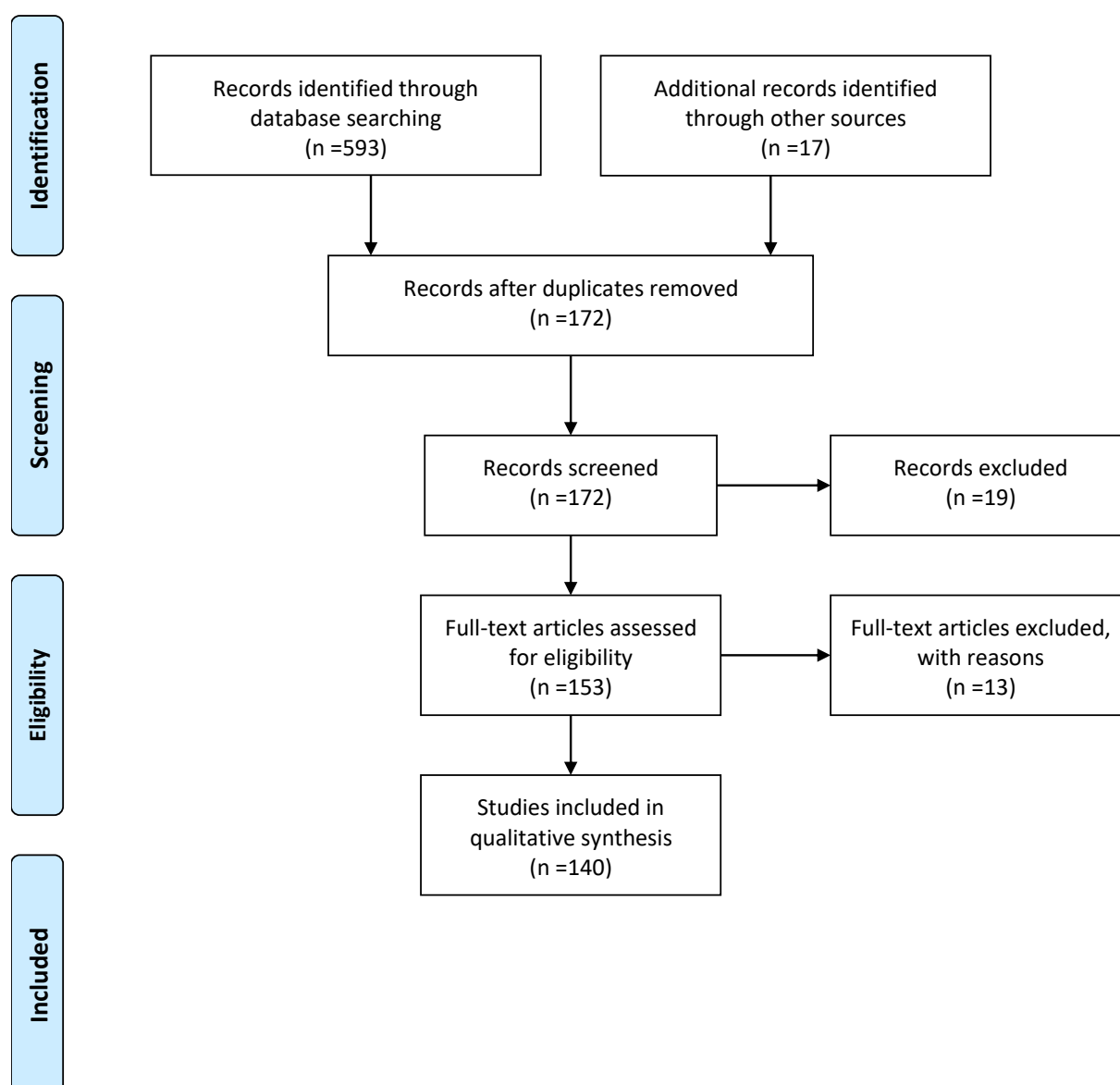
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8.1.2 Supplementary Material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fmars.2020.614282/full#supplementary-material>

i) Data Sheet 1: PRISMA 2009 Flow Diagram for the BBNJ Sample

PRISMA 2009 Flow Diagram for the BBNJ Sample



Based on: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit www.prisma-statement.org.

ii) Data Sheet 2: Annex 2: BBNJ Sample

Annex 2: BBNJ Sample

	Source	Journal	Year	Thematic Group	Region
1.	Altwater, S., Fletcher, R., & Passarello, C. (2019). The Need for Marine Spatial Planning in Areas Beyond National Jurisdiction. In J. Zaucha & K. Gee (Eds.), <i>Maritime Spatial Planning: past, present, future</i> (pp. 397-415). Cham: Springer International Publishing.	Maritime Spatial Planning: Past, Present, Future	2019	ABMTs/MPAs	Europe
2.	Ardron, J. A., Rayfuse, R., Gjerde, K. M., & Warner, R. (2014). The sustainable use and conservation of biodiversity in ABNJ: What can be achieved using existing international agreements? <i>Marine Policy</i> , 49, 98-108. doi:10.1016/j.marpol.2014.02.011	Marine Policy	2014	among other frameworks	Europe
3.	Ban, N. C., et al. (2014a). "Systematic Conservation Planning: A Better Recipe for Managing the High Seas for Biodiversity Conservation and Sustainable Use." <i>Conservation Letters</i> 7(1): 41-54.	Conservation Letters	2014	ABMTs/MPAs	North America
4.	Ban, N. C., Maxwell, S. M., Dunn, D. C., Hobday, A. J., Bax, N. J., Ardron, J., . . . Pressey, R. L. (2014b). Better integration of sectoral planning and management approaches for the interlinked ecology of the open oceans. <i>Marine Policy</i> , 49, 127-136. doi:10.1016/j.marpol.2013.11.024	Marine Policy	2014	ABMTs/MPAs	North America
5.	Barnes, R. (2016). The Proposed LOSC Implementation Agreement on Areas Beyond National Jurisdiction and Its Impact on International Fisheries Law. <i>International Journal of Marine and Coastal Law</i> , 31(4), 583-619. doi:10.1163/15718085-12341411	International Journal of Marine and Coastal Law	2016	ABMTs/MPAs	Europe
6.	Barros-Platau, A. F., Sondergaard, N., & Prantl, J. (2019). Policy networks in global environmental governance: connecting the Blue Amazon to Antarctica and the Biodiversity Beyond National Jurisdiction (BBNJ) agendas. <i>Revista Brasileira De Politica Internacional</i> , 62(2). doi:10.1590/0034-7329201900206	Revista Brasileira De Politica Internacional	2019	among other frameworks	South America

7.	Bax, N. J., Appeltans, W., Brainard, R., Duffy, J. E., Dunstan, P., Hanich, Q., . . . Wilkin, J. (2018). Linking Capacity Development to GOOS Monitoring Networks to Achieve Sustained Ocean Observation. <i>Frontiers in Marine Science</i> , 5. doi:10.3389/fmars.2018.00346	Frontiers in Marine Science	2018	CB&TT	Oceania
8.	Becker-Weinberg, V. (2017). Preliminary Thoughts on Marine Spatial Planning in Areas beyond National Jurisdiction. <i>International Journal of Marine and Coastal Law</i> , 32(3), 570-588. doi:10.1163/15718085-12323029	International Journal of Marine and Coastal Law	2017	ABMTs/MPAs	Europe
9.	Bell, J. B., Guijarro-Garcia, E., & Kenny, A. (2019). Demersal Fishing in Areas Beyond National Jurisdiction: A Comparative Analysis of Regional Fisheries Management Organisations. <i>Frontiers in Marine Science</i> , 6. doi:10.3389/fmars.2019.00596	Frontiers in Marine Science	2019	fishing	Europe
10.	Blanchard, C., Durussel, C., & Boteler, B. (2019). Socio-ecological resilience and the law : Exploring the adaptive capacity of the BBNJ agreement. <i>Marine Policy</i> , 108. doi:10.1016/j.marpol.2017.03.004	Marine Policy	2019	CB&TT	Europe
11.	Blasiak, R., Durussel, C., Pittman, J., Senit, C. A., Petersson, M., & Yagi, N. (2017). The role of NGOs in negotiating the use of biodiversity in marine areas beyond national jurisdiction. <i>Marine Policy</i> , 81, 1-8. doi:10.1016/j.marpol.2017.03.004	Marine Policy	2017	general BBNJ	Europe
12.	Blasiak, R., Jouffray, J. B., Wabnitz, C. C. C., Sundstrom, E., & Osterblom, H. (2018). Corporate control and global governance of marine genetic resources. <i>Science Advances</i> , 4(6). doi:10.1126/sciadv.aar5237	Science Advances	2018	MGRs	Europe
13.	Blasiak, R., Pittman, J., Yagi, N., & Sugino, H. (2016). Negotiating the Use of Biodiversity in Marine Areas beyond National Jurisdiction. <i>Frontiers in Marine Science</i> , 3. doi:10.3389/fmars.2016.00224	Frontiers in Marine Science	2016	general BBNJ	Europe

14.	Blasiak, R., Wynberg, R., Grorud-Colvert, K., Thambisetty, S., Bandarra, N., Canario, A., ... Wabnitz, C. (2020). The ocean genome and future prospects for conservation and equity. Nature Sustainability. doi:10.1038/s41893-020-0522-9	Nature Sustainability	2020	MGRs	Europe
15.	Blasiak, R., & Yagi, N. (2016). Shaping an international agreement on marine biodiversity beyond areas of national jurisdiction: Lessons from high seas fisheries. Marine Policy, 71, 216. doi:10.1016/j.marpol.2016.06.004	Marine Policy	2016	general BBNJ	Europe
16.	Broggiato, A., Arnaud-Haond, S., Chiarolla, C., & Greiber, T. (2014). Fair and equitable sharing of benefits from the utilization of marine genetic resources in areas beyond national jurisdiction: Bridging the gaps between science and policy. Marine Policy, 49, 176-185. doi:10.1016/j.marpol.2014.02.012	Marine Policy	2014	MGRs	Europe
17.	Broggiato, A., Vanagt, T., Lallier, L. E., Jaspars, M., Burton, G., & Muyldermans, D. (2018). Mare Geneticum: Balancing Governance of Marine Genetic Resources in International Waters. International Journal of Marine and Coastal Law, 33(1), 3-33. doi:10.1163/15718085-13310030	International Journal of Marine and Coastal Law	2018	MGRs	Europe
18.	Campbell, L. M., Gray, N. J., Fairbanks, L. W., Silver, J. J., & Gruby, R. L. (2013). Oceans at Rio+20. Conservation Letters, 6(6), 439-447. doi:10.1111/conl.12035	Conservation Letters	2013	general BBNJ	Europe
19.	Chiarolla, C. (2014). Intellectual property rights and benefit sharing from marine genetic resources in areas beyond national jurisdiction: current discussions and regulatory options. Queen Mary Journal of Intellectual Property, 4(3), 171-194. doi:10.4337/qmijp.2014.03.01	Queen Mary Journal of Intellectual Property	2014	MGRs	Europe
20.	Collins, J. E., Harden-Davies, H., Jaspars, M., Thiele, T., Vanagt, T., & Huys, I. (2019). Inclusive innovation: Enhancing global participation in and benefit sharing linked to the utilization of marine genetic resources from areas beyond national jurisdiction. Marine Policy, 109, 103696. doi:https://doi.org/10.1016/j.marpol.2019.103696	Marine Policy	2019	MGRs	Europe

21.	Cordonery, L., Hemmings, A. D., & Kriwoken, L. (2015). Nexus and Imbroglia: CCAMLR, the Madrid Protocol and Designating Antarctic Marine Protected Areas in the Southern Ocean. <i>International Journal of Marine and Coastal Law</i> , 30(4), 727-764. doi:10.1163/15718085-12341380	International Journal of Marine and Coastal Law	2015	ABMTs/MPAs	Oceania
22.	Crespo, G. O., Dunn, D. C., Gianni, M., Gjerde, K. M., Wright, G., & Halpin, P. N. (2019). High-seas fish biodiversity is slipping through the governance net. <i>Nature Ecology & Evolution</i> , 3(9), 1273-1276. doi:10.1038/s41559-019-0981-4	Nature Ecology & Evolution	2019	fishing	North America
23.	Crespo, G. O., Dunn, D. C., Reygondeau, G., Boerder, K., Worm, B., Cheung, W., . . . Halpin, P. N. (2018). The environmental niche of the global high seas pelagic longline fleet. <i>Science Advances</i> , 4(8). doi:10.1126/sciadv.aat3681	Science Advances	2018	fishing	North America
24.	Davies, T. E., Maxwell, S. M., Kaschner, K., Garilao, C., & Ban, N. C. (2017). Large marine protected areas represent biodiversity now and under climate change. <i>Scientific Reports</i> , 7. doi:10.1038/s41598-017-08758-5	Scientific Reports	2017	ABMTs/MPAs	Europe
25.	De Lucia, V. (2017). The Arctic environment and the BBNJ negotiations. Special rules for special circumstances? <i>Marine Policy</i> , 86, 234-240. doi:10.1016/j.marpol.2017.09.011	Marine Policy	2017	other	Europe
26.	De Santo, E. M. (2018). Implementation challenges of area-based management tools (ABMTs) for biodiversity beyond national jurisdiction (BBNJ). <i>Marine Policy</i> , 97, 43. doi:10.1016/j.marpol.2018.08.034	Marine Policy	2018	ABMTs/MPAs	North America
27.	De Santo, E. M., Ásgeirsdóttir, Á., Barros-Platau, A., Biermann, F., Dryzek, J., Gonçalves, L. R., . . . Young, O. (2019). Protecting biodiversity in areas beyond national jurisdiction: An earth system governance perspective. <i>Earth System Governance</i> , 100029. doi:https://doi.org/10.1016/j.esg.2019.100029	Earth System Governance	2019	general BBNJ	North America

28.	De Santo, E. M., Mendenhall, E., Nyman, E., & Tiller, R. (2020). Stuck in the middle with you (and not much time left): The third intergovernmental conference on biodiversity beyond national jurisdiction. <i>Marine Policy</i> , 117, 103957. doi:https://doi.org/10.1016/j.marpol.2020.103957	Marine Policy	2020	general BBNJ	Europe
29.	Dias, M. P., Oppel, S., Bond, A. L., Carneiro, A. P. B., Cuthbert, R. J., Gonzalez-Solis, J., . . . Ryan, P. G. (2017). Using globally threatened pelagic birds to identify priority sites for marine conservation in the South Atlantic Ocean. <i>Biological Conservation</i> , 211, 76-84. doi:10.1016/j.biocon.2017.05.009	Biological Conservation	2017	ABMTs/MPAs	Europe
30.	Drankier, P. (2012). Marine Protected Areas in Areas beyond National Jurisdiction. <i>The International Journal of Marine and Coastal Law</i> 27(2), 291-350.	International Journal of Marine and Coastal Law	2012	ABMTs/MPAs	Europe
31.	Drankier, P., Elferink, A. G. O., Visser, B., & Takacs, T. (2012). Marine Genetic Resources in Areas beyond National Jurisdiction: Access and Benefit-Sharing. <i>International Journal of Marine and Coastal Law</i> , 27(2), 375-433. doi:10.1163/157180812x637984	International Journal of Marine and Coastal Law	2012	MGRs	Europe
32.	Druel, E., & Gjerd, K. M. (2014). Sustaining marine life beyond boundaries: Options for an implementing agreement for marine biodiversity beyond national jurisdiction under the United Nations Convention on the Law of the Sea. <i>Marine Policy</i> , 49, 90-97. doi:10.1016/j.marpol.2013.11.023	Marine Policy	2014	general BBNJ	Europe
33.	Dunn, D. C., Ardron, J., Bax, N. J., Bernal, P., Cleary, J., Cresswell, I., . . . Halpin, P. N. (2014). The Convention on Biological Diversity's Ecologically or Biologically Significant Areas: Origins, development, and current status. <i>Marine Policy</i> , 49, 137-145. doi:10.1016/j.marpol.2013.12.002	Marine Policy	2014	ABMTs/MPAs	Europe
34.	Dunn, D. C., Harrison, A. L., Curtice, C., DeLand, S., Donnelly, B., Fujioka, E., . . . Halpin, P. N. (2019). The importance of migratory connectivity for global ocean policy. <i>Proceedings of the Royal Society B-Biological Sciences</i> , 286(1911). doi:10.1098/rspb.2019.1472	Royal Society	2019	ABMTs/MPAs	Oceania

35.	Dunn, D. C., Jablonicky, C., Crespo, G. O., McCauley, D. J., Kroodsma, D. A., Boerder, K., . . . Halpin, P. N. (2018). Empowering high seas governance with satellite vessel tracking data. <i>Fish and Fisheries</i> , 19, 739. doi:10.1111/faf.12285	Fish and Fisheries	2018	fishing	Europe
36.	Dunstan, P. K., Bax, N. J., Dambacher, J. M., Hayes, K. R., Hedge, P. T., Smith, D. C., & Smith, A. D. M. (2016). Using ecologically or biologically significant marine areas (EBSAs) to implement marine spatial planning. <i>Ocean & Coastal Management</i> , 121, 116-127. doi:10.1016/j.ocecoaman.2015.11.021	Ocean & Coastal Management	2016	ABMTs/ MPAs	Europe
37.	Durussel, C., Soto Oyarzún, E., & Urrutia S, O. (2017). Strengthening the Legal and Institutional Frame-work of the Southeast Pacific: Focus on the bbnj Package Elements. <i>The International Journal of Marine and Coastal Law</i> , 32, 671. doi:10.1163/15718085-12324051	International Journal of Marine and Coastal Law	2017	institutional arrangements	Europe
38.	Elferink, A. G. O. (2018). Coastal States and MPAs in ABNJ: Ensuring Consistency with the LOSC. <i>International Journal of Marine and Coastal Law</i> , 33(3), 437-466. doi:10.1163/15718085-12333008	International Journal of Marine and Coastal Law	2018	ABMTs/ MPAs	Europe
39.	Elferink, A. G. O. (2019). Exploring the future of the institutional landscape of the oceans beyond national jurisdiction. <i>Review of European Comparative & International Environmental Law</i> . doi:10.1111/reel.12301	Review of European Comparative & International Environmental	2019	institutional arrangements	Europe
40.	Evans, J. L., Peckett, F., & Howell, K. L. (2015). Combined application of biophysical habitat mapping and systematic conservation planning to assess efficiency and representativeness of the existing High Seas MPA network in the Northeast Atlantic. <i>ICES Journal of Marine Science</i> , 72(5), 1483-1497. doi:10.1093/icesjms/fsv012	ICES Journal of Marine Science	2015	ABMTs/ MPAs	North America
41.	Freestone, D., Johnson, D., Ardron, J., Morrison, K. K., & Unger, S. (2014). Can existing institutions protect biodiversity in areas beyond national jurisdiction? Experiences from two on-going processes. <i>Marine Policy</i> , 49, 175. doi:10.1016/j.marpol.2013.12.007	Marine Policy	2014	ABMTs/ MPAs	North America

42.	Friedman, A. (2017). Submarine Telecommunication Cables and a Biodiversity Agreement in ABNJ: Finding New Routes for Cooperation. <i>International Journal of Marine and Coastal Law</i> , 32(1), 1-35. doi:10.1163/15718085-12341425	International Journal of Marine and Coastal Law	2017	ABMTs/MPAs	North America
43.	Friedman, A. (2019). Beyond "not undermining": possibilities for global cooperation to improve environmental protection in areas beyond national jurisdiction. <i>ICES Journal of Marine Science</i> , 76(2), 452-456. doi:10.1093/icesjms/fsy192	ICES Journal of Marine Science	2019	among other frameworks	North America
44.	George, M., & George, A. R. (2018). Registration of BBNJ Research Activities: A Move towards Transparency in Research Governance. <i>Journal of East Asia and International Law</i> , 11(1), 121-143. doi:10.14330/jeail.2018.11.1.06	Journal of East Asia and International Law	2018	institutional arrangements	Asia
45.	Gjerde, K. M. (2012). Challenges to Protecting the Marine Environment beyond National Jurisdiction. <i>International Journal of Marine and Coastal Law</i> , 27(4), 839-847. doi:10.1163/15718085-12341255	International Journal of Marine and Coastal Law	2012	general BBNJ	North America
46.	Gjerde, K. M., Clark, N. A., & Harden-Davies, H. (2019). Building a Platform for the Future: the Relationship of the Expected New Agreement for Marine Biodiversity in Areas beyond National Jurisdiction and the UN Convention on the Law of the Sea. <i>Ocean Yearbook</i> , 33(1), 3-44. doi:10.1163/9789004395633_002	Ocean Yearbook	2019	general BBNJ	North America
47.	Gjerde, K. M., Reeve, L. L. N., Harden-Davies, H., Ardron, J., Dolan, R., Durussel, C., . . . Wright, G. (2016). Protecting Earth's last conservation frontier: scientific, management and legal priorities for MPAs beyond national boundaries. <i>Aquatic Conservation-Marine and Freshwater Ecosystems</i> , 26, 45-60. doi:10.1002/aqc.2646	Aquatic Conservation-Marine and Freshwater Ecosystems	2016	ABMTs/MPAs	North America
48.	Gjerde, K. M., & Ruliska-Domino, A. (2012). Marine Protected Areas beyond National Jurisdiction: Some Practical Perspectives for Moving Ahead. <i>The International Journal of Marine and Coastal Law</i> , 27, 373. doi:10.1163/157180812X633636	International Journal of Marine and Coastal Law	2012	ABMTs/MPAs	North America

49.	Goodman, C., & Matley, H. (2018). Law Beyond Boundaries: innovative mechanisms for the integrated management of biodiversity beyond national jurisdiction (vol 75, pg 402, 2018). ICES Journal of Marine Science, 75(3), 1154-1154. doi:10.1093/icesjms/fsy005	ICES Journal of Marine Science	2018	general BBNJ	Oceania
50.	Gownaris, N. J., Santora, C. M., Davis, J. B., & Pikitch, E. K. (2019). Gaps in Protection of Important Ocean Areas: A Spatial Meta-Analysis of Ten Global Mapping Initiatives. Frontiers in Marine Science, 6. doi:10.3389/fmars.2019.00650	Frontiers in Marine Science	2019	ABMTs/MPAs	North America
51.	Haas, B., McGee, J., Fleming, A., & Haward, M. (2020b). Factors influencing the performance of regional fisheries management organizations. Marine Policy, 113, 103787.	Marine Policy	2020	fishing	Oceania
52.	Harden-Davies, H. (2016). Marine science and technology transfer: Can the Intergovernmental Oceanographic Commission advance governance of biodiversity beyond national jurisdiction? Marine Policy, 74, 260-267. doi:10.1016/j.marpol.2016.10.003	Marine Policy	2016	CB&TT	Oceania
53.	Harden-Davies, H. (2017a). Deep-sea genetic resources: New frontiers for science and stewardship in areas beyond national jurisdiction. Deep-Sea Research Part II, 137, 513. doi:10.1016/j.dsr.2016.05.005	Deep-Sea Research Part II-Topical Studies in Oceanography	2017	MGRs	Oceania
54.	Harden-Davies, H. (2017b). Research for Regions: Strengthening Marine Technology Transfer for Pacific Island Countries and Biodiversity beyond National Jurisdiction. The International Journal of Marine and Coastal Law, 32, 822. doi:10.1163/15718085-13204023	International Journal of Marine and Coastal Law	2017	CB&TT	Oceania
55.	Harden-Davies, H. (2018). The next wave of science diplomacy: marine biodiversity beyond national jurisdiction. ICES Journal of Marine Science, 75(1), 426-434. doi:10.1093/icesjms/fsx165	ICES Journal of Marine Science	2018	CB&TT	Oceania

56.	Harden-Davies, H., & Gjerde, K. M. (2019). Building Scientific and Technological Capacity: a Role for Benefit-sharing in the Conservation and Sustainable Use of Marine Biodiversity beyond National Jurisdiction. 33, 400. doi:10.1163/9789004395633_015	Ocean Yearbook	2019	CB&TT	Oceania
57.	Hasanali, K. (2018). Approaching the implementing agreement to UNCLOS on biodiversity in ABNJ: Exploring favorable outcomes for CARICOM. Marine Policy, 98, 92-96. doi:10.1016/j.marpol.2018.09.030	Marine Policy	2018	other	South America
58.	Heffernan, O. (2020). Why a landmark treaty to stop ocean biopiracy could stymie research. Nature, 580. doi:10.1038/d41586-020-00912-w	Nature	2020	MGRs	Europe
59.	Hofman, R. J. (2019). Stopping overexploitation of living resources on the high seas. Marine Policy, 103, 91-100. doi:https://doi.org/10.1016/j.marpol.2019.02.037	Marine Policy	2019	other	North America
60.	Houghton, K. (2014). Identifying new pathways for ocean governance: The role of legal principles in areas beyond national jurisdiction. Marine Policy, 49, 118-126. doi:10.1016/j.marpol.2014.04.007	Marine Policy	2014	general BBNJ	Europe
61.	Houghton, K. and J. Rochette (2014). "Introduction: Advancing governance of areas beyond national jurisdiction." Marine Policy 49: 81-84.	Marine Policy	2014	general BBNJ	Europe
62.	Humphries, F. (2018). Sharing aquatic genetic resources across jurisdictions: playing 'chicken' in the sea. International Environmental Agreements-Politics Law and Economics, 18(4), 541-556. doi:10.1007/s10784-018-9403-3	International Environmental Agreements-Politics Law and Economics	2018	MGRs	Oceania

63.	Humphries, F., Gottlieb, H. M., Laird, S., Wynberg, R., Lawson, C., Rourke, M., . . . Jaspars, M. (2020). A tiered approach to the marine genetic resource governance framework under the proposed UNCLOS agreement for biodiversity beyond national jurisdiction (BBNJ). <i>Marine Policy</i> , 103910. doi:https://doi.org/10.1016/j.marpol.2020.103910	Marine Policy	2020	MGRs	Oceania
64.	Johnson, C. M. (2017). The Relevance of the Southern Ocean to the Development of a Global Regime for Marine Areas beyond National Jurisdiction-An Uncommon Commons. <i>International Journal of Marine and Coastal Law</i> , 32(4), 709-732. doi:10.1163/15718085-13204026	International Journal of Marine and Coastal Law	2017	ABMTs/MPAs	Oceania
65.	Johnson, D. E. (2019). Protecting the lost city hydrothermal vent system: All is not lost, or is it? <i>Marine Policy</i> , 107. doi:10.1016/j.marpol.2019.103593	Marine Policy	2019	ABMTs/MPAs	Europe
66.	Johnson, D. E., Barrio Froján, C., Bax, N. J., Dunstan, P., Woolley, S., Halpin, P., . . . Von Nordheim, H. (2019a). The Global Ocean Biodiversity Initiative: Promoting scientific support for global ocean governance. <i>Aquatic Conservation: Marine and Freshwater Ecosystems</i> , 29(S2), 162-169. doi:10.1002/aqc.3024	Aquatic Conservation: Marine and Freshwater Ecosystems	2019	ABMTs/MPAs	Europe
67.	Johnson, D. E., Ferreira, M. A., & Kenchington, E. (2018). Climate change is likely to severely limit the effectiveness of deep-sea ABMTs in the North Atlantic. <i>Marine Policy</i> , 87, 111-122. doi:10.1016/j.marpol.2017.09.034	Marine Policy	2018	ABMTs/MPAs	Europe
68.	Johnson, D. E., Frojan, C. B., Neat, F., Van Oeveien, D., Stirling, D., Gubbins, M. J., & Roberts, J. M. (2019b). Rockall and Hatton: Resolving a Super Wicked Marine Governance Problem in the High Seas of the Northeast Atlantic Ocean. <i>Frontiers in Marine Science</i> , 6. doi:10.3389/fmars.2019.00069	Frontiers in Marine Science	2019	ABMTs/MPAs	Europe
69.	Jorem, A., & Tvedt, M. W. (2014). Bioprospecting in the High Seas: Existing Rights and Obligations in View of a New Legal Regime for Marine Areas beyond National Jurisdiction. <i>International Journal of Marine and Coastal Law</i> , 29(2), 321-343. doi:10.1163/15718085-12341319	International Journal of Marine and Coastal Law	2014	MGRs	Europe

70.	Kaye, S. (2004). Implementing high seas biodiversity conservation: global geopolitical considerations. <i>Marine Policy</i> , 28(3), 221-226. doi:https://doi.org/10.1016/j.marpol.2003.09.001	Marine Policy	2004	ABMTs /MPAs	Oceania
71.	Kraabel, K. D. (2020). Institutional arrangements in a BBNJ treaty: Implications for Arctic marine science. <i>Marine Policy</i> . doi:10.1016/j.marpol.2019.103807	Marine Policy	2020	institutional arrangements	Europe
72.	Laffoley, D., & Freestone, D. (2017). A world of difference - opportunities for applying the 1972 World Heritage Convention to the High Seas. <i>Aquatic Conservation: Marine and Freshwater Ecosystems</i> , 27, 88. doi:10.1002/aqc.2813	Aquatic Conservation- Marine and Freshwater Ecosystems	2017	other	Europe
73.	Leary, D. (2019). Agreeing to disagree on what we have or have not agreed on: The current state of play of the BBNJ negotiations on the status of marine genetic resources in areas beyond national jurisdiction. <i>Marine Policy</i> , 99, 21-29. doi:10.1016/j.marpol.2018.10.031	Marine Policy	2019	MGRs	Oceania
74.	Li, J. C. (2018). New Relationship of the Antarctic Treaty System and the UNCLOS System: Coordination and Cooperation. In X. Xiao, T. Hauer, & S. A. R. Khan (Eds.), <i>Proceedings of the 2018 4th International Conference on Social Science and Higher Education</i> (Vol. 181, pp. 374-377).	Book chapter	2018	general BBNJ	Asia
75.	Long, R. (2019). Restoring marine environmental damage: Can the Costa Rica v Nicaragua compensation case influence the BBNJ negotiations? <i>Review of European Comparative & International Environmental Law</i> . doi:10.1111/reel.12309	Review of European Comparative & International Environmental Law.	2019	institutional arrangements	Europe
76.	Ma, D. Q., Fang, Q. H., & Guan, S. (2016). Current legal regime for environmental impact assessment in areas beyond national jurisdiction and its future approaches. <i>Environmental Impact Assessment Review</i> , 56, 23-30. doi:10.1016/j.eiar.2015.08.009	Environmental Impact Assessment Review	2016	EIAs	Asia

77.	Ma, D. Y. (2018). Exploitation and Protection of Biological Resources in Deep Seabed Areas beyond National Jurisdiction: China's Legislation and Practice. <i>Journal of East Asia and International Law</i> , 11(1), 145-161. doi:10.14330/jeail.2018.11.1.07	Journal of East Asia and International Law	2018	MGRs	Asia
78.	Marciniak, K. J. (2017). New implementing agreement under UNCLOS: A threat or an opportunity for fisheries governance? <i>Marine Policy</i> , 84, 320-326. doi:10.1016/j.marpol.2017.06.035	Marine Policy	2017	fishing	Europe
79.	Matz-Luck, N., & Fuchs, J. (2014). The impact of OSPAR on protected area management beyond national jurisdiction: Effective regional cooperation or a network of paper parks? <i>Marine Policy</i> , 49, 155-166. doi:10.1016/j.marpol.2013.12.001	Marine Policy	2014	ABMTs/ MPAs	Europe
80.	Maxwell, S. M., Gjerde, K. M., Connors, M. G., & Crowder, L. B. (2020). Mobile protected areas for biodiversity on the high seas. <i>Science</i> (New York, N.Y.), 367, 254. doi:10.1126/science.aaz9327	Science	2020	ABMTs/ MPAs	North America
81.	McLaughlin, R. (2010). 20. Exploiting Marine Genetic Resources Beyond National Jurisdiction And The International Protection Of Intellectual Property Rights: Can They Coexist? In (pp. 371-382). Leiden, Nederlande: Brill Nijhoff.	Book chapter	2010	MGRs	North America
82.	Medaglia, J. C., & Perron-Welch, F. (2019). The benefit-sharing principle in international law. <i>Journal of Intellectual Property Law & Practice</i> , 14(1), 62-76. doi:10.1093/jiplp/jpy162	Journal of Intellectual Property Law & Practice	2019	MGRs	South America
83.	Mendenhall, E., De Santo, E. M., Nyman, E., & Tiller, R. (2019). A soft treaty, hard to reach: The second inter-governmental conference for biodiversity beyond national jurisdiction. <i>Marine Policy</i> , 108, 103664. doi:https://doi.org/10.1016/j.marpol.2019.103664	Marine Policy	2019	general BBNJ	North America

84.	Menini, E., & Van Dover, C. L. (2019). An atlas of protected hydrothermal vents. <i>Marine Policy</i> , 108, 103654. doi:https://doi.org/10.1016/j.marpol.2019.103654	Marine Policy	2019	ABMTs/ MPAs	North America
85.	Merrie, A., Dunn, D. C., Metian, M., Boustany, A. M., Takei, Y., Elferink, A. O., . . . Osterblom, H. (2014). An ocean of surprises - Trends in human use, unexpected dynamics and governance challenges in areas beyond national jurisdiction. <i>Global Environmental Change-Human and Policy Dimensions</i> , 27, 10-21. doi:10.1016/j.gloenvcha.2014.04.012	Global Environmental Change-Human and Policy Dimensions	2014	general BBNJ	Europe
86.	Mossop, J. (2018). The relationship between the continental shelf regime and a new international instrument for protecting marine biodiversity in areas beyond national jurisdiction. <i>ICES Journal of Marine Science</i> , 75, 450. doi:10.1093/icesjms/fsx111	ICES Journal of Marine Science	2018	among other frameworks	Oceania
87.	Mossop, J., & Schofield, C. (2020). Adjacency and due regard: The role of coastal States in the BBNJ treaty. <i>Marine Policy</i> , 103877. doi:https://doi.org/10.1016/j.marpol.2020.103877	Marine Policy	2020	general BBNJ	Oceania
88.	Nurbintoro, G., & Nugroho, H. B. (2016). Biodiversity Beyond National Jurisdiction: Current Debate and Indonesia's Interest. <i>Indonesia Law Review</i> , 6(3), 283-306. doi:10.15742/ilrev.v6n3.213	Indonesia Law Review	2016	MGRs	North America
89.	O'Leary, B. C., Brown, R. L., Johnson, D. E., Von Nordheim, H., Ardron, J., Packeiser, T., & Roberts, C. M. (2012). The first network of marine protected areas (MPAs) in the high seas: The process, the challenges and where next. <i>Marine Policy</i> , 36, 605. doi:10.1016/j.marpol.2011.11.003	Marine Policy	2012	ABMTs/ MPAs	Europe
90.	O'Leary, B. C., Hoppit, G., Townley, A., Allen, H. L., McIntyre, C. J., & Roberts, C. M. (2020). Options for managing human threats to high seas biodiversity. <i>Ocean & Coastal Management</i> , 187, 105110. doi:https://doi.org/10.1016/j.ocecoaman.2020.105110	Ocean and Coastal Management	2020	ABMTs/ MPAs	Europe

91.	O'Leary, B. C., & Roberts, C. M. (2017). The Structuring Role of Marine Life in Open Ocean Habitat: Importance to International Policy. <i>Frontiers in Marine Science</i> , 4. doi:10.3389/fmars.2017.00268	Frontiers in Marine Science	2017	ABMTs/MPAs	Europe
92.	O'Leary, B. C., & Roberts, C. M. (2018). Ecological connectivity across ocean depths: Implications for protected area design. <i>Global Ecology and Conservation</i> , 15. doi:10.1016/j.gecco.2018.e00431	Global Ecology and Conservation	2018	ABMTs/MPAs	Europe
93.	Pecot, M. (2005). The conservation of marine biological diversity in areas beyond national jurisdiction. <i>Environmental and Planning Law Journal</i> , 22(6). Retrieved from <Go to ISI>://WOS:000213682500006	Environmental and Planning Law Journal	2005	general BBNJ	South America
94.	Peña Neira, S. (2017). Sharing the benefits of marine genetic resources in the High Seas for conservation? <i>Ocean & Coastal Management</i> , 146, 129-134. doi:https://doi.org/10.1016/j.ocecoaman.2017.06.014	Ocean & Coastal Management	2017	MGRs	South America
95.	Pentz, B., Klenk, N., Ogle, S., & Fisher, J. A. D. (2018). Can regional fisheries management organizations (RFMOs) manage resources effectively during climate change? <i>Marine Policy</i> , 92, 13-20. doi:10.1016/j.marpol.2018.01.011	Marine Policy	2018	fishing	North America
96.	Popova, E., Vousden, D., Sauer, W. H. H., Mohammed, E. Y., Allain, V., Downey-Breedt, N., . . . Yool, A. (2019). Ecological connectivity between the areas beyond national jurisdiction and coastal waters: Safeguarding interests of coastal communities in developing countries. <i>Marine Policy</i> , 104, 90-102. doi:10.1016/j.marpol.2019.02.050	Marine Policy	2019	general BBNJ	Europe
97.	Quirk, G. C., & Harden-Davies, H. (2017). Cooperation, Competence and Coherence: The Role of Regional Ocean Governance in the South West Pacific for the Conservation and Sustainable Use of Biodiversity beyond National Jurisdiction. <i>International Journal of Marine and Coastal Law</i> , 32(4), 672-708. doi:10.1163/15718085-13204022	International Journal of Marine and Coastal Law	2017	among other frameworks	Oceania

98.	Rabone, M., Harden-Davies, H., Collins, J. E., Zajderman, S., Appeltans, W., Droege, G., . . . Horton, T. (2019). Access to Marine Genetic Resources (MGR): Raising Awareness of Best-Practice Through a New Agreement for Biodiversity Beyond National Jurisdiction (BBNJ). <i>Frontiers in Marine Science</i> , 6. doi:10.3389/fmars.2019.00520	Frontiers in Marine Science	2019	MGRs	Europe
99.	Ramiro-Sanchez, B., Gonzalez-Irusta, J. M., Henry, L. A., Cleland, J., Yeo, I., Xavier, J. R., . . . Murton, B. (2019). Characterization and Mapping of a Deep-Sea Sponge Ground on the Tropic Seamount (Northeast Tropical Atlantic): Implications for Spatial Management in the High Seas. <i>Frontiers in Marine Science</i> , 6. doi:10.3389/fmars.2019.00278	Frontiers in Marine Science	2019	ABMTs/ MPAs	Europe
100.	Ranganathan, S. (2016). Global Commons. <i>European Journal of International Law</i> , 27(3), 693-717. doi:10.1093/ejil/chw037	European Journal of International Law	2016	other	Europe
101.	Rayfuse, R. (2012). Precaution and the Protection of Marine Biodiversity in Areas beyond National Jurisdiction. <i>International Journal of Marine and Coastal Law</i> , 27(4), 773-781. doi:10.1163/15718085-12341257	International Journal of Marine and Coastal Law	2012	fisheries	Oceania
102.	Ribeiro, M. C. (2017). South Atlantic Perspectives on the Future International Legally Binding Instrument under the LOSC on Conservation and Sustainable Use of BBNJ. <i>International Journal of Marine and Coastal Law</i> , 32(4), 733-764. doi:10.1163/15718085-13204017	International Journal of Marine and Coastal Law	2017	among other frameworks	Europe
103.	Rice, J., Gjerde, K. M., Ardron, J., Arico, S., Cresswell, I., Escobar, E., . . . Vierros, M. (2011). Policy relevance of biogeographic classification for conservation and management of marine biodiversity beyond national jurisdiction, and the GOODS biogeographic classification. <i>Ocean & Coastal Management</i> , 54(2), 110-122. doi:10.1016/j.ocecoaman.2010.10.010	Ocean & Coastal Management	2011	ABMTs/ MPAs	North America
104.	Ridings, P. (2018). Redefining environmental stewardship to deliver governance frameworks for marine biodiversity beyond national jurisdiction. <i>ICES Journal of Marine Science</i> , 75(1), 435-443. doi:10.1093/icesjms/fsx122	ICES Journal of Marine Science	2018	general BBNJ	Oceania

105.	Rochette, J., & Bille, R. (2008). Governance of marine biodiversity beyond national jurisdictions: Issues and perspectives Report of the international seminar "Towards a new governance of high seas biodiversity" (Principality of Monaco, March 20-21, 2008). <i>Ocean & Coastal Management</i> , 51(12), 779-781. doi:10.1016/j.ocecoaman.2008.10.001	Ocean & Coastal Management	2008	general BBNJ	Europe
106.	Rochette, J., Gjerde, K. M., Druel, E., Ardron, J. A., Craw, A., Halpin, P., . . . Cleary, J. (2014a). Delivering the Aichi target 11: challenges and opportunities for marine areas beyond national jurisdiction. <i>Aquatic Conservation-Marine and Freshwater Ecosystems</i> , 24, 31-43. doi:10.1002/aqc.2507	Aquatic Conservation-Marine and Freshwater Ecosystems	2014	ABMTs/MPAs	Europe
107.	Rochette, J., Unger, S., Herr, D., Johnson, D., Nakamura, T., Packeiser, T., . . . Cebrian, D. (2014b). The regional approach to the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction. <i>Marine Policy</i> , 49, 109-117. doi:https://doi.org/10.1016/j.marpol.2014.02.005	Marine Policy	2014	ABMTs/MPAs	Europe
108.	Rowlands, G., Brown, J., Soule, B., Boluda, P. T., & Rogers, A. D. (2019). Satellite surveillance of fishing vessel activity in the Ascension Island Exclusive Economic Zone and Marine Protected Area. <i>Marine Policy</i> , 101, 39-50. doi:10.1016/j.marpol.2018.11.006	Marine Policy	2019	ABMTs/MPAs	Europe
109.	Sander, G. (2016). International Legal Obligations for Environmental Impact Assessment and Strategic Environmental Assessment in the Arctic Ocean. <i>International Journal of Marine and Coastal Law</i> , 31(1), 88-119. doi:10.1163/15718085-12341385	International Journal of Marine and Coastal Law	2016	EIAs	Europe
110.	Scanlon, Z. (2018). The art of "not undermining": possibilities within existing architecture to improve environmental protections in areas beyond national jurisdiction. <i>ICES Journal of Marine Science</i> , 75(1), 405-416. doi:10.1093/icesjms/fsx209	ICES Journal of Marine Science	2018	among other frameworks	Oceania
111.	Scott, K. N. (2019). Area-based Protection beyond National Jurisdiction Opportunities and Obstacles. <i>Asia-Pacific Journal of Ocean Law and Policy</i> , 4(2), 158. doi:https://doi.org/10.1163/24519391-00402004	Asia-Pacific Journal of Ocean Law and Policy	2019	ABMTs/MPAs	Oceania

112.	Scovazzi, T. (2016). The negotiations for a binding instrument on the conservation and sustainable use of marine biological diversity beyond national jurisdiction. <i>Marine Policy</i> , 70, 188-191. doi:10.1016/j.marpol.2016.04.007	Marine Policy	2016	MGRs	Europe
113.	Selig, E. R., Turner, W. R., Troeng, S., Wallace, B. P., Halpern, B. S., Kaschner, K., . . . Mittermeier, R. A. (2014). Global Priorities for Marine Biodiversity Conservation. <i>PLOS ONE</i> , 9(1).	PLOS ONE	2014	other	Europe
114.	Sequeira, A. M. M., Hays, G. C., Sims, D. W., Eguiluz, V. M., Rodriguez, J. P., Heupel, M. R., . . . Duarte, C. M. (2019). Overhauling Ocean Spatial Planning to Improve Marine Megafauna Conservation. <i>Frontiers in Marine Science</i> , 6. doi:10.3389/fmars.2019.00639	Frontiers in Marine Science	2019	ABMTs/MPAs	Oceania
115.	Shirayama, Y., Itoh, H., & Fukushima, T. (2017). Recent Developments in Environmental Impact Assessment with Regard to Mining of Deep-Sea Mineral Resources.	Book chapter	2017	EIAs	Asia
116.	Smith, D., & Jabour, J. (2018). MPAs in ABNJ: lessons from two high seas regimes. <i>ICES Journal of Marine Science</i> , 75(1), 417-425. doi:10.1093/icesjms/fsx189	ICES Journal of Marine Science	2018	ABMTs/MPAs	Oceania
117.	Sun, Z. (2019). Experts Meetings on Biodiversity beyond National Jurisdiction. <i>Asia-Pacific Journal of Ocean Law and Policy</i> , 4(2), 300. doi:https://doi.org/10.1163/24519391-00402016	Asia-Pacific Journal of Ocean Law and Policy	2019	general BBNJ	Asia
118.	Tiller, R., De Santo, E. M., Mendenhall, E., & Nyman, E. (2019). The once and future treaty: Towards a new regime for biodiversity in areas beyond national jurisdiction. <i>Marine Policy</i> , 99, 242. doi:10.1016/j.marpol.2018.10.046	Marine Policy	2019	general BBNJ	Europe

119.	Tiller, R., De Santo, E. M., Mendenhall, E., Nyman, E., & Ralby, I. (2020). Wealth blindness beyond national jurisdiction. <i>Marine pollution bulletin</i> , 151, 110809. doi:10.1016/j.marpolbul.2019.110809	Marine Pollution Bulletin	2020	MGRs	Europe
120.	Tiller, R., & Nyman, E. (2018). Ocean plastics and the BBNJ treaty—is plastic frightening enough to insert itself into the BBNJ treaty, or do we need to wait for a treaty of its own? <i>Journal of Environmental Studies and Sciences</i> , 8(4), 411-415. doi:10.1007/s13412-018-0495-4	Journal of Environmental Studies and Sciences	2018	general BBNJ	Europe
121.	Tladi, D. (2015). The Proposed Implementing Agreement: Options for Coherence and Consistency in the Establishment of Protected Areas beyond National Jurisdiction. <i>International Journal of Marine and Coastal Law</i> , 30(4), 654-673. doi:10.1163/15718085-12341375	International Journal of Marine and Coastal Law	2015	ABMTs/MPAs	Africa
122.	Tladi, D. (2019). An institutional framework for addressing marine genetic resources under the proposed treaty for marine biodiversity in areas beyond national jurisdiction. <i>International Environmental Agreements-Politics Law and Economics</i> , 19(4-5), 485-495. doi:10.1007/s10784-019-09449-4	International Environmental Agreements-Politics Law and Economics	2019	MGRs	Africa
123.	Töpfer, K., Tubiana, L., Unger, S., & Rochette, J. (2014). Charting pragmatic courses for global ocean governance. <i>Marine Policy</i> , 49, 85-86. doi:https://doi.org/10.1016/j.marpol.2013.12.004	Marine Policy	2014	general BBNJ	Europe
124.	Tsuru, Y. (2017). “13 Institutional Interplay between Marine Biodiversity beyond National Jurisdiction—A New Agreement?”. In <i>Ocean Law and Policy</i> . Leiden, The Netherlands: Brill Nijhoff. doi: https://doi.org/10.1163/9789004311442_015	Book chapter	2017	among other frameworks	Asia
125.	Tvedt, M. W., & Jørem, A. E. (2013). Bioprospecting in the High Seas: Regulatory Options for Benefit Sharing. <i>The Journal of World Intellectual Property</i> , 16(3-4), 150-167. doi:10.1002/jwip.12010	Journal of World Intellectual Property	2013	MGRs	Europe

126.	Van Dover, C. L., Arnaud-Haond, S., Clark, M.R., Smith, S., Thaler, A.D. and van den Hove, S. (2016). Application of Biological Studies to Governance and Management of the Deep Sea. In <i>Biological Sampling in the Deep Sea</i> (eds M.R. Clark, M. Consalvey and A.A. Rowden). doi:10.1002/9781118332535.ch18	Book chapter	2016	MGRs	North America
127.	Vithanage, A. C. (2017). A Deep Dive into the High Seas: Harmonizing Regional Frameworks for Marine Protected Areas with the UNCLOS Convention on the Conservation and Sustainable Use of Marine Biological Diversity in Areas beyond National Jurisdiction. <i>Yearbook of International Environmental Law</i> , 28, 63-84. doi:10.1093/yiel/yyv085	Yearbook of International Environmental Law	2017	ABMTs/MPAs	North America
128.	Voigt-Hanssen, G. (2018). Current 'Light' and 'Heavy' Options for Benefit-sharing in the Context of the United Nations Convention on the Law of the Sea. <i>International Journal of Marine and Coastal Law</i> , 33(4), 683-705. doi:10.1163/15718085-12334012	International Journal of Marine and Coastal Law	2018	MGRs	Europe
129.	Wang, Y. (2019). On dilemmas and solutions for the issues of high seas marine protected areas during the BBNJ negotiation <i>Applied Ecology and Environmental Research</i> , 17(4), 8615-8629. doi:10.15666/aeer/1704_86158629	Applied Ecology and Environmental Research	2019	ABMTs/MPAs	Asia
130.	Warner, R. (2012). Tools to Conserve Ocean Biodiversity: Developing the Legal Framework for Environmental Impact Assessment in Marine Areas beyond National Jurisdiction. <i>Ocean Yearbook</i> , 26(1), 317-341. Retrieved from <Go to ISI>://WOS:000213814500016	Ocean Yearbook	2012	EIAs	Oceania
131.	Warner, R. (2016). Developing New Regulatory Paradigms for the Conservation and Sustainable Use of Marine Biodiversity in Areas beyond National Jurisdiction. In R. Warner & S. Kaye (Eds.), <i>Routledge Handbook of Maritime Regulation and Enforcement</i> (pp. 394-408).	Book chapter	2016	EIAs	Oceania
132.	Warner, R. (2017). Strengthening Governance Frameworks for Conservation and Sustainable Use of Marine Biodiversity in Areas beyond National Jurisdiction: Southern Hemisphere Perspectives. <i>International Journal of Marine and Coastal Law</i> , 32(4), 607-634. doi:10.1163/15718085-13204064	International Journal of Marine and Coastal Law	2017	among other frameworks	Oceania

133.	Warner, R. (2018). Oceans in Transition: Incorporating Climate-Change Impacts into Environmental Impact Assessment for Marine Areas Beyond National Jurisdiction. <i>Ecology Law Quarterly</i> , 45(1), 31-51. doi:10.15779/z38m61bq0j	Ecology Law Quarterly	2018	EIAs	Oceania
134.	Warner, R., Gjerde, K. and Freestone, D. (2014). Regional governance for fisheries and biodiversity. In S. M. Garcia, J. Rice and A. Charles (Eds.), <i>Governance of Marine Fisheries and Biodiversity Conservation: Interaction and Coevolution</i> (pp. 211-224). United Kingdom: John Wiley and Sons.	Book chapter	2014	among other frameworks	Oceania
135.	Warner, R., & Rayfuse, R. (2008). Securing a Sustainable Future for the Oceans Beyond National Jurisdiction: The Legal Basis for an Integrated Cross-Sectoral Regime for High Seas Governance for the 21st Century. <i>The International Journal of Marine and Coastal Law</i> , 23(3), 399-421.	International Journal of Marine and Coastal Law	2008	general BBNJ	Oceania
136.	Warner, R. M. (2014). Conserving marine biodiversity in areas beyond national jurisdiction: co-evolution and interaction with the law of the sea. <i>Frontiers in Marine Science</i> , 1. doi:10.3389/fmars.2014.00006	Frontiers in Marine Science	2014	EIAs	Oceania
137.	Wright, G., & Rochette, J. (2017). Regional Management of Areas beyond National Jurisdiction in the Western Indian Ocean: State of Play and Possible Ways Forward. <i>International Journal of Marine and Coastal Law</i> , 32(4), 765-796. doi:10.1163/15718085-13204020	International Journal of Marine and Coastal Law	2017	ABMTs/MPAs	Europe
138.	Yu, C. X. (2019). Implications of the UNCLOS Marine Scientific Research Regime for the Current Negotiations on Access and Benefit Sharing of Marine Genetic Resources in Areas Beyond National Jurisdiction. <i>Ocean Development and International Law</i> . doi:10.1080/00908320.2019.1677018	Ocean Development and International Law	2019	MGRs	Asia
139.	Yu, M. C. (2014). China Being A Maritime Power under the UNCLOS: Issues and Ways Ahead. <i>Journal of East Asia and International Law</i> , 7(2), 313-334. Retrieved from <Go to ISI>://WOS:000345851900002	Journal of East Asia and International Law	2014	MGRs	Asia

140.	Zhu, L. J. (2009). Chinese Practice in Public International Law: 2008*. Chinese Journal of International Law, 8(2), 493-551. doi:10.1093/chinesejil/jmp011	Chinese Journal of International Law	2009	general BBNJ	Asia
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8.2 Science Input

After analysing science output, in a second step, I investigated the science *input* into the BBNJ negotiations. Simply looking at what the scientific community contributed does not give insights on how science-policy interfaces were taking place in the BBNJ process and whether this scientific knowledge entered the negotiations. Through event ethnography and semi-structured interviews, I could study the direct scientific input into the negotiations, and more precisely, the actors and their practices of scientific input, prominent throughout the BBNJ *negotiation stage*. This paper focuses on how science was integrated into the policy-making process “on site” at the negotiations and in the intersessional period to get a sense of how the knowledge base was created on which, presumably, decisions were then taken.

CEE provided a valuable methodology for the study, as it allowed for a systematic analysis of pathways of scientific input – even beyond the formalised structures initiated by the UN Secretariat. Formal and informal practices of scientific input in the negotiation stage were identified, namely the means by which science reached the negotiations and was made available to policy-makers. In this way, it became clear that scientific input was voluntary, only broadly formalised by the UN Secretariat and conditioned by financial and technical capacities of actors.

Findings show that scientific input in the BBNJ negotiations was not systematic and transparent and conditioned by a) available national scientific capacity, b) financial resources, c) established contacts and d) active involvement of actors. The study outcomes suggest introducing more formalised science-policy interfaces, initiated by the UN Secretariat to guarantee a more inclusive global knowledge base for decision-making.

*8.2.1 Paper 2: Pathways of Scientific Input into Intergovernmental Negotiations
A new Agreement on Marine Biodiversity*

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Pathways of Scientific Input into Intergovernmental Negotiations: A new Agreement on Marine Biodiversity

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Abstract

A new legally binding agreement for the conservation and sustainable use of marine biodiversity beyond national jurisdiction (BBNJ) was concluded. Setting new regulations and filling regulatory gaps of the United Nations Convention on the Law of the Sea are expected to be informed by “best available science”. It is critical to understand how science entered the negotiations, which defined the global scientific knowledge base of decision-makers.

This paper presents various pathways over which scientific input entered the BBNJ negotiations, using empirical data, collected through collaborative event ethnography, including participant observation and semi-structured interviews at the BBNJ negotiation site.

Results show that scientific input in the BBNJ negotiations was not systematic and transparent but dependent on a) available national scientific capacity, b) financial resources, c) established contacts and d) active involvement of actors. Results of the study call for formalised science-policy interfaces, initiated by the UN Secretariat to guarantee a global knowledge base for decision-making.

Keywords: international negotiations; United Nations; marine biodiversity; BBNJ; ocean protection; science-policy interfaces

List of Abbreviated Terms

ABNJ	Areas Beyond National Jurisdiction
BBNJ	Marine Biodiversity Beyond National Jurisdiction
CARICOM	Caribbean Community
CBD	Convention on Biological Diversity
CEE	Collaborative Event Ethnography
COVID-19	SARS-CoV-2 Corona Virus Disease 2019
DOSI	Deep Ocean Stewardship Initiative

ERC	European Research Council
HSA	High Seas Alliance
IGC	Intergovernmental Conference
IGO	Intergovernmental Organisation
IOC-UNESCO	Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization
IPCC	Intergovernmental Panel on Climate Change
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IR	International Relations
MEA	Multilateral Environmental Agreement
MGR	Marine Genetic Resource
NGO	Non-governmental Organisation
UN	United Nations
UNDOALOS	United Nations Division for Ocean Affairs and the Law of the Sea
UNEP	United Nations Environment Programme
USA	United States of America
WOA I	First World Ocean Assessment
WOA II	Second World Ocean Assessment

1. Introduction

A new legally binding agreement for the conservation and sustainable use of marine biodiversity beyond national jurisdiction (BBNJ) was concluded at the United Nations (UN). The new instrument regulates access and benefit sharing of marine genetic resources, enables the establishment of area-based management tools, including marine protected areas, introduces obligations for the conduct of environmental impact assessments and strengthens capacity building and the transfer of marine technology in international waters (Tessnow-von Wysocki & Vadrot, 2020). There seems to be general agreement that science needs to inform decision-making regarding marine biodiversity (Gjerde, Clark, & Harden-Davies, 2019; Gownaris, Santora, Davis, & Pikitch, 2019; Lubchenco & Grorud-Colvert, 2015; Marques & Carranza, 2013; Rabone et al., 2019). The UN Decade for Ocean Science exemplifies the need for and willingness of governments to engage with policy-relevant science throughout the development

of ocean protection measures and new international agreements (Howell et al., 2021; Polejack, 2021; Ryabinin et al., 2019; Vadrot et al., 2022).

In past experience, however, the bargaining process of intergovernmental negotiations has been dominated by political and economic considerations, rather than by science (Susskind, Ali, & Hamid, 2014). There is vast literature on the role of science in international environmental agreements, including regime formation (e.g. Driesen, 2004; Haas, 1992), science-policy interfaces (Koetz, Farrell, & Bridgewater, 2012; Matsumoto et al., 2020; van den Hove, 2007), science advice of expert committees or formalised subsidiary bodies (Andresen, 2014; Andresen, Baral, Hoffman, & Fafard, 2018; Castells & Ravetz, 2001; Chasek, 2019; Kohler, 2019; Weiss, 2003), intergovernmental science bodies, such as the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) (Hughes & Vadrot, 2019; Turnhout, Dewulf, & Hulme, 2016; Vadrot, 2014), and scientific assessments (Selin & Eckley, 2003). Some scholars have used ethnographic approaches during formal negotiations but focused on science-related conflicts e.g. (De Santo et al., 2019; Gray, Gruby, & Campbell, 2014; Hughes, Suiseeya, & Vadrot, 2019; Hughes & Vadrot, 2019). Regarding the BBNJ negotiations, research looks at imbalances in academic authorship (Blasiak, Pittman, Yagi, & Sugino, 2016; Tolochko & Vadrot, 2021), science cooperation (Harden-Davies & Snelgrove, 2020), stakeholder perceptions on science-based approaches (Gaebel, Baulcomb, Johnson, & Roberts, 2020) and relevant traditional knowledge (Mulalap et al., 2020). Yet, there is a lack of research on ways over which science enters the BBNJ conferences and intersessional period. Our study therefore focuses on pathways of scientific input at the *negotiation stage*.

We understand science-policy interfaces as diverse forms of “exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making” and account for “relations between scientists and other actors in the policy process” (van den Hove, 2007). Thus, we emphasise *practices* by scientists and policy-makers within the BBNJ negotiations. We look at pathways of scientific input as *formal and informal practices that bring science into the negotiation process*, i.e. means by which science reaches the formal BBNJ negotiation setting and that is made available to state and non-state actors throughout the process of agreement-making. Formal practices refer to science-policy interactions, officially initiated or overseen by the UN Secretariat; informal practices are hereby defined as the science-policy interactions among – and on the initiative of – individual actors outside of the “formal” ways. In this light, we study *how, through which actors and under what conditions* science enters the BBNJ negotiations during the negotiation stage.

This article first introduces the state of the art of scientific input into intergovernmental negotiations and categorises the negotiation process into different stages (Chasek, 2001; Young, 1998), arguing that while limited scientific input into the *negotiation stage* has been criticised (Susskind et al., 2014), research has so far failed to open the black box of possible pathways and conditions thereof. Second, it lays out the methodological approach of collaborative event ethnography (CEE). Third, it identifies pathways of scientific input into the BBNJ intergovernmental negotiations and intersessional period and uncovers their conditional factors. Finally, it discusses findings and concludes by emphasising the need for a systematic inclusion of a diversity of actors, disciplines and knowledge systems when designing a new agreement for the governance of the global commons.

2. The Role of Science in Intergovernmental Negotiations

Science has a significant role in agreement-making (Hughes et al., 2021; Vadrot, 2020). Particularly in the case of environmental issues, scientific input is crucial for decision-making, as these topics are often technical and complex (Haas, 1992; O'Neill, 2017; Weiss, 2003). Through science, environmental problems can be identified, understood and more effective responses be developed (Andresen, 2014; Castells & Ravetz, 2001; Meyer, 2016). The importance of scientific input to inform policy decisions is highlighted by the UN system, acknowledging that “decision-makers need accurate scientific and technical information about the nature of threats, how each actor will be affected, and the types of arrangements that can be developed to address transboundary and global risks” (Chasek, 2019, p. 17).

The most influential concept to capture the role of science in International Relations (IR) continues to be the concept of “epistemic communities”, which emphasises the importance of organised networks of scientists and experts in shaping international environmental governance (Haas, 1992, 2016). What distinguishes epistemic communities from the broader idea of a scientific community are their specific characteristics: “a shared set of normative and principled beliefs”; “shared causal beliefs”; “shared notions of validity”; “common policy enterprise” (Haas, 1992, p. 3). It is assumed that scientific information from such networks supports decision-makers “to articulate an understanding of the world and of their own policies and interests” (Haas, 2016, p. 1). Research on scientific input into international negotiations includes attributes necessary for linking science to policy, namely salience, credibility and legitimacy (Cash et al., 2002), conditions under which policy-makers regard science as relevant and use it in international negotiations (Dimitrov, 2006; Rietig, 2014) and the role of consensual information (Kailis, 2017). While literature has initially drawn a clear line between science and

policy (Ehrlich, 2006; Haas, 1992; Rose & Parsons, 2015; von Winterfeldt, 2013), the “scientist-policy maker dichotomy”, whereby scientists produce and certify the facts and policy makers ensure legitimacy, has increasingly been criticised (Jasanoff, 2004; Litfin, 1994; Saltelli & Giampietro, 2017). Scholars argue that such an approach is limited, and overlooks the “rich spectrum of actors and competences” (Saltelli & Giampietro, 2017, p. 65), highlighting the need to also study struggle over environmental knowledge (Hughes & Vadrot, 2019; Vadrot, 2020) and “relations between scientists and other actors in the policy process”, considering “exchanges, co-evolution, and joint construction of knowledge” (van den Hove, 2007, p. 815).

2.1 Scientific input at different stages of Intergovernmental Negotiations

Distinguishing between different stages of intergovernmental negotiations proves to be useful for analysing scientific input into agreement-making. In accordance with existing categorisations (Chasek, 2001; Young, 1998), we distinguish three stages of the BBNJ negotiations: the pre-negotiation (Ad Hoc Open-Ended Working Group & Preparatory Committee Meetings); negotiation (Intergovernmental Conferences IGCs); and implementation (after adoption of the agreement) (Figure 5).

The first stage - the “pre-negotiation”- includes stakeholder input by scientific and technical experts, as well as informal discussions prior to formal negotiations, in which Parties can analyse the situation, develop an information base and set the agenda (Chasek, 2001; Young, 1998). In the emergence of multilateral environmental agreements (MEAs), science is crucial to understand ecological systems and point to specific problems, such as the cumulative loss of biodiversity (O'Neill, 2017). On the basis of scientific input, international negotiations start informally, to decide whether the problem deserves global decision-making. In this regard, scientific publications and advocacy by experts can shape agenda-setting and influence how, when and which topics will be discussed (O'Neill, 2017).

The second stage is the formal “negotiation”, where negotiating of the actual terms of the treaty– the “bargaining” – begins (Susskind et al., 2014; Young, 1998). This stage serves to learn about other states’ positions, priorities and red lines, to make compromises and reach consensus. Scientists can shape the drafting of the final agreement by advising international organisations, national governments and non-governmental organisations (NGOs) and corporations during the negotiation stage (O'Neill, 2017, p. 106).

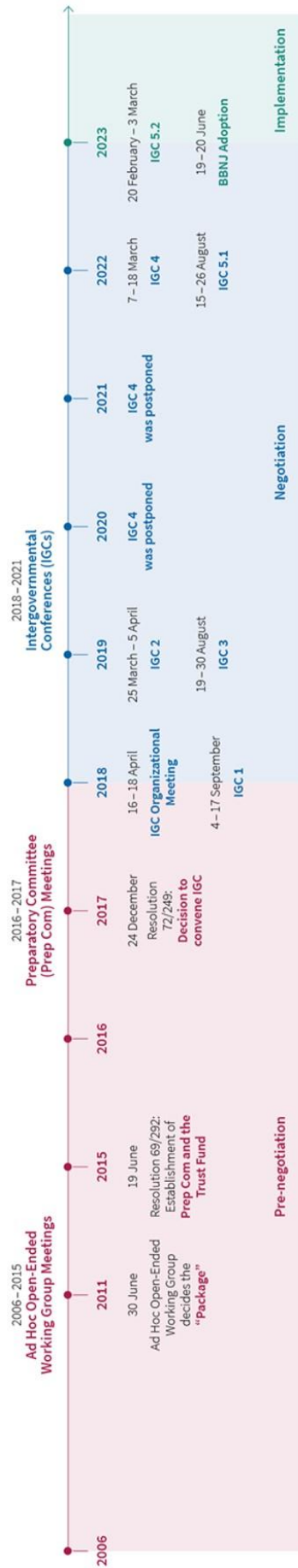


Figure 5: Stages of the BBNJ

With consensus to adopt the new agreement, negotiators are in the final stage, namely the ratification and implementation (Chasek, 2001; Young, 1998). MEAs are implemented on regional and national levels, which requires the adaptation of national laws and can take several years. Science is crucial for the implementation of the agreement, as there is a need to monitor and review progress, evaluate the effectiveness and revise and adapt measures over time.

Our study focuses on the *negotiation stage, namely the intergovernmental negotiations and the intersessional period*. Limited scientific considerations at that stage have been criticised, as it decreases the likely effectiveness of the treaty in reversing ecological damage, arguing that “scientists have far too long been the missing link in the bargaining process” (Susskind et al., 2014, p. 65). Our study opens the black box of scientific input into the bargaining process, identifies relevant actors and their formal and informal practices, and is applicable to intergovernmental negotiations beyond BBNJ.

3. Data Collection and Analysis

This study uses data collected in the research project REMOVED¹⁰ through collaborative event ethnography (CEE). An ethnographic research lens proves to be useful to empirically analyse the different ways through which science can enter the negotiations and potentially shape agreement-making. Considering negotiations as “sites” of agreement-making (Campbell, Corson, Gray, MacDonald, & Brosius, 2014; Hughes & Vadrot, 2019; Vadrot, 2020), CEE enables us to study how, through which actors and under what conditions science entered the BBNJ negotiations during the *negotiation stage*.

The research team undertook in-person and digital CEE at the two-week-long conference sessions between 2018 and 2023¹¹. BBNJ negotiation sites included the plenary and informal working group sessions – where official bargaining took place – as well as other sites of interaction between scientists within the UN setting, such as side events and thematic workshops. Ethnographic fieldnotes used for this study include data collected in person, virtually or through a combination of the two for all IGCs, as well as the virtual intersessional work during the COVID-19 pandemic, coordinated by the UN Secretariat^{12 13}. The research

¹⁰ See: REMOVED

¹¹ IGC1 retrospectively through video recordings; IGC2 (March/April 2019), IGC3 (August 2021), IGC5 (August 2022) and IGC5.2 (February 2023) in person; IGC4 (March 2022) digitally due to COVID-19 restrictions and intersessional period between IGC3 and IGC4; and between IGC4 and IGC5 digitally.

¹² Virtual intersessional work: <https://www.un.org/bbnj/content/Intersessional-work>

¹³ Data collected from other online forums (not initiated by the UN Secretariat) was not included (e.g. High Seas Dialogues: <https://highseasdialogues.org/>)

team used a standardised format for fieldnote-taking, including a documentation of actors, their statements, and general observations – with indications to references to science (Vadrot, Langlet, & Tessnow-von Wysocki, 2021). Semi-structured interviews were conducted at the conference sites and digitally to trace practices of scientific input into BBNJ.

<i>Data</i>		<i>Themes</i>	<i>Codes</i>
Fieldnotes (Interventions in plenary and side events throughout IGC1-5.2)	Reference to Science	➤ “Science“/ ➤ “Scientific“ ➤ Mentioning/explaining scientific concepts/terms ➤ Reference to scientific institutions ➤ Reference to scientific outputs/events ➤ Mention of scientific research activities & capacities	• reference to scientific publications • explanations of a scientific concepts/terms • statements on the importance of science for the agreement • invitations to scientific side events
Interview material (IGC2; 3; 5; 5.2)	Practices of scientific input	➤ How the interviewee obtained or communicated scientific information ➤ described broader practices of science-policy interfaces	• challenges • involvement in parallel processes • meaning of science • role of science • scientific capacity • scientific concepts/terms • scientific cooperation • scientists in BBNJ negotiations

Table 11: Qualitative Coding of Ethnographic Data

For analysis the data was limited to statements with a reference to science across all IGCs and online posts on the UN intersessional work platform. Interview material consisted of 70 interviews, including 29 state delegates; 7 representatives of intergovernmental organisations (IGOs); 19 representatives of NGOs; 12 natural scientists and 3 researchers from social sciences and law¹⁴. The written transcripts of the interviews were inductively coded to portray the practices of scientific input, mentioned by interviewees and served to identify science-policy interfaces within the BBNJ process. At the final conference session, interviewees were confronted with the identified pathways to revise and complement the results.

¹⁴ For this publication we identify interview material in the format (actor, number of interview from general database, date of the interview). In some cases roles are not clearly defined, e.g. when there is an NGO advisor on a state delegation (Advisor & State Delegate).

4. Results: Pathways of Scientific Input into the BBNJ Negotiation Stage

The *negotiation stage* in BBNJ consists of IGCs, happening in the UN Headquarters in New York, and the *intersessional period*, which is the time in-between the conferences. With a mandate of four IGCs to reach a legally binding agreement, the conferences started in 2018 and happened once to twice a year until in 2020 the last conference was postponed to 2022 and extended by two additional conference sessions.¹⁵ This section describes the pathways of *formal* and *informal* practices of scientific input into the BBNJ negotiations, as well as conditioning factors thereof, in both *on site* at the conferences and during the *intersessional period* (Figure 6).



Figure 6: Scientific Input into the BBNJ Negotiation Stage

4.1 Scientific Input at the Conference: On Site

CEE gives insights into the structure and dynamics of the BBNJ negotiations on site. In the conferences, nearly two-hundred state delegations negotiate the draft text, which is provided by the President of the negotiations with support of the UN Division for Ocean Affairs and the Law of the Sea, based on previous discussions. Participants were registered as official state delegations, IGOs or NGOs. IGOs and NGOs were “observers” and granted different rights within the negotiations¹⁶. Access to the main building also differed between these groups, permitting state delegates more time to stay on the premises. During the COVID-19 pandemic,

¹⁵ IGC 5.1 and IGC 5.2

¹⁶ Differences between state delegations and others include *interventions* (state delegations speak first) and *attendance* at “informal informals” sessions (only passive participation of a restricted number of five non-state actors)

the postponed fourth session restricted access to the negotiation rooms for observers.¹⁷ The final two sessions were in person, however, included small group discussions and president's consultations that were closed to observers and not streamed online, oftentimes targeted at a certain group of state delegates only. The following section demonstrates formal and informal practices of scientific input on site.

4.1.1 Formal Practices

Scientists on delegations

A formal way how scientists were present was through registration on state or on non-state delegations. Scientist-based partnerships and initiatives informed the negotiations, such as the Global Ocean Biodiversity Initiative, and the Deep Ocean Stewardship Initiative (DOSI). These “scientific representatives”, however, blended in – whether individually or in an alliance – with other non-state actors, including environmental NGOs and business representatives. These three actor groups (science, NGO, private sector) were categorised under “NGOs” on the participant list and enjoyed the same speaking and access rights. Additionally, scientists could be on IGO delegations, such as on the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC-UNESCO), advising the BBNJ process (Scientist_1_03/2019).

Scientists were also part of national delegations and represented particular states. In this case, they attended regular on-site coordination meetings in-between the formal sessions (State_Delegate_15_04/2019), which served as a ground for interaction between actors but were generally only accessible to state delegations. Apart from scientific advisors on delegations, some policy-makers were themselves scientists and entered the negotiations with knowledge of their previous or ongoing individual scientific research (e.g. Switzerland, IGC5.2).

“Scientists are technically part of our delegation. So when we feel that we need a heavy hand over scientists on board right here in New York we'll take one with us.”
(State_Delegate_28_08/2019)

“Unless you're a very large delegation, [...] specialists on every part and on the underlying issues, it is very difficult, if not near impossible, to engage substantively across the text.” (State_Delegate_77_03/2023)

Interviewees emphasised differences among state delegations' resources to have scientists on their delegations (IGO_44_08/2019; Researcher_60_03/2021).

¹⁷ All IGC4 sessions were virtually accessible for passive attendance of registered participants, however, criticism by NGOs and some state delegations resulted in opening access to the negotiation rooms in week 2.

“Could we have more scientists on our delegations? Yes. If we had the resources. (State_Delegate_61_04/2021).

The inclusion of scientists on state and non-state delegations constitutes a formal practice of scientific input, as registration is enabled by the UN Secretariat. These examples demonstrate the variety of “hats” of scientists in the negotiations, sometimes even within the same conference. As shown, there are several ways for scientists to attend the BBNJ negotiations and bring science into the process. While non-presence of scientists on site does not exclude the possibility of the delegation having “their scientists” at home, advising them (State_Delegate_28_08/2019), interviewees pointed to the differences among states as regards scientific capacity and/or resources to include scientists on delegations.

Science Interventions

Statements made in the negotiation room were simultaneously translated into all UN languages. Such interventions by state and non-state actors constitute another formal practice of bringing science into the negotiations. References to science in statements throughout all IGCs included: references to scientific publications, explanations of scientific concepts/terms, statements on the importance of science for the agreement, and invitations to scientific side events.

The World Ocean Assessments I & II (UN, 2016, 2021) served as scientific basis for statements, to portray awareness of the state of the ocean and draw conclusions for the role of the BBNJ instrument¹⁸.

“we are acutely aware of the pressures arising from unsustainable usage of our oceans, which is supported by the findings of the first global integrated marine assessment, [quotes from the assessment][...] the impacts of climate change and other stressors arising therefrom which are resulting in ocean acidification, the warming of the ocean and the bleaching of our coral reefs.” (Barbados on behalf of CARICOM, Plenary Statement, IGC1)

Delegates referred indirectly to science by mentioning own or other authors’ publications and information (UNEP, IGC1; ICO, IGC1)¹⁹, as well as advocating for side events on scientific topics (IOC-UNESCO, IGC1; Ocean Care, IGC1; Secretariat, IGC1).

¹⁸ Reference to WOA I: Belize, IGC1; Barbados on behalf of CARICOM, IGC1; Maldives, IGC1; High Seas Alliance, IGC1; IOC-UNESCO, IGC2; International Seabed Authority, IGC1; UNEP, IGC1; USA, IGC1
Reference to WOA II: Secretariat, IGC2; IGC4

¹⁹ UNEP. (2017). Regional Seas Programmes covering Areas Beyond National Jurisdictions. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwj-1dKBnev9AhWJc_EDHUF8D88QFnoECBAQAQ&url=https%3A%2F%2Fwww.un.org%2FDepts%2Flos%2Fbiodiversityworkinggroup%2FRegional_seas_programmes_ABNJ.pdf&usg=AOvVaw2TM-mgFSpsW8RrHc9MqXEU

Cicin-Sain et al. (2018). Policy Brief on Capacity Development as a Key Aspect of a New International Agreement

“UNEP stands ready to provide any technical input.” (UNEP, Plenary Statement, IGC1)

Scientific input happened through scientists intervening themselves (Scientist_46_08/2019) to convey the relevance of their findings for the agreement. In other cases, scientists fed the science into interventions by communicating it through other actors (Scientist_14_04/2019). In small group and presidential consultations, “experts were brought into the room by delegations and [...] give some clarity on a few issues.” (State_Delegate_77_03/2023).

BBNJ actors’ perceptions differed regarding the desirability of interventions by scientists during the negotiation stage, as seen in the following responses:

“If you mean scientific input to the negotiation, there is not much because most of negotiators are lawyers or diplomats. [...] otherwise it's going to be like a scientific talk. And that will require scientists as heads of delegations and they are the worst diplomats [...].” (State_Delegate_28, 08/2019)

“we need more [scientists] to come to the negotiations, rather than having diplomats, you know, removing the brackets, the comas, etc. We need somebody that can talk about substance.” (State_Delegate_44, 08/2019)

“the people who are at the microphone are not scientists and they probably shouldn't be either” (Advisor/State_Delegate_26_08/2019)

Intervening in the plenary sessions constitutes a significant formal practice of scientific input into the negotiations, as it is overseen by the UN Secretariat. CEE and interview data shows that state and non-state actors, including scientists and non-scientists, make scientific interventions throughout all IGCs. The extent to which science is brought into the negotiations, however, depends on the scientific capacities and willingness of actors on site, which is closely linked to their financial capacity to attend the conference.

Side Events and Workshops

Apart from representing a delegation and intervening in the plenary, scientists can also formally contribute to scientific input into the negotiations by presenting at a side event, seminar or workshop (Scientist_4_03/2019; Scientist_24_08/2019) that take place during lunchtime, in the evenings and on weekends, serving interaction between state delegates, scientists, and civil society actors. Side event hosts can invite scientists to give a talk (Scientist_23_08/2019; Scientist_43_08/2019; Scientist_42_08/2019; NGO/Scientist_46_08/2019).

on Marine Biodiversity Beyond National Jurisdiction (BBNJ).

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiwjcbhnuv9AhVKQPEDHSCbA78QFnoECBQQAQ&url=https%3A%2F%2Fglobaloceanforumdotcom.files.wordpress.com%2F2018%2F08%2Fpolicy-brief-on-bbnj-capacity-development-dec-2018-email-version.pdf&usg=AOvVaw3AR_ZO-Ze6KbDbuvbVKy-N

“we kind of used the side event to show governments or whoever is interested – decision-makers – that if you regulate, [...] transboundary pollution within the agreement, that you cover a lot of threats that face the High Seas.” (NGO_24_08/2019)

“the lack of side events now [...] removes an opportunity for scientists to be able to engage with the parties of their country representatives.” (Scientist_76_03/2023)

Side events and workshops during the negotiation stage provided a space for scientists and other actors to communicate science that they perceived relevant for the negotiations. Non-state actors see side events as valuable spaces to “convey scientific concepts” (Advisor/State_Delegate_6_03/2019), “educate the delegates [...] on specific topics or elements of the text, [...] because some aren't fully up to speed with the BBNJ process” (NGO_21_08/2019) and “to make science relevant” (Scientist_24_08/2019).

Responses also reveal that these events serve to inform and are considered of “great importance to delegations” (State_Delegate_48_08/2019):

“Side events are very useful [...] I've picked up on some information that I've then fed to my delegation and then expressed from the floor.” (State_Delegate_39_08/2019)

“I look forward to [UNESCO side event] I'm sure there will be a lot of marine science there as well. That's what we need.” (State_Delegate_27_08/2019)

“Very informational[...]very interesting and very thought-provoking. And of course, not being scientists ourselves, it's good to know what's actually happening in the field.” (State_Delegate_61_04/2021)

Interviewees stated that they were approached after side events by interested BBNJ participants to receive the information presented (Scientist_23_08/2019) or were asked follow-up questions (Researcher_25_08/2019).

Despite these valuable existing initiatives, however, there are calls for a more systematic role of science in the negotiations:

“Let's have something fully dedicated to science, back to back with the plenary – even before we discuss, [...] a briefing so that when the delegates go to the plenary, they know what they're talking about.[...] the role of science must be better organised in this process.” (State_Delegate_44_08/2019)

Results also indicate that while state delegates perceive side events as relevant, attendance is limited by time and capacity constraints, due to small delegations and parallel meetings (State_Delegate_28_08/2019; State_Delegate_38_08/2019; State_Delegate_39_08/2019). Some invited scientists were new, unknowledgeable or even misinformed about the procedures and their opportunity to get involved in the negotiations (Scientist_43_08/2019;

Scientist_42_08/2019). This demonstrates the variety of scientists conducting relevant BBNJ research, who are not or only little aware about the negotiations and their opportunity to be involved. Broadly, this means that only scientists who were aware of the negotiations, motivated to engage in the political process and had the resources to attend, were presenting their findings at the negotiations at side events and workshops, to which not all delegations had access, due to resource and time constraints.

4.1.2 Informal Practices

Scientific publications, briefs and other information material

A variety of documents were distributed during the conference on site, including publications, briefs, and information material that informally inserted science into the negotiations directly, by e.g. summarising main scientific concepts, or indirectly by advertising a scientific side event. Science can make its way into the negotiations through peer-reviewed articles, books and assessments, as well as publications in “grey literature”, such as reports by NGOs, or IGOs. Moreover, it can include policy briefs (Advisor/State_Delegate_6_03/2019), and technical briefs (Scientist_3_03/2019), generally written by NGOs, but also by policy-makers, advocating for a particular cause.

“we have a paper [...], but that might be too technical [...]. So we demystify these complex theories and we write them in a more accessible way.”
(Advisor/State_Delegate_6_03/2019)

Dissemination of publications, briefs and other information on site was mostly concentrated on a few locations in the UN building, where actors made their material available, in other cases, the material was put directly on the plenary desks of state and non-state actors. Ethnographers have noted the importance of such objects on site (“artefacts”) in meaning-making and interaction among actors. Information material ranges from small flyers²⁰ to printed studies²¹. Oftentimes, this material included colourful pictures of marine species and the ocean, though, occasionally, also shocking images, such as blood-covered sharks²² to illustrate the need for the new agreement to regulate the conservation and sustainable use of marine biodiversity.

Such artefacts allow scientists and policy-makers to interact directly. Peer-reviewed scientific articles, reports, technical and/or policy briefs were directly requested by state delegates or

²⁰ “The deep is an essential part of a healthy functioning ocean that provides food and oxygen, regulates our planetary systems and sequesters carbon. [...]”, deepsea conservation coalition, Flyer.

²¹ Ross Salazar, E., Jiménez Ramón, J.A., Castro Campos, M., Blanco Bolaños, M. 2019. The Thermal Dome of Costa Rica / Atlas. MarViva Foundation, San José. 108 pp. Online available: <https://marviva.net/es/node/305>

²² Greenpeace International, 2019, “Sharks under attack”, Report online available: <https://www.greenpeace.org/international/publication/22700/sharks-under-attack/>

targeted to certain delegations or individual state representatives by scientists and NGOs. State delegates (NGO_21_08/2019; NGO_34_08/2019), as well as NGOs and IGOs contacted authors (NGO_34_08/2019).

In some cases, representatives of states were even directly involved in the *production* of publications. Some state delegates have been or are continuously undertaking scientific research and publishing in peer-reviewed scientific journals. These include individual researchers from the natural sciences and law as authors or co-authors of peer-reviewed literature, while being currently on delegations of CARICOM, the EU, Eritrea, Micronesia and Vanuatu (Broggiato, Arnaud-Haond, Chiarolla, & Greiber, 2014; Broggiato et al., 2018; Hassanali, 2018, 2021; Hassanali & Mahon, 2022; Marciniak, 2020; Mulalap et al., 2020; Popova et al., 2019; Yadav & Gjerde, 2020). Connection between their published work and the state position they are representing varies and ranges from an explicitly stated separation between the research and the policy-making (EU) (Marciniak, 2020), to policy-makers publishing policy briefs and supporting the findings in their political statements (Eritrea; Palestine) (DOSI, 2023; Popova et al., 2019).

Informal Talks

During the IGCs, informal meetings and spontaneous talks between state delegates and actors from academia, and NGOs, including bilateral meetings and conversations over coffee, lunch or dinner, are an important pillar of the agreement-making process. On site at the negotiations, there are various spaces that invite for a chat, be it the “Vienna Café” directly outside of the plenary room, or other restaurants and cafes throughout the building, seating areas on several levels, inside and outside places to get together, as well as the “Delegates’ Lounge”, only accessible to state delegates and invited guests.

“[...] like in every multilateral negotiation, there is a lot of informal personal contacts [...] talks on the margins, lunchtime, coffee time [...] We have one bilateral today with [an NGO].” (State_Delegate_19_08/2019)

Informal talks constitute a noteworthy practice of scientific input into intergovernmental negotiations. Such conversations are often informal gatherings but still constitute an integral part in bringing actors together, exchange ideas, explain political positions and offer an opportunity for the consideration of alternative arguments and scientific knowledge. It is also a way to extend networks for future collaborations but is again limited to the actors that attend the conference.

Reaching out to (pre-existing) contacts

Consultations with individuals from already established contacts constitute an additional pathway of informal scientific input into the negotiations.

“We don't have that many native scientists [...] I'm always happy to reach out to colleagues here in New York. [...] sometimes they share papers with me [...], the scientific aspects, and I try to incorporate them as much as possible. I don't formally consult them, but I have different colleagues, have a network, people can help me out sometimes.” (State_Delegate_39_08/2019)

Interviewees from state delegations referred to consulting their own networks when in need for science. Existing contacts between scientists and policy-makers, thus, facilitate scientific input. Such networks play a role for the intergovernmental conferences, and more broadly for meetings throughout the intersessional period, in which state delegations are refining their positions. Moreover, recommendations for certain scientists and meeting scientists in the intersessional period have played a role in establishing new contacts to scientists (State_Delegate_77_03/2023).

4.2 Scientific Input during the Intersessional Period

The intersessional period offers an opportunity for state representatives to clarify views, recalculate and refine their positions. This time was identified as particularly important for scientific input (State_Delegate_61_04/2021; Researcher_60_03/2021; NGO_41_08/2019), as state positions are formed prior to the conference and unlikely to change during the conference (NGO_41_08/2019; Researcher_60, 03/2021) but that state delegations “maybe have some second thoughts, or [we] need to improve a specific position or idea for the next round” (State delegate_9_04/2019). State delegates emphasised that they “are taking it very seriously to work intersessionally [between the regional group members] and be able to come here with a ready-made position basically, and to be able to negotiate during those periods with other groups” (State_Delegate_38_08/2019).

4.2.1 Formal Practices

Virtual intersessional “negotiations”

The intersessional period during the COVID-19 pandemic made online exchanges among and between state and non-state actors possible, which we consider “formal” when they were initiated by the UN Secretariat. As personal contact was reduced and in most areas of the world completely halted, the planned-to-be last negotiation session was postponed three times and extended by two further sessions. During this over two-year intersessional period, a formal

online intersessional work platform was initiated by the UN Secretariat²³, where registered participants to BBNJ could attend, post written responses to questions by the facilitators and comment on other actors' suggestions and views. State and non-state actors used this space to not only make references to scientific concepts and terms, but also to link or upload academic papers and evidence. In this way, the online space served to directly link statements to academic papers, policy briefs, assessments and video material and extended the traditional way of intervening with an oral statement.

4.2.2 Informal Practices

Online exchanges

While during the intersessional period, actors regularly communicate via email, phone, social media and video calls (NGO_47_08/2019; State Delegate/Scientist_19_08/2019), online interaction particularly increased since the extended intersessional period between IGC3 and IGC4 due to the COVID-19 pandemic (Vadrot, Langlet, Tessnow-von Wysocki, et al., 2021). Intersessional meetings under Chatham House rules were organised by a few states and the High Seas Alliance (HSA)²⁴, where actors could express their views but was not formally overseen by the UN Secretariat. These meetings were identified as important exchanges (Scientist_1_03/2019).

“we're going to do monthly meetings to cover the range of issues [...] to develop, further refine, and actually work through what we've heard in the High Seas Treaty Dialogues and during the informal intersessional interactions, [...] whether or not we need to abandon certain things or refine or reach out to someone”
(State_Delegate_61_04/2021)

While targeted invitations for some intersessional events resulted in limited participation and thus, information gaps between attendees and non-attendees (State_Delegate_77_03/2023), respondents generally supported online intersessional work, as online workshops and capacity building trainings were able to include a larger number of participants (with over 100 and 70 online participants in 2021, respectively), compared to a maximum of 80-90 and 25 participants in an in-person format (Researcher_60_03/2021_revised).

Preparing on National and Regional Levels

Prior to and after the IGC sessions, preparation on national and regional levels was taking place. State delegates referred to scientific publications in their preparation prior to the conference.

²³ See information on the Virtual intersessional work of the Intergovernmental Conference on an international legally binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ intersessional work): <https://www.un.org/bbnj/content/Intersessional-work>

²⁴ An Alliance of 42 NGOs; See information on the BBNJ Informal Intersessional Dialogues: <https://highseasdialogues.org/>

Information sources also included reports of the Subsidiary Body on Scientific, Technical and Technological Advice of the Convention on Biological Diversity (CBD), the Nagoya Protocol, and the World Intellectual Property Organisation (WIPO) to understand the issue of MGRs (State_delegate_28_08/2019) and scientific reports by national research institutes (State_Delegate_9_04/2019).

Moreover, some state representatives actively sought inputs from the scientific community – which is however dependent on the engagement of the departments and agencies (State_Delegate_39_08/2019), as well as individual state representatives. Occasionally, state representatives contacted scientists directly for scientific explanations and briefings. Apart from existing contacts, individual scientists were recommended to state delegations, and new contacts established via webinars to reach out for information or even publish jointly (State_Delegate_77_03/2023).

Briefings and de-briefings between state delegates and scientists, such as ministry consultations, or meetings of already established national scientific committees, seminars, workshops and dialogues on national and regional levels are common (State_Delegate_40_08/2019) taking place in-between sessions of the IGCs, which can contribute to scientific input (Scientist_4_03/2019). Assuming previous contact with “their own scientists”:

“scientists may be not present. But the information has been given. And they influence of course, the positions of their delegations.” (State_Delegate_33_08/2019)

State delegates mentioned they included Scientific Reports in their preparations and encouraged national experts to attend intersessional period meetings and comment on the national position from a scientific perspective (State_Delegate_9_04/2019). They also referred to “official scientific institutions” of their country or region that were considered in their preparations (9_04/2019; 28_08/2019) and in some cases scientists within the ministries (28_08/2019).

States invited experts to “regular periodic workshops” to “enlighten” them on “the relevant science and technology” (State_Delegate_9_04/2019). NGOs and governments jointly hosted workshops (NGO_21_08/2019; Researcher_60_03/2021) “to help the national delegates to prepare to get their positions together [regionally]” (NGO_47_08/2019).

These meetings on national and regional levels are instances for different stakeholder groups, including scientists, to discuss certain topics related to the new agreement. “Closed meetings [...] between scientists, scientific institutions, ministries, the Navy, private sector in different

aspects – shipping and others – fishing sector and lawyers” (State_Delegate_33_08/2019), organised by states are taking place, as well as capacity building workshops, organised by NGOs and research institutes, bringing together state representatives from different countries and their respective responsible ministries, regional fisheries management organisations, global UN institutions, such as UNEP and civil society organisations with national regional and international experts and scientists (Researcher_60_03/2021). Negotiators trainings that introduce lawyers and diplomats to the work in scientific labs are welcomed by state delegates, e.g. to discuss the treaty’s consequences (State_Delegate_33_08/2019) and described as “a real eye-opener for them” (Scientist_26_08/2019). But room for improvement remains, as a BBNJ scientist (76_03/2023) put it: “there needs to be more getting together of science and policy people, not just nationally, in terms of combining scientists and policymakers from different ministries, but also internationally.”

Using Science from other Negotiation Settings

Scientific concepts can be brought informally into the BBNJ negotiations from other fora (State_Delegate_40_08/2019). Other fora oftentimes include pre-negotiation meetings, but also previous or parallel political processes. In this way, science can enter the negotiations through the reference to existing law that refer to scientific concepts already enshrined in international law under previous conventions and protocols, or concepts that are being discussed in parallel political processes.

“the parallel process in the CBD Nagoya framework, [...] debates on in situ and ex situ [...] in silico and digital sequence information. [...] that debate sort of over-spilled into this process and also the discussions in parallel in WIPO on disclosure of origin and intellectual property rights in general also have their impacts into this process.”
(State_Delegate/Scientist_19_08/2019)

Further examples include the concepts of the ecosystem-based approach, the precautionary approach and compatibility that have been adopted under previous international agreements and were mentioned throughout the IGCs. This pathway can be used by state and non-state actors who are attending or following parallel processes and connect the contents of discussions. “Science spill-over” – which refers to science being used beyond one and traveling to another negotiation setting – thus happened with various terms in the BBNJ process, making it a significant pathway of scientific input. Such pathway could be formalised when being made formal (i.e. when the link is made explicit by the UN bodies) but is currently informal, as brought in through delegates in the negotiations.

5. Discussion: The complex Pathways of Science into BBNJ

Scientific input into the BBNJ negotiations is critical to explain technical and complex topics related to marine biodiversity, including different ecosystems, species, and the state of the ocean. Scientists from different disciplines, including natural and social sciences, contribute to knowledge of policy-makers on deep-sea research and how these activities play out in practice. In turn, there is concern about the lack of scientific understanding of decision-makers, who are new to the topics, due to continuously changing posts.

Our results highlight formal and informal pathways of scientific input into the BBNJ IGCs and intersessional period. Collected data also shows that policy-makers obtained new scientific information throughout the negotiation stage of international agreement-making until the very end of the bargaining process, some of which have adapted their statements in the plenary accordingly. This proves the existence of scientific input throughout the negotiation stage and its relevance to shape the negotiations. Yet, despite the articulated need to base policy decisions on science, scientific input to guide the BBNJ intergovernmental conferences was only **voluntary and broadly formalised** (through the opportunity to register scientists on delegations and intervene in the plenary, as well as present in side events), and **conditioned** by national financial, technical and scientific capacities. Merely a fraction of the pathways was initiated by the UN Secretariat, and rather largely dependent on national structures (e.g. the decision whether or not to deploy scientists on delegations) or individual efforts (to inform themselves/others about scientific issues).

This is concerning, as our interview data underlines **inequalities between state delegations** regarding scientific expertise on the national level and financial resources to ensure scientific advice on their delegations in New York, which created an imbalance of scientific knowledge among state delegates from the start of official negotiations. Oftentimes, scientific input into the negotiations happened through recognised national scientific institutions or personal contacts between the scientists and policy-makers: whether *on site* at the negotiations, or through established networks of the policy-makers or the responsible ministries during the intersessional period. This practice points to the importance of perceived salience, credibility and legitimacy (Cash et al., 2002) of the scientists and scientific information by policy-makers to be considered for policy-making, but also calls for formalised ways to enable a comprehensive scientific base for all delegations.

There was **no official representation of science in the negotiation room**. Participating scientists from research institutes and universities were grouped under “NGOs”,

indistinguishable from environmental activists and industry representatives on the sidelines of the negotiations, only allowed to speak after no further interventions by state delegates are requested. Further, they were themselves responsible for the registration and travel. A network of deep-sea scientists, with “shared normative commitments” (Haas, 1992, p. 19) constituted the “Deep Ocean Stewardship Initiative”, DOSI. This community works on diverse ocean-related topics and were actively involved in the negotiations, published policy briefs and received attention by policy-makers. The fact that DOSI had their own delegation and took the floor as a coordinated group of experts qualifies them as an epistemic community in Haas’ (1992, p.27;35) sense of transmitting their ideas “in tandem with a set of causal and principled beliefs and reflect a particular political vision”. However, as our data shows, they are still a self-organised, self-funded network to send representatives, and without an officially UN-recognised “science” badge. Moreover, our research portrays pathways that go beyond this transnational epistemic community of DOSI, which are only visible when considering social interactions and individual actors in the negotiations (van den Hove, 2007). Scientific input into the BBNJ negotiations was largely initiated informally, by a number of people who were either scientists presenting and advocating for their findings to be included into the negotiations; or individual state or non-state actors who actively united policy-makers and scientists in workshops and side events. This indicates that scientific expertise by scientists who were neither contributing to global assessments, nor actively involved through coordinated scientific groups or individually and were not in contact with policy-makers, risked to be left outside of the discussions.

Results also emphasise **varying efforts of scientific input among state delegations**. Not only the number of scientists to advice national delegations differed, but also options on what was considered relevant knowledge. During the intersessional period, scientific input was identified as important for state delegations to clarify and re-think their positions. While interaction between policy-makers and scientists existed and national scientific institutions were mentioned as the primary scientific advice, it however varied among states and regions.

Moreover, results point to **different types of scientific input across the negotiation stage**, depending on the level of advancement in the negotiations. Towards the end of the negotiation stage, with the start of IGC4, we observed less formal scientific input on-site, as the Secretariat did not allocate room for side events or observer interventions. While restrictions due to the COVID-19 pandemic might have played a role, assumingly, at that stage, delegates were expected to have a comprehensive scientific understanding of the issues, even though

diplomatic staff turnover continued to happen until the last session. Negotiation time was prioritised over observer interventions, resulting in pathways of scientific input shifting almost exclusively to informal. While the beginning of the negotiation stage was marked by formal pathways of scientific input (through side events, workshops and interventions by non-state actors), towards the end, focus was rather set on political bargaining. Yet, as interview material shows, scientific input was until the very end of negotiations still required by delegations and happened solely informally, making informed negotiations more difficult for small delegations in parallel sessions and in case of diplomats turn over.

We can also differentiate between **in-person and online formats** of scientific input. New online tools and webinars to inform policy-makers can further contribute to science-policy interfaces within intergovernmental negotiations and offer new opportunities for scientific input in the intersessional period. Intersessional work, set up by the UN Secretariat and informal dialogues, organised by three states and the HSA²⁵, maintained momentum for the completion of the agreement, while the fourth conference was postponed due to the pandemic and policy-makers could not formally move the process forward without further guidance from the UN Secretariat. Online exchanges offered a useful space for scientists to submit and for policy-makers to access scientific information. However, the intersessional period did not officially advance the draft text and *in-person* discussions were required for formal negotiations (Vadrot, Langlet, Tessnow-von Wysocki, et al., 2021) and while it technically enabled broader participation, it risked to create small hubs of scientific knowledge, only known among a fraction of attending delegates.

Lastly, stakeholders in BBNJ took on **different roles**: There are examples of professional diplomats who are scientists; there are scientists representing NGOs, individual scientists that are attending the negotiations as presenters at side events to portray their work and coordinated scientists in alliances. Secondly, we observed that policy-makers and scientists appeared as authors of **scientific publications**, relevant to the BBNJ negotiations, which is a form of co-production of science and policy. Thirdly, scientific information for state delegates was not strictly only coming from peer-reviewed publications or global assessments, but also influenced by the **national/regional perception of credibility, legitimacy and salience** (Cash et al., 2002) and **personal contacts** between individual policy-makers and scientists. Scholarship of international relations, which has focused on institutionalised science-policy interfaces, thus,

²⁵ The High Seas Dialogues are organised by Monaco, Belgium, Costa Rica and the High Seas Alliance, an Alliance of 41 NGOs

would benefit from looking at science-policy interfaces as social processes (van den Hove, 2007) and the agency of individual actors in the science-policy spheres when studying scientific input into intergovernmental negotiations in the negotiation stage.

6. Conclusion and Outlook

Undisputedly, scientific input is required for policy decisions on the future of marine biodiversity. Yet, *how, over whom and under what conditions* scientific input was happening in the BBNJ negotiations has not been studied by IR scholars. We categorised the BBNJ negotiations into three different stages (Chasek, 2001; Young, 1998), namely the pre-negotiation (Ad Hoc Open-Ended Working Groups and Preparatory Committee Meetings), the negotiation (Intergovernmental Conferences) and the implementation (after adoption). Based on CEE fieldnotes and interview data, we identified pathways for scientific input into the BBNJ *negotiation stage*. These included pathways initiated and overseen by the UN Secretariat, namely i) scientists on delegations; ii) science interventions; iii) side events and workshops; and informal ones: iv) publications; and v) informal talks. In the intersessional period, virtual “negotiations” constituted an UN-initiated, formal pathway and informal practices were vi) science spill-over from other negotiations, vii) pre-existing networks; viii) preparation on national and regional levels, and ix) online exchanges. As shown, different actors (scientists, NGOs, IGOs, state representatives) used these pathways to communicate, disseminate or access scientific information throughout the negotiation stage and even contribute to generation of new knowledge.

Our results show that scientific input throughout the BBNJ negotiation stage existed but UN-initiated science-policy structures were limited. Scientific input into the BBNJ negotiations was only voluntary and broadly formalised, and conditioned by a) national scientific capacity; b) financial resources; c) established contacts and d) active involvement of individual actors. This left scientific input during the *negotiation stage* to the agency of individual actors, requiring willing and financially capable state delegations to include scientists on their delegations; and scientists to join the conference sessions on delegations or at side events; national and regional scientific and financial capacity and established contacts; and ultimately, self-organised individual advocates for science integration into policy-making, including scientific networks, such as DOSI. This points to the potential for the UN Secretariat to encourage further formal practices of scientific input throughout the negotiation stage in future intergovernmental negotiations for new legally binding agreements.

The majority of pathways included non-UN initiated, namely *informal* practices, i.e. interaction between actors outside of formal UN structures. Existing concepts within IR literature fall short of explaining these complex science-policy interfaces, including the changing and multiple roles of BBNJ actors. It is important to discuss these findings in light of the negotiations for the protection of a global common which is to be governed by all and protected for future generations and nature in itself. Knowledge generation requires embracing the diversity of actors and knowledge forms to inform decision-making *during the negotiation stage*. When it comes to designing future regulations, it is crucial that all actors have access to a global knowledge base. Currently, scientific input is conditioned by scientific and financial resources, established contacts, and active involvement of actors.

We therefore suggest a more UN-initiated scientific input into the *negotiation stage*. This could be achieved through a formalised, independent and inclusive scientific expert group/panel to produce assessments on issues discussed, that is formally represented on site, available for consultancy, to answer questions and undertake research in areas of interest to the international community - also during the intersessional period. Such group/panel could provide evidence for specific topics, attend the discussions to clarify practical implementation of the agreement and answer questions of delegates. Moreover, the group/panel would be present as a recognised scientific observer, formally detached from a certain country position. In this way, imbalances between state delegations as regards their scientific capacity and resources could be accommodated, a formalised representation of knowledge for the international community to inform decisions on the global commons further approached, and uptake of science and other knowledge forms facilitated.

In future intergovernmental negotiations, established entities could provide such scientific advice. Access to a scientific expert group that follows the political discussions and offers guidance throughout the negotiations stage would facilitate effective treaty design for meeting the objectives. Online and hybrid forms can be considered for continuous and inclusive participation of scientists across diverse disciplines, regions and knowledge systems. Additionally, it is important to include scientific assessments on the topic and incorporate new ideas for science-policy interfaces, such as the proposed Panel for Ocean Sustainability (Gaill et al., 2022).

To design a global agreement on areas that are beyond the jurisdiction of any state, a comprehensive and inclusive knowledge base is crucial. As shown, a continuous, global scientific support during the negotiation stage of BBNJ was lacking and attempted through

formal and informal practices along the way. For implementation, however, scientific advice, tailored to the topics of the treaty is envisaged in form of a scientific and technical body. Several parts of the new treaty empower the new science body to assess, evaluate and give recommendations. However, details of the role of such a body, such as its functions and operation, including the selection process remain to be negotiated in the upcoming Conference of the Parties²⁶, which calls for further research on its structure, characteristics and powers in light of an informed, inclusive and just governance of the global commons.

²⁶ United Nations Division for Ocean Affairs and the Law of the Sea (UNDOALOS), 2022, Art.49 (2), (4)

Conflict of Interest

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Compliance with Ethical Standards

The research project passed an ethics screening and review by the Ethics Committee of the University of Vienna (Votum 00380, 20.10.2018) and the Ethics Unit of the European Research Council. The research was carried out in line with the highest ethical standards and the applicable EU, international and national law on ethical principles and data protection law, as required by the European Research Council to ensure informed consent of all participants in the study and appropriate data collection and storage. Participants of our research were not vulnerable persons.

(Extract from the ERC ethics review response, October 2018: “Research participants are function owners (state representatives, experts, public servants, scientists, researchers) and the project was exclusively interested in collecting non-sensitive data, respecting the privacy of each participant. Participants were not exposed to any risk that exceeds the risk that participants expose themselves by participating in international negotiations and/or working in their work environment, where they will be interviewed/observed. The research project did not collect or process sensitive data and respects the privacy of each participant by following the principle of confidentiality and by implementing related technical, organisational and security measures.”)

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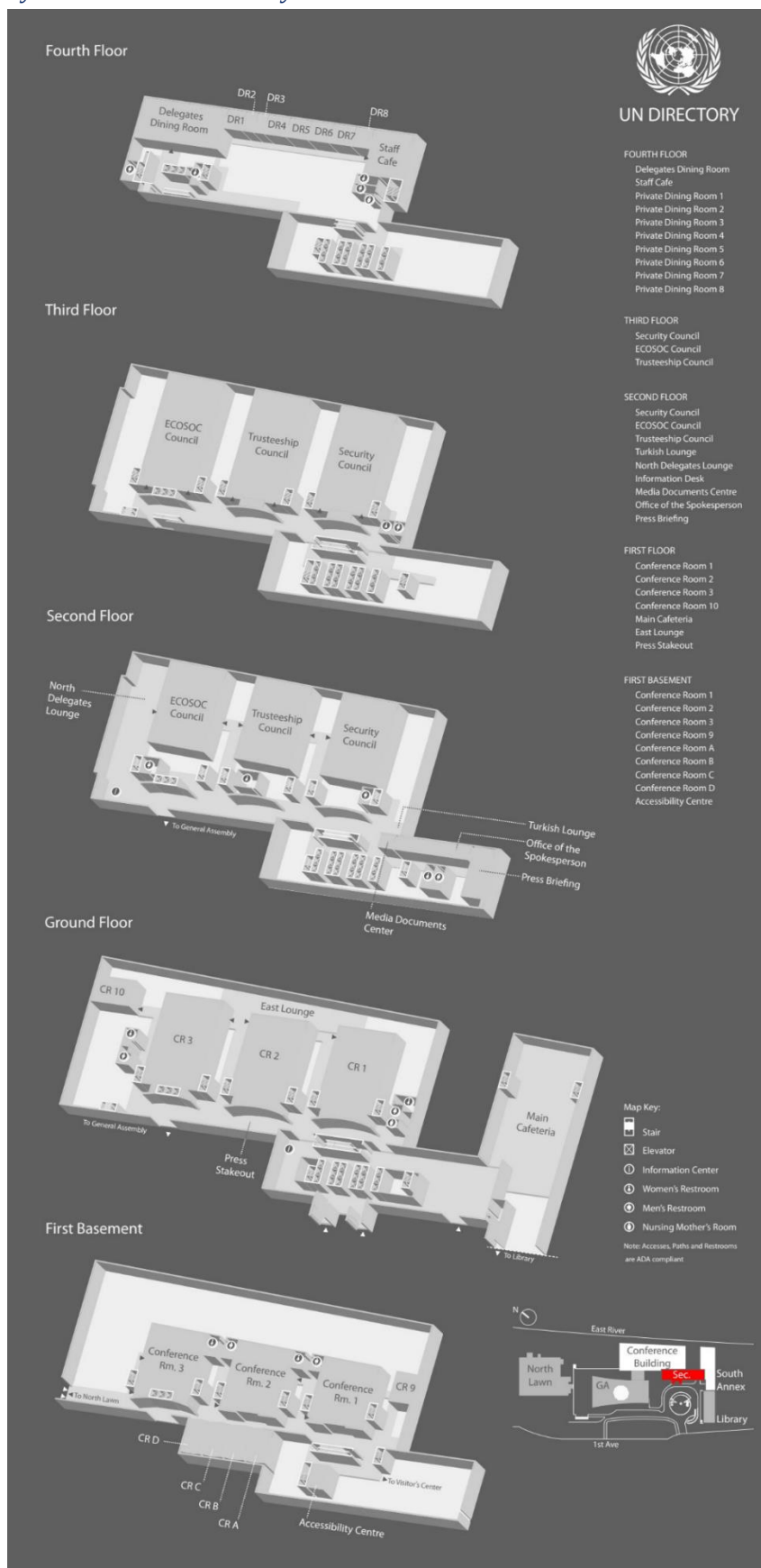
8.2.2 Supplementary Material

i) Supplementary Material: Publications at IGCs

Selection of academic articles and briefs distributed during IGCs

<i>Time of Distribution</i>	<i>Type of Publication</i>	<i>Name of publication</i>
IGC 5.2	Policy Brief	Climate and biodiversity beyond national jurisdiction. DOSI 2023
IGC 5.2	Policy Brief	Briefing Note on the common heritage of humankind and areas beyond national jurisdiction. Becker Lorca & Derrig 2023
IGC5	Academic Article	The diverse benefits of biodiversity conservation in global ocean areas beyond national jurisdiction Santos et al. 2022
IGC3	Academic Article	Fish slipping through the governance net, Crespo et al. 2019
	Policy Brief	30x30 A Blueprint for ocean protection, Greenpeace, 2019.
	Policy Brief	So far, yet so close: Ecological connectivity between ABNJ and territorial waters, Popova et al. 2019
IGC2	Policy Brief	POLICY BRIEF: Adjacency: How legal precedent, ecological connectivity, and Traditional Knowledge inform our understanding of proximity. Dunn et al. 2019
	Policy Brief	Mico. What is migratory connectivity?

ii) Supplementary Material: UN Directory



Source: UN Statistics Division. https://ggim.un.org/meetings/GGIM-committee/9th-Session/documents/GA_Building_Layout.pdf

8.3 Science Use

The third paper studied the use of science in the BBNJ negotiations at the example of the scientific concept of ecological connectivity. With the use of collaborative event ethnography, the concept of ecological connectivity could be traced throughout the negotiations, identifying the actors and their rationales for seeking to include this scientific concept into the agreement text.

Results show that state and non-state actors used the concept strategically from the perspective of their geographic, political, cultural and socio-economic contexts, recognising the limitations of the existing legal ocean governance framework in light of scientific realities. This specific example empirically shows that science was co-produced by scientists and practitioners in the BBNJ negotiation stage to address societal challenges (Wyborn et al., 2019), and, thus, contributes to the academic literature on science-policy interfaces being mutually enforcing dynamics in ongoing marine biodiversity negotiations towards a new legally binding agreement. Findings highlight the intertwining of science with value judgements (Turnhout & Gieryn, 2019) and the transformative power of the concept of ecological connectivity for current ocean governance.

8.3.1 Paper 3: Governing a Divided Ocean

The Transformative Power of Ecological Connectivity in the BBNJ Negotiations

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Governing a Divided Ocean: The Transformative Power of Ecological Connectivity in the BBNJ Negotiations

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Abstract

Science plays an important role in the emergence, development, and implementation of new environmental regimes. However, there are opposing views regarding the type of knowledge that is considered policy-relevant to address global environmental problems. In intergovernmental negotiations, these tensions are visible in debates about the inclusion of scientific concepts in a negotiated text. This article analyses the case of “ecological connectivity” in the negotiations for an international legally-binding instrument (ILBI) for the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction (BBNJ). As a key scientific concept portraying the ocean as one, the term ecological connectivity challenges the status quo and has far-reaching implications for future ocean governance. Our study draws on ethnographic data collected during the BBNJ negotiations and analyses the actors and their different rationales for including the ecological connectivity concept in the treaty text. Our results demonstrate two things. First, state and non-state actors use the ecological connectivity concept to support their interests in the new ILBI, based on different types of rationales: ecologic, socio-economic, juridic, and epistemic. Second, our analysis demonstrates that several actors recognise the limitations of the existing legal order underpinning ocean governance in areas beyond national jurisdiction and are keen to embrace a new legal framework regarding the idea of an interconnected ocean. We conclude that while the ecological connectivity concept runs the risk of losing its meaning in an array of competing political interests, it does have the potential to achieve transformative change in global ocean governance and fundamentally alter the way humans use and protect BBNJ.

1. Introduction

Science plays an important role in the emergence, development, and implementation of new environmental regimes (Andresen, 2014; Haas, 2016; Lidskog & Sundqvist, 2015; Litfin, 1994; Lubchenco & Grorud-Colvert, 2015; Miller & Edwards, 2001). However, the use of science can be contested and result in opposing views of policy-relevant knowledge to address global environmental problems (Peterson, 2019). In the context of text-based intergovernmental negotiations, these tensions are visible in debates about the inclusion or exclusion of scientific concepts (Hughes & Vadrot, 2019; Vadrot, 2014). These debates are particularly interesting research subjects because they reveal how actors maintain or contest global order by embracing scientific findings that imply transformative change.

This article takes a close look at the use of science in the negotiations for an international legally-binding instrument (ILBI) for the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction (BBNJ). Under the 1982 United Nations Convention on the Law of the Sea (UNCLOS), areas beyond national jurisdiction are currently governed by a fragmented framework of global, regional, subregional, and sectoral bodies (Yadav & Gjerd, 2021; Tessnow-von Wysocki & Vadrot, 2020). Recognising the need for holistic marine biodiversity governance, ad hoc Open-Ended Informal Working Group (OEWG) and Preparatory Committee (PrepCom) meetings resulted in the recommendation that there be a new ILBI. In 2017, the United Nations General Assembly (UNGA) decided to convene an intergovernmental conference to formally negotiate and adopt the new ILBI in four conference sessions between 2018 and 2019. Due to the Covid-19 pandemic, what had been planned as the final conference was postponed (Vadrot et al., 2021) to March 2022, and another conference is being planned for August 2022.

This article analyses the use of the scientific concept of “ecological connectivity” in these negotiations. As a key scientific concept portraying the ocean as one, ecological connectivity challenges the status quo and has far-reaching implications for future ocean governance. We show how the ecological connectivity concept has made its way into the BBNJ negotiations through various actors. The scientific concept proves an interconnection of ocean processes that BBNJ actors consider relevant in different dimensions. The article analyses the actors who introduced the concept into the negotiations and their rationales for doing so. To what extent it will guide future ocean governance is currently under negotiation.

To date, academic literature has only sparsely studied the use of scientific concepts in intergovernmental negotiations (Gray et al., 2014; Kobayashi et al., 2020), focussing on contestations of specific terminology in the context of intergovernmental assessment bodies (Borie & Hulme, 2015; Hughes & Vadrot, 2019). Scholars have discussed conditions under which science influences policy-making (Lidskog & Sundqvist, 2015; Rietig, 2014) and the role of science in institutionalised bodies and assessments (Chasek, 2019; Haas, 2017; Kohler, 2019) rather than the use of scientific concepts in the bargaining process over legal texts in the early treaty-making stage. We aim to close this gap by tracing the ecological connectivity concept in the BBNJ negotiations and identifying the actors who introduced it into the diplomatic sphere and their rationales, drawing on ethnographic data collected at three intergovernmental conferences and different fora of intersessional work. The ecological connectivity concept in the BBNJ negotiations is an interesting case with far-reaching implications for ocean governance, as it inherently questions existing legal structures and—if embraced in the new legal text—has the potential to change the status quo of marine biodiversity governance fundamentally.

This article will firstly give a brief overview of existing research on the role of science within intergovernmental negotiations. Secondly, it introduces the ecological connectivity concept and its relevance to the BBNJ negotiations. Thirdly, it explains the methodology used for data collection and analysis, namely collaborative event ethnography. Fourthly, it identifies the actors that support the inclusion of the ecological connectivity concept in the ILBI and their different rationales for doing so. Lastly, the article discusses the main findings and points to opportunities for how the ecological connectivity concept could be operationalised in the treaty text to shape future BBNJ governance. The research adds to the academic literature on science–policy interfaces by analysing practices of individual BBNJ actors in linking science to policy and attracting interest in the ILBI. It shows that the concept continues to play a role in shaping the BBNJ negotiations and that actors use it to challenge the status quo of current global ocean governance with ecologic, socio-economic, juridic, and epistemic rationales.

2. The Use of Science in Intergovernmental Negotiations

Many scholars would agree that science plays a prevalent role in global environmental policy-making (Chasek, 2019; Haas, 2016; Johnston, 2019; O'Neill, 2017). When actors regard scientific information as “salient, credible, and legitimate,” chances are high that it will be considered policy-relevant to support global sustainability agendas (Cash et al., 2003, p.2). Thus, scientific knowledge alone is not sufficient to influence global environmental governance but is rather conditioned by the perceived relevance for policy-making, which may cause

controversies between different actors and knowledge forms (Peterson, 2019; Vadrot, 2014). Scholars point to the challenge that “contestations over knowledge are entwined with contestations over the potential political and societal implications of that knowledge...these controversies are not just about facts, but also simultaneously about values and interests” (Turnhout & Gieryn, 2019, p. 70). Therefore, even in cases where concepts are broadly agreed upon, there still might not be a political consensus in intergovernmental negotiations which has been captured by the notion of “boundary objects” (Gray et al., 2014). As Turnhout et al. (2016, p. 67) put it, “the construction of policy-relevant knowledge is a political act that involves choices about the preferred audiences of knowledge and the types of policy actions that may follow from this knowledge.”

Negotiation settings are entry points to empirically study contestations among actors and their rationales for including scientific concepts in treaty texts (Vadrot, 2020). There are several ways in which actors use science in intergovernmental negotiations. NGOs, for instance, use science to alter governments’ interests and, in this way, try to shift their positions in intergovernmental negotiations (Corell et al., 2007, p. 23). Through specialised knowledge and information, NGOs can increase their perceived legitimacy and influence in the negotiations (Corell et al., 2007, p. 23). Science can, in this way, facilitate cooperation and push for a certain policy outcome, align state positions, and convince state actors that coming to the negotiation table is in their interest. To date, the use of scientific concepts within intergovernmental negotiations has only been touched upon by a handful of scholars, analysing how contestation has shaped final negotiated texts (Borie & Hulme, 2015; Gray et al., 2014; Hughes & Vadrot, 2019). This article goes a step further by studying the actors and their different rationales for including scientific concepts in a treaty text, arguing that scientific concepts, once they have entered the political sphere, can either lose their meaning in an array of political interests or alter the status quo and achieve transformative change.

3. Methods and Data

This article is based on collaborative event ethnography data, collected at three intergovernmental conferences of the BBNJ negotiations and during intersessional work. Collaborative event ethnography is increasingly used to make sense of international policy-making by studying the process of negotiations (Campbell et al., 2014; Hughes et al., 2021; Vadrot, 2020), opening up the “black box of how decisions are made” (Duffy, 2014). Event ethnography focuses on diving into the setting of an event, which includes engaging with stakeholders, understanding the procedures and structures, analysing participants’ behaviour,

the alliances they form, and their negotiation strategies. By following the negotiations closely, analyses are not limited to evaluating the final treaty text but can rather study modifications in government positions over time and detect negotiation trends. In the negotiations, contestations about including certain terms in the legal text can point to differences in actors' positions and political influence.

Collaborative event ethnography involves attending the formal conference sessions with a research team, conducting participant observation on-site during the plenary sessions and additional meetings (e.g., side events), and interviews with relevant stakeholders. The research team attended intergovernmental conference no. 2 and intergovernmental conference no. 3 in person for ethnographic fieldwork. Digital ethnographic data from intergovernmental conference no. 1 and the intersessional period after intergovernmental conference no. 3 complemented the database. A systematic matrix served for taking field notes (see methodology in Vadrot et al., 2022), covering the categories actor, observation (verbal and non-verbal), comment (content of observation), date, and time (moment when observation occurs).

The database of field notes covers all statements by state and non-state actors throughout intergovernmental conferences no. 1–3 in plenary discussions and selected side events. Through filtering for “connectivity,” 46 statements served as a database for analysis.

The statements were qualitatively analysed and coded for *actor*, *time of mentioning*, *type of connectivity*, and *rationale*. For an in-depth qualitative analysis of the rationales of different actors, seven interviews with BBNJ participants were conducted on-site, in person, and online after the negotiations. We interviewed BBNJ participants that (a) mentioned the ecological connectivity concept in the plenary or working group sessions, (b) published in ecological connectivity academic literature and policy and technical briefs, and (c) engaged in ecological connectivity side events. Moreover, key issues in each package element of the agreement were identified, where ecological connectivity was implied without being mentioned, based on a literature review on ecological connectivity in BBNJ (Tessnow-von Wysocki et al., 2021). Document analysis of legal draft texts served to pinpoint the emergence and disappearance of the use of the concept.

4. Ecological Connectivity as a Scientific Concept in the BBNJ Context

Ecological connectivity describes “a complex natural phenomenon linking various components of marine ecosystems in time and space” (Popova et al., 2019a, p. 92). The World Ocean Assessments recognise the concept and describe the ocean as “one single interconnected ocean

system” (United Nations, 2015). As this section shows, the relevance of the ecological connectivity concept for the BBNJ agreement is mentioned in academic literature and policy and technical briefs, categorising different types of ecological connectivity and discussing implications for the ILBI (see Table 1 in the Supplementary File).

Scientists explain how the ocean is connected both actively through the migration of species (Dunn et al., 2019; Mossop & Schofield, 2021) and passively through ocean circulation (Popova et al., 2019a). Additionally, the ocean is horizontally and vertically connected, meaning that species migration and ocean circulation occur over different geographical areas, as well as through different ocean depths (O’Leary & Roberts, 2018). Genetic connectivity links marine species across the ocean genetically (United Nations Environment Programme World Conservation Monitoring Centre [UNEP-WCMC], 2018). Increasingly, there are publications on cultural connectivity, which consider the cultural and ceremonial importance of highly migratory species to coastal and island nations (Popova et al., 2019a) and the relevance of traditional knowledge of Indigenous Peoples and local communities (Endalew Lijalem et al., 2021; Harden-Davies et al., 2020; Mulalap et al., 2020; Vierros et al., 2020).

Authors warn that not considering connectivity in areas beyond national jurisdiction management would lead to “legal and practical issues in the future” (Mossop & Schofield, 2021, p. 286), including coastal zones being exposed to challenges arising from pollution, overfishing, mining, or geoengineering experiments in areas beyond national jurisdiction (Popova et al., 2019a), and discuss the extended rights of coastal states for regional ocean governance in these areas (Molenaar, 2021). Concerns about anthropogenic impacts in the context of ocean connectivity point to invasive species, plastic pollution, and climate change (UNEP-WCMC, 2018). Recent findings concerning connections between the deep seabed and surface waters emphasise the importance of the twilight zone’s unique function in the marine ecosystem, including its role in carbon sequestration and the food web (Woods Hole Oceanographic Institution, 2022).

Overall, ecological connectivity literature calls for more coherent ocean governance, pointing to shortcomings in the existing sectoral and regional approaches. As we will show in the following, the ecological connectivity concept travelled from science to the BBNJ negotiations, where it is used by state and non-state actors with different rationales.

5. Tracing the Emergence and Use of Ecological Connectivity in the BBNJ Negotiations

The BBNJ process started in 2006 with the establishment of the ad hoc Open-Ended Informal Working Group to study issues relating to the conservation and sustainable use of BBNJ. In 2011, at its fourth meeting, the Package Deal agreed on the four pillars of the new ILBI: marine genetic resources (MGRs); area-based management tools (ABMTs), including marine protected areas (MPAs); environmental impact assessments (EIAs); and capacity building and the transfer of marine technology (CB&TT). The general idea of ocean connectivity was present in final documents of the pre-negotiations, namely of the OEWGs in 2010 and 2015 (UNGA, 2010, 2015), and PrepCom no. 3 in 2017 (UNGA, 2017). When the intergovernmental conferences started in 2018, the ecological connectivity concept was missing from the guidance document President's Aid to Discussions (UNGA, 2018). However, it was later re-introduced in the three UNGA documents that followed (UNGA, 2019a, 2019b, 2020; see also Table 2 in the Supplementary File). The President's Aid to Negotiations incorporated connectivity in relation to ABMTs, including MPAs (see "III. 4.3.1 Identification of areas (2) Option I (xiv)" in UNGA, 2019a) and EIAs (see "III. 1. (4) [General principles and approaches raised in relation to environmental impact assessments] (q)" in UNGA, 2019a). In the draft negotiating texts of intergovernmental conferences no. 3 and 4 (UNGA, 2019b, 2020), ecological connectivity was only integrated, respectively, as criteria for identifying areas requiring protection and in Annex I on ABMTs. There remain, however, passages that reflect the meaning of the concept without specifically naming it, such as paragraphs on networks of MPAs and impacts surpassing jurisdictions for EIAs. This section identifies the actors using the concept in the intergovernmental conferences (Table 12) and analyses their rationales (Table 13).

5.1. Actors Introducing the Ecological Connectivity Concept into the BBNJ Negotiation Process

Throughout the intergovernmental conferences, actors from different sectors participated in the negotiations, including state and non-state actors (observers) from IGOs, NGOs, as well as representatives from academia and the private sector. Participants included 131 state and 67 non-state actors in intergovernmental conference no. 1, 128 state and 66 non-state actors in intergovernmental conference no. 2, and 137 state and 58 non-state actors in intergovernmental conference no. 3.

BBNJ actors used several strategies to introduce ecological connectivity into the discussions, including the publication and distribution of academic articles and briefs, as well as side events

on-site and capacity building workshops. Scientists, representing non-state actors at the negotiations provided scientific expertise (Scientist_150321_3):

A lot of negotiators see...four different package elements...we need to establish these connections between them to make ocean conservation work....We've discussed the ecological connectivity concept in terms of making sure that everyone understands how the ocean, the atmosphere, the planet is connected...you can't keep looking at these things as different elements.

We have close contact with the countries, and we help them understand the negotiations better through capacity building training, through different reports and publications...through participation in their national dialogues.

Authors of publications on the concept included representatives of UN institutions (UNEP-WCMC and the Food and Agriculture Organisation, financed by the Global Environmental Facility), NGOs, other non-state actors, including the International Institute for Environment and Development (IIED), the International Union for Conservation of Nature (IUCN), the Institute for Advanced Sustainability Studies, the Global Ocean Biodiversity Initiative, the Deep Ocean Stewardship Initiative (DOSI), a number of universities, research centres and laboratories, as well the representative of Eritrea. As interview data reveals, on the initiative of Eritrea, policy-makers and scientists also jointly produced policy-relevant information for the BBNJ negotiations, which underscores the importance of policymakers' agency:

I was contacted by one of the negotiators...and he asked me: "Would it be possible to convene an expert group to review if there is evidence for connectivity between the high seas in the coastal zones?" (Scientist_250221_2)

Another strategy by scientists to bring the ecological connectivity topic to the negotiations was to present research at side events. Three ecological connectivity side events took place: one in PrepCom no. 3, hosted by the Nippon Foundation, and two at intergovernmental conference no. 2, hosted by UNEP-WCMC, the Permanent Commission for the South Pacific (CPPS), and the Global Environmental Facility (see Table 3 in the Supplementary File). Discussions at side events dealt with different aspects of connectivity, including migratory connectivity (CPPS, intergovernmental conference no. 2 side event; Duke University, intergovernmental conference no. 2 side event), vertical connectivity between the high seas and coastal waters (University of British Columbia (UBC), intergovernmental conference no. 2 side event), as well as its implications (such as the need for interconnected MPA networks and integrated ocean

management (UNEP-WCMC, intergovernmental conference no. 2 side event). The following are statements made by two scientists who took part in these side events:

For us, prime relevance [of the side event] was exactly “let’s go country by country and see how they are linked [to areas beyond national jurisdiction].” Just to give an example that it does matter for specific countries, it’s not an abstract concept. (Scientist_250221_2)

We had a side event on adjacency...at PrepCom [no. 3]. The issue had sort of just been raised at PrepCom [no. 2] and we were looking at connectivity and at ways in the discussions of how to make connectivity relevant to the discussions, and we picked up on adjacency. (Scientist_190403_14)

Capacity building workshops by non-state actors served as a strategy to bring the topic closer to state delegates prior to and in-between conference sessions:

We were working with the Regional Seas Bodies...to help them understand how they could engage, what their issues might be, what management measures they could use....Those countries were saying to us: “We can’t even manage our own waters. Why should we be interested in areas beyond national jurisdiction?” And the answer we gave them was because they are connected. (Scientist_210222_1)

[We did] some work on physical connectivity...ecological connectivity, particularly around fish stocks...because that’s of economic interest and how they flowed across the border of the EEZ [exclusive economic zone] into areas beyond national jurisdiction. And...also looked at conservation value. (Scientist_210222_1)

Interview material shows that information from side events and capacity building workshops familiarised policy-makers with the ecological connectivity concept and its relevance in the BBNJ context:

It felt a little bit odd that it was our job to convince countries of the value of participating in the BBNJ process....So we had these reports...look[ing] at different types of connectivity between national waters and areas beyond national jurisdiction waters. And that seems to do the trick....Ultimately, the countries did engage in our projects, and they did engage in the debates. (Scientist_210222_1)

One of the items I picked up [from side events] is the idea of...passive connectivity....And I thought that was a very useful, interesting idea. And it’s definitely

something that we've developed...traditional knowledge about, that I hadn't considered before. So that was useful. And I mentioned it to my mission, and it was mentioned repeatedly on the floor....Those elements we've incorporated into some of our talking points. (State delegate_190828_39)

As data shows, scientists from state and non-state actors strategically used capacity-building workshops and side events to communicate their findings and link them to the political BBNJ discussions. The success can be seen in delegates' increased interest in participating in the treaty-making process and the use of new information in interventions. State and non-state actors collaborated on ecological connectivity publications and policy briefs (Mulalap et al., 2020; Popova et al., 2019a, 2019b), NGOs and IGOs hosted side events, and non-state actors organised trainings to build capacity.

Nineteen states, twelve NGOs, and two IGOs referenced connectivity throughout the three intergovernmental conferences in plenary statements, side events, textual proposals after the intergovernmental conference no. 3, and the UNDOALOS intersessional work. The majority of actors using the concept in the BBNJ negotiations were developing countries, particularly small island developing states and developing coastal states, as well as scientific institutions and environmental NGOs. After intergovernmental conference no. 3, actors could submit textual proposals in which Indonesia emphasised the importance of the ecological connectivity concept for BBNJ in light of the “enormous impact of ecological connectivity to archipelagic states” (United Nations, 2020). Regarding protected area networks, South Africa suggested including the principle of connectivity, and IUCN referred to ecologic, oceanographic, and genetic connectivities (United Nations, 2020). DOSI criticised the fact that the ecological connectivity concept had not been embraced: “The draft text does not currently acknowledge...the interconnections between BBNJ and coastal and atmospheric processes” (United Nations, 2020). With the postponement of intergovernmental conference no. 4, the United Nations Division for Ocean Affairs and the Law of the Sea (UNDOALOS) created an online intersessional work platform. Publications (see High Seas Alliance, 2021), virtual capacity building workshops, and webinars during the intersessional period also contributed to the connectivity debate.

Actor	IGC1	IGC2	Side Event IGC2	Side Event IGC3	IGC3	Textual proposals after IGC3	UNDOALOS intersessional work
State/ Regional group	Eritrea	Ecuador	Micronesia	Belize (AOSIS)		Indonesia	Fiji
	Cameroon	Eritrea		Ecuador		South Africa	
	Mexico	Jamaica		Eritrea			
	Nauru (PSIDS)	Maldives		Micronesia			
	Indonesia	Micronesia		Nauru (PSIDS)			
		Monaco		New Zealand			
		Palau		Palestine			
		Papua New-Guinea		Philippines			
				Singapore			
IGO	Convention on Migratory Species		CPPS				
NGO	IUCN	IUCN	Duke		Global Ocean Forum	DOSI	DOSI
		KIOST	University			IUCN	High Seas Alliance
		OceanCare	IIED				IUCN
			IUCN				SERR
			UBC				WECF
							WWF

Note: IGC stands for “intergovernmental conference”; UNDOALOS stands for United Nations Division for Ocean Affairs and the Law of the Sea; PSIDS and AOSIS stand for the Pacific Small Island Developing States and the Alliance of Small Island States respectively; KIOST stands for Korea Institute of Ocean Science and Technology; SERR stands for the NGO Servicios Ecumenicos Para Reconciliacion Y Reconstruccion Y SIGLO XXIII and WECF stands for the NGO Women Engage for a Common Future.

Table 12: Support for ecological connectivity concept by BBNJ actors

5.2 Rationales for Contesting the Status Quo With the Ecological Connectivity Concept

While the previous section identified the actors who introduced ecological connectivity into the negotiations, this section analyses their rationales. Analyses of plenary statements and interview material show that rationales to include the concept differ between ecologic, socioeconomic, juridic, and epistemic.

5.2.1. Ecologic: Imperative of Protecting the Marine Environment

Several state actors, IGOs, and NGOs connected the ecological connectivity concept to marine conservation and ABMTs/MPAs and EIAs.

Palau (intergovernmental conference no. 2) agreed there was “much value” in including ecological connectivity for the establishment of ABMTs. On the basis of migratory connectivity, the Convention on Migratory Species (intergovernmental conference no. 1) argued for the need for ecologically coherent networks by mentioning that species “connect ecosystems, countries and cultures,” recognising that “no one country or intergovernmental organisation by itself can ensure alone the conservation and sustainable use of migratory

species.” IUCN (intergovernmental conference no. 1) added that a representative and integrated network of MPAs would support connectivity, climate change resilience, and ecosystem conservation. OceanCare (intergovernmental conference no. 2) based their intervention on the concept of horizontal and migratory connectivity, calling for more flexible and highly adaptable “dynamic” ABMTs and “designation according to migratory routes rather than geographical borders,” as “areas beyond national jurisdiction cannot fit under the same geographical ideas of borders as terrestrial tools.” At intergovernmental conference no. 3, the Philippines, Singapore, and Eritrea supported the inclusion of ecological connectivity for the identification of areas (UNGA, 2020, Art. 16). There were suggestions to extend the ecological connectivity concept to cultural connectivity, put forward by New Zealand (intergovernmental conference no. 3), and to interconnectivity between climate change and health, mentioned by Nauru (intergovernmental conference no. 3).

Rationale		Actor
Ecologic	Representative/integrated/ecologically coherent networks of MPAs	IUCN
	Pollution crosses jurisdictions; dynamic conservation tools	Convention on Migratory Species
	Establishment of ABMTs	OceanCare
		Palau
		High Seas Alliance
	Mandatory EIAs	Eritrea
	EIAs and strategic environmental assessments	Belize (AOSIS)
Socio-economic	Protection of Galapagos	Ecuador
	Impact on/vulnerability of coastal states	Eritrea
		Ecuador
		Maldives
Juridic	Common heritage of humankind	Eritrea
	Food security	Ecuador
	Key role of coastal states in areas beyond national jurisdiction governance	Micronesia
Epistemic	Traditional navigation	Micronesia
	Relevance of traditional knowledge for areas beyond national jurisdiction	Papua New-Guinea
		High Seas Alliance
		DOSI
	Cultural connectivity; cultural value as criteria (ABMTs/MPAs)	New Zealand
	Ecological connectivity is a fastly developing area of research	IIED
	Acknowledgement of changing ecological connectivity patterns	Eritrea

Table 13: Rationales for the use of the ecological connectivity concept by BBNJ actors

The relevance of ecological connectivity for conservation was also linked to EIAs. Mexico (intergovernmental conference no. 1) referred to ecological connectivity regarding possible impacts from activity in areas beyond national jurisdiction on national waters, as visible in concerns of Ecuador (intergovernmental conferences no. 2 and 3) about plastic debris

and other pollution reaching the Galapagos Islands. Eritrea argued with the ecological connectivity concept for mandatory EIAs “for any activity under the jurisdiction or control of a party to the instrument that has the potential to cause direct or indirect social or environmental impact to BBNJ or areas within the national jurisdiction of other states.” Nauru (intergovernmental conference no. 1) emphasised the need to consider transboundary and cumulative impacts. In intergovernmental conference no. 3, Belize, on behalf of the AOSIS, supported the consideration of EIAs and strategic environmental assessments for BBNJ. In the intersessionals, WECF argued for an effects-based approach to EIAs and strategic environmental assessments respecting the “reciprocal connectivity of ocean areas.” Moreover, Eritrea (intergovernmental conference no. 1) supported the establishment of “a contingency fund” to restore ecosystems and mitigate potential impacts of activities on biodiversity in areas within national jurisdiction and areas beyond national jurisdiction.

5.2.2. Socio-Economic: Vulnerability of Small Island States and Developing Coastal States

Apart from conservation rationales, the ecological connectivity concept was strongly linked to socio-economic concerns, particularly to the vulnerability of small island developing states and developing coastal states. Horizontal connectivity was used to show geographical interconnectedness between exclusive economic zones (EEZs) and areas beyond national jurisdiction regarding the socio-economic impacts of harmful activity in areas beyond national jurisdiction on coastal states’ communities and economies.

Ecuador (intergovernmental conference no. 1) recognised that “small impacts might not be critical in some places, but maybe in others” and was concerned about the effects on coastal states (intergovernmental conferences no. 2 and 3). Papua New Guinea and the Maldives (intergovernmental conference no. 2) emphasised small island developing states’ special circumstances and ocean interconnectivity as a key issue. Indonesia (intergovernmental conference no. 1) pointed to the relevance of the ecological connectivity concept for BBNJ regarding their geographic condition and the national contexts of other countries. Micronesia (intergovernmental conference no. 2) reminded delegates that “some states are more dependent on the ocean and its resources economically and socially,” pointing to a “direct impact of ocean pollution, sea-level rise, ocean acidification.” Also, Belize, on behalf of AOSIS (intergovernmental conference no. 3), emphasised small island developing states’ dependence on marine biodiversity. Interview material further shows how policy-makers increasingly see socio-economic relevance for their local communities:

I first talked about socio-economic factors in PrepCom [no. 1]; people could not get the point. They were saying: “Why is he talking about socio-economic factors? This is about the High Seas; there are no people there.” But now, a number of delegations...have expressed their support....Because what we are saying is, as remote as it may seem, it is so relevant and important for coastal communities as well. (State delegate_190328_6)

Eritrea (intergovernmental conference no. 1) drew the link to the migratory connectivity of economically important fish species for coastal states and whose feeding and spawning areas lay outside national jurisdiction. In this regard, the protection of such species in areas beyond national jurisdiction impacts their national fishing effort. As Eritrea put it at intergovernmental conference no. 2: “We advocated criteria for a long time, such as connectivity with regard to economic and social factors” when it comes to identifying areas, with the need to “ensure that conservation benefits are distributed through different areas.” Migratory connectivity was also mentioned at side events (UBC, intergovernmental conference no. 2 side event) concerning the connectivity of fish stocks between EEZs and areas beyond national jurisdiction. Interview material additionally points to the benefits of non-exploitation of species for recovery with a direct economic benefit for fishing states and coastal communities:

How much are they [communities] benefiting through the non-use of resources versus the exploitation of those resources. And that would be largely fisheries....If we’re not having an impact on the benthic environment they could actually start to understand [that] conservation measures might be more in their interests, than even allowing some fisheries revenue. (Scientist_190826_45)

In a side event, the Global Ocean Forum (intergovernmental conference no. 3) emphasised the importance of considering the connection between coastal waters and areas beyond national jurisdiction concerning finance, arguing for a needs-based approach for countries’ EEZs and connection to areas beyond national jurisdiction for CB&TT. In the intersessionals, WWF suggested, based on this connectivity, that the scope of CB&TT obligations in the agreement should be cross-jurisdictional, covering both areas within and beyond national jurisdiction.

5.2.3. Juridic: Expanding Roles and Rights of Coastal States

In the early stages of the BBNJ process, connectivity was mentioned together with the concept of adjacency. Academic literature documented statements of the Philippines in PrepCom no. 4 on the importance of “biophysical and genetic connectivities in the high seas and the application of connectivities in the adjacency principle, particularly in providing fair and equitable access and benefit-sharing to adjacent coastal states who contribute to the conservation of habitats for

MGRs” (Su, 2021). A policy brief and related side event called for greater influence over the management of adjacent areas beyond national jurisdiction resources for coastal states and their “primary responsibility” for areas beyond national jurisdiction governance (See Dunn et al., 2017, pp. 2–3, 5, 9).

Regarding stakeholder consultation concerning a scientific and technical body, Nauru, on behalf of PSIDS (intergovernmental conference no. 1), argued for “mandatory and active consultation of adjacent or connected SIDS,” and Eritrea (intergovernmental conference no. 2) stated that adjacency should include ecological connectivity and geographical proximity. Interview material points to a state delegate’s view that ecological connectivity challenges the adjacency concept, as any remote areas can be connected even if they are not “adjacent” (State delegate_190328_6). As coastal states can be adversely impacted by activity on the high seas and their conservation management is connected to areas beyond national jurisdiction, there were demands for a stronger role for coastal and island states in areas beyond national jurisdiction governance (Micronesia, intergovernmental conference no. 2).

5.2.4. Epistemic: Extending the Knowledge Base

In intergovernmental conference no. 2, discussions concerned the need for increased ecological connectivity knowledge. At a side event, non-state actors stressed the importance of understanding connectivity (IUCN, side event), calling for a mandate for a scientific body, to be established under the ILBI, to assess such phenomena (Greenpeace, side event). Connectivity also implies the need for flexibility in a fast-changing environment (IIED) and acknowledgement of changing patterns of ecological connectivity (Eritrea). In the intersessionals, the High Seas Alliance emphasised the importance of genomic science and technology using environmental DNA to assess population composition and connectivity.

Various actors, including regional groups, linked the ecological connectivity discussion to the traditional knowledge of Indigenous Peoples and local communities. On behalf of PSIDS (intergovernmental conference no. 1), Nauru emphasised the need to account for regional and subregional characteristics in line with connectivity and the relevance of traditional knowledge. For the design of a scientific or expert body, Nauru, on behalf of PSIDS (intergovernmental conference no. 1), suggested considering traditional navigation alongside the best available science, e.g., IPCC criteria, to identify connectivity between ecosystems. Micronesia (intergovernmental conference no. 2) argued that traditional knowledge about connectivity regarding marine species that migrate between areas within and beyond national jurisdiction and best practices of Indigenous Peoples and local communities could complement science. On

behalf of AOSIS (intergovernmental conference no. 3), Belize reiterated the relevance of traditional knowledge and the connection between coastal waters and areas beyond national jurisdiction. At an ecological connectivity side event (intergovernmental conference no. 2), the representative of Micronesia argued for the relevance of traditional knowledge for BBNJ, despite areas beyond national jurisdiction being 200 nautical miles away from shores, giving examples of traditional knowledge on migratory paths, seamounts, and wave patterns that interact with BBNJ and best practice examples for ocean management, including temporal closure systems.

Submissions to the online intersessional work platform increasingly called for the inclusion of traditional and Indigenous knowledge on ocean connectivity to inform the ILBI and the relevance of cultural connectivity (High Seas Alliance, DOSI). On behalf of the PSIDS, Fiji reminded delegates of “the reality of ocean connectivity” that MGRs can both be found in areas within and beyond national jurisdiction, and therefore relevant traditional knowledge for the ILBI could not be limited to being associated with MGRs in areas beyond national jurisdiction.

5.3. The Politics of Using Ecological Connectivity to Guide Future Ocean Governance

Despite named benefits to nature and humans, interview partners from both state and non-state actors were concerned about the perceived relevance of the concept for BBNJ, due to economic (exploitation of resources) and geopolitical (marine governance in areas within and beyond national jurisdiction) interests. Data from interviews with a state delegate and a scientist shows the difference between awareness of the scientific reality of ecological connectivity and political will to draft treaty text in a way that considers it:

The science is there....They won't deny it. But the question becomes political because it means that we would have to look at the ocean from a global perspective; try to have different protected areas or any types of tools that are somehow related that might move around....States are very cautious and very scared of protected areas or any type of management tools. Because they're afraid that there are going to be no-takes, so that fisheries and anything else won't be able to take place. They don't want anything within their EEZs, or not much....They don't want any of their freedoms to be cut. (Scientist_150321_3)

At some level, everyone acknowledges it [the ecological connectivity concept]. Whether or not it becomes relevant for them to our discussion and to the powers that we want to

embed within this treaty, that's a different discussion entirely; then you will hear "well, you know, there are certain limitations, there are frameworks that are already in place" [or] "well, let's talk more about cooperation and let's not set out new rules"....I think at some level there is an agreement that that concept exists, and it is relevant, but how much it dictates what we do, that's where the line starts getting red—deep red. (State delegate_130421_4)

As interview material of Scientist_150321_3 shows, BBNJ actors embrace ecological connectivity when their direct interests are affected, particularly regarding illegal fishing, repercussions to the coast or warming and how it affects fisheries productivity; however, in conservation/protection topics, "people are less inclined to do anything about it".

You can always put words on paper saying that we're committed to ensuring that we take a holistic or comprehensive ecosystem-based approach to things. But that's not enough. Ultimately, it's in the operational parts....There's definitely enough interest in maintaining status quo, which could jeopardise whether or not that concept is really fully respected. For me, the status quo right now is...all of those bodies continuing doing what they're doing. And ultimately, that does not lend support to ecological connectivity. (State delegate_130421_4)

Results show that state and non-state ecological connectivity supporters alike are concerned about the concept being left out of future ocean governance due to a preference for the status quo. At this stage, integration of the concept in the overall logic of the revised draft text (UNGA, 2020) has been criticised for lack of consideration of the three-dimensional ocean space, climate change, seasonality, and migration between ocean basins (Scientist_150321_2). Final negotiations will determine where the concept is placed in the legal text and how the ILBI will operationalise ecological connectivity.

6. Discussion and Conclusion

This research traced the ecological connectivity concept throughout the BBNJ negotiations by identifying the actors and their rationales. In line with previous studies, our research demonstrates that science plays an important but contested role in global environmental agreement-making (Gray et al., 2014; Hughes & Vadrot, 2019; Peterson, 2019). The BBNJ negotiations, as a site where "struggle over environmental knowledge" takes place (Vadrot, 2020), served for collaborative event ethnography data collection and allowed us to empirically study the use of science by analysing how actors employed the ecological connectivity concept within the political discussions. While there is almost no contestation over the concept and its

policy relevance, actors opting for its inclusion in the treaty text invoke different rationales for perceiving it as relevant to marine biodiversity governance. Results demonstrate, first, that state and non-state actors used the ecological connectivity concept to support their interests in the new ILBI based on ecologic, socio-economic, juridic, and epistemic rationales. This confirms that policy-relevant science is actor and context-dependent and shows that the same concept may be used strategically by various actors for different purposes. Second, several actors recognise the limitations of the existing legal order of ocean governance, embracing the need for regulations to govern an interconnected ocean. While the ecological connectivity concept risks losing its meaning in an array of competing political interests, it has the transformative power to challenge the status quo of global ocean governance and fundamentally alter the way humans govern the ocean.

6.1. The Transformative Power of Ecological Connectivity to Alter Marine Biodiversity Governance

The analysis shows that actors strategically used the same concept to underpin distinct interests: Some actors pointed to various types of connectivity to challenge the status quo by advocating for change regarding existing practices in conservation. Others highlighted the vulnerability of certain regions, or demanding increased rights for the involvement of certain states and the recognition of alternative forms of knowledge when considering and taking decisions in global governance. Non-state actors deliberately used the concept to convince state actors with low interest in the BBNJ negotiations to develop a stake in the new ILBI by connecting high seas governance to the domestic situation. This result ties well with previous studies wherein NGOs seek to influence negotiators' positions by providing information (Corell et al., 2007); in our case, this involved making the ecological connectivity concept more popular among governments before and during the negotiations, circulating scientific papers, and targeting political audiences during side events. However, results also show how the initiative of an individual state actor reaching out to scientists resulted in joint publications on the topic and contributed to ecological connectivity discussions within BBNJ.

The “making” and strategic use of policy-relevant knowledge in intergovernmental negotiations, and the fact that actors are worried that interests of sovereignty and resource exploitation might lead to a weak operationalisation of the ecological connectivity concept in the treaty text, confirm that knowledge is intertwined with political and societal factors (Turnhout & Gieryn, 2019). Controversies that may emerge in relation to specific knowledge—or, in our case, a specific scientific concept and its ontological and epistemological implications—“are not just about facts, but also simultaneously about values and interests”

(Turnhout & Gieryn, 2019, p. 70). Nevertheless, results illustrate that controversies over environmental knowledge are not always explicit and are sometimes difficult to detect. Apparent agreement between actors on the policy-relevance of scientific concepts and their inclusion in policy-making, as the ecological connectivity case suggests, can still be implicitly controversial and become explicit conflicts at a later stage, complicating the effective implementation of agreements (Vadrot, 2014).

The idea of an interconnected ocean blurs the boundaries between national waters, EEZs, and the high seas and challenges the legal division of the ocean into different maritime zones (Lambach, 2021). While enshrined in existing international law, managing the ocean in different maritime zones through various actors has been criticised as ineffective for the conservation and sustainable use of marine biodiversity (Maxwell et al., 2020). Increasingly, authors argue that the one ocean would need to be governed as such, calling for an “ecosystem-based approach rather than [one] based on geopolitical divides and prior agreements” (Popova et al., 2019a, p. 99). The BBNJ instrument, with its exclusive mandate for the conservation and sustainable use of marine biodiversity beyond national jurisdiction, cannot legally change the delineations of the maritime zones established under UNCLOS. Nevertheless, embracing the ecological connectivity concept and, in turn, questioning the effectiveness of current ocean governance can enhance cooperation and coordination among existing instruments, bodies, and frameworks that have tended to operate separately. In this way, a more holistic approach to marine biodiversity conservation and sustainable use might be achieved, which would improve current ocean governance. It demonstrates how scientific concepts have the power to question existing legal and administrative structures that might appear static and definite in international law today but do have the potential to adapt with time through future deliberations in international negotiations. Furthermore, the ecological connectivity concept is not only relevant to the ILBI but also to other marine biodiversity-related negotiations and agreements, such as the Convention on Migratory Species, the Convention on Biological Diversity, the Convention on International Trade in Endangered Species, or regional governance organisations and knowledge bodies—it can exert power beyond the ILBI context. As argued by Hughes and Vadrot (2019), once a concept is “weighted,” it might travel to other negotiation sites and enact similar dynamics. Thus, the power of ecological connectivity as a scientific concept in the BBNJ negotiations lies not only in its use as a negotiation tool but also in its capacity to question the maritime legal order and anticipate transformative change beyond the institutional and legal context within which it is mentioned. The fact that at least one government (UK Parliament, 2021) has started questioning whether UNCLOS is still “fit for purpose” in light of new

emerging challenges and scientific findings might enable future ocean governance to respect ecological connectivity fully.

6.2. What This Means for BBNJ Governance

While previously established maritime zones under UNCLOS serve to divide governance tasks and delegate responsibilities, alignment of the fragmented ocean governance framework is needed for effective marine biodiversity governance. The ILBI has the potential to coordinate existing efforts and contribute a holistic solution to change the status quo of marine biodiversity governance (Yadav & Gjerde, 2020). As our results show, actors link the ecological connectivity concept to their national and regional context; thus, there seems to be a lack of recognition of the common interest in the agreement to embrace the ecological connectivity concept for current and future generations and planetary health.

While no actor directly opposed the concept in their interventions and textual proposals, their reluctance to put the concept into practice can be seen through its removal from the “general principles and approaches” provision and their indirect opposition to acknowledging the interconnectedness of the ocean in the operational parts of the revised draft text (UNGA, 2020). To prevent adverse transboundary and cumulative effects, conducting additional EIAs for activities in areas within national jurisdiction that have potential adverse effects on marine biodiversity in areas beyond national jurisdiction and establishing coherent networks of ABMTs (including MPAs in ocean space and depth) will be necessary if the ecological connectivity concept is to be put into practice—issues that, to date, remain subject to negotiation. The current BBNJ revised draft text does mention ecological connectivity; however, to fully embrace the concept, it will need to be operationalised in various parts of the treaty text. In the different package elements, this translates into the need for an ecosystem-based approach to marine biodiversity governance with a re-consideration of the static nature of ABMTs, including MPAs (Balbar & Metaxas, 2019; Ortuño Crespo et al., 2020; Steinberg & Peters, 2015). For the establishment of ABMTs, including MPAs, as well as the conduct of EIAs, the acknowledgement of marine species movement, oceanographic currents, and pollution (including noise, plastic, and chemical) that occur across maritime zones of UNCLOS and impact different jurisdictions is paramount (Yadav & Gjerde, 2020). Conservation and sustainable use of marine biodiversity, thus, requires cross-jurisdictional governance and coordination among different bodies responsible for certain regions or sectors in both areas within and beyond national jurisdiction. This implies the need for an effects-based approach to EIAs and strategic environmental assessments, which considers cumulative and transboundary impacts (Hassanali & Mahon, 2022). MGRs with the same genetic material can be found in

areas within and beyond national jurisdiction, which calls for a coherent legal framework for the access to and sharing of benefits from MGRs. Regarding the CB&TT package, the protection of marine biodiversity in areas beyond national jurisdiction also depends on effective conservation management of national waters of coastal and island states (Harden-Davies et al., 2022).

Lastly, fully embracing the ecological connectivity concept would also entail a sense of global solidarity and shared responsibility to ensure that the aims of the ILBI are met. This implies a need for cross-jurisdictional data sharing and the inclusion of different types of knowledge when seeking to understand ecological connectivity through a future scientific and technical body. The ocean as a global commons requires different voices and types of knowledge to be embraced, including traditional knowledge, practitioners' experience, guarding a sensitivity to gender, cultural, and generational diversity. The ILBI needs to be drafted with regards to intraand intergenerational justice, as well as with the overall aim for a harmonic human–nature relationship for the next decades and centuries, one which recognises the intrinsic value of nature in its own right. The ecological connectivity concept also invites one to consider how this ILBI is relevant for everyone and the life that will inhabit this planet centuries from now. Therefore, it is time to look beyond national and regional interests—and recognise the shared benefit of applying the concept for future biodiversity governance.

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Conflict of Interests

The authors declare no conflict of interest.

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8.3.2 Supplementary Material

Supplementary material for this article is available online in the format provided by the author (unedited).

a) Supplementary Material 1

Table 1. Types of connectivity, Scientific information and Implications for the BBNJ Agreement

Types of connectivity	Scientific Information	Implications for the BBNJ Agreement
Passive (circulation) connectivity/ Structural connectivity	Ocean currents vary in position, strength and direction and are modified by climate change (Popova et al., 2019) Ocean currents carry pollution to different regions of the ocean (UNEP-WCMC, 2018)	Cumulative and transboundary impacts have to be accounted for in ABMT establishment and conduct of EIAs (Gjerde & Wright, 2019) Policy responses need to adapt to changing conditions of the ocean
Active (migration connectivity)/ Functional connectivity	Long-distance migrations of sea birds, turtles, sharks and marine fish such as tuna (Mossop & Schofield, 2021) Movement of species and the organic matter derived from them (UNEP-WCMC, 2018)	Access to baseline information on migratory connectivity needed for the establishment of ABMTs (Dunn et al., 2019) Dynamic ABMTs are suggested (Maxwell et al. 2020; Popova et al., 2019) MGRs with the same genetic material can be found in AWNJ and ABNJ (Metaxas et al., 2020)
Horizontal connectivity	The ocean is connected geographically (O'Leary & Roberts, 2018)	"Straddling" MGRs can be found in AWNJ and ABNJ A network of ecologically connected marine protected areas are needed to conserve and sustainably use marine biodiversity (IUCN, 2019; Mossop & Schofield, 2021) EIAs for activities in ABNJ to consider impacts on AWNJ (Mossop & Schofield, 2021)
Vertical connectivity	Upper-ocean communities and processes are linked to seabed ecology and biogeochemistry (O'Leary & Roberts, 2018; WHOI, 2022) Exploitation of the water column can have impacts on the deep sea (O'Leary & Roberts, 2018)	Water column and seafloor cannot be governed independently but in coordination Cross-sectoral cooperation requires a common goal/overarching set of

		principles, shared between managing bodies (Gjerde et al., 2018)
Genetic connectivity	Population genetic studies demonstrate genetic connectivity (UNEP-WCMC, 2018)	MGRs with the same genetic material can be found in areas within and beyond national jurisdiction
Cultural Connectivity	Indigenous views on the interconnectedness between humans and ecosystems point to an extraterritorial and eco-centric view of governance (Endalew Lijalem et al., 2021)	Recognition of indigenous models of ocean connectivity (Endalew Lijalem et al., 2021)

Further sources:

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Webster, Marra, P. P., Haig, S. M., Bensch, S., & Holmes, R. T. (2002). Links between worlds: unraveling migratory connectivity. *Trends in Ecology & Evolution*, 17(2), 76–83. [https://doi.org/10.1016/S0169-5347\(01\)02380-1](https://doi.org/10.1016/S0169-5347(01)02380-1)

b) Supplementary Material 2

Table 2. The Ecological Connectivity Concept in BBNJ documents

BBNJ Meeting	Text Document	Number of Mentions	Location of Mentions
IGC 4	Revised Draft Text	1	[ANNEX I Indicative criteria for identification of areas]
IGC 3	Draft Text	1	Article 16 (2)(n) Identification of areas requiring protection
IGC 2	Presidents Aid to Negotiations	2	1. General Principles & Approaches (Part III, Section 1(4)(9)) <i>[General principles and approaches raised in relation to environmental impact assessments]</i> 4. Measures such as area-based management tools, including marine protected areas Identification of areas (4.3.1(2)(a)(xiv))
IGC 1	Presidents Aid to Discussions	0	-

c) Supplementary Material 3

Table 3. Side events on ecological connectivity in BBNJ

Time	Title	Host
Prep Com 3	Making Connections: Cultural, ecological and legal connectivity between national jurisdictions and areas beyond national jurisdiction	The Nippon Foundation
IGC 2	“Connectivity: a critical consideration in global ocean governance”	UNEP-WCMC, CPPS, GEF
IGC 2	So far, yet so close: Ecological connectivity between ABNJ and territorial waters	IEED

9. Discussion of Central Research Findings

This section discusses the central research findings in the context of the overarching research question that connects the individual publications: How is science shaping the BBNJ negotiations? It reflects on the empirical findings from the three papers, embedded in the theoretical foundations.

9.1 Global North – Global South Imbalance

Results point to epistemic inequalities (Hornidge, 2023) both in science output and science input into intergovernmental negotiations for the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction.

As results of Paper 1 show, there is an active and growing BBNJ scientific community interested in informing the negotiations by publishing scientific findings and identifying recommendations for the way forward. However, an imbalance between developed and developing countries in terms of first-authorship in peer-reviewed, English language scientific literature could be identified. Epistemic inequalities (Hornidge, 2023) among world regions could be empirically shown with this review of scientific output: First authors were mainly affiliated with Europe (46%), Oceania (21%), and North America (20%), while input was significantly lacking from Asia (8%), Latin America (4%), and Africa (1%). The fact that the majority of first authors on BBNJ publications were based in Global North research institutions shifts the epistemic attention away from Global South actors. This provides an unequal playing field in knowledge production and sharing – and ultimately – the knowledge availability to policy-makers in the negotiations.

The finding that publications on BBNJ were mainly produced by first authors from the Global North can be linked to capacity constraints of the Global South. Within the BBNJ literature, several levels of inequality regarding Global South countries were discussed: the lack of institutional, human, financial, and technological resources to conduct deep-sea research (Nurbintoro & Nugroho, 2016), limited capacity to protect and benefit from the marine environment (Gjerde et al., 2019), difficulties to publish and access data (Bax et. al, 2018), as well as develop marine biotechnologies (Brogiato et al., 2014) and an underrepresentation in the BBNJ negotiations (Blasiak et al., 2016). BBNJ authors point to the challenges across all package elements for Global South countries to implement the new agreement (Peña Neira, 2017; Ribeiro, 2017; Wang, 2019) and highlight the role of CB&TT (Durussel et al., 2017; Harden- Davies, 2016; Harden-Davies & Gjerde, 2019; Nurbintoro & Nurgroho, 2016).

In the BBNJ negotiation stage, epistemic inequalities of scientific input could be shown empirically in findings of Paper 2. State delegates from the Global South voiced their need to get in contact with scientists, as in their home countries, they did not have this expertise or the financial capacities for undertaking marine research available, including the necessary technology and equipment. The number of representatives often differed between Global North and Global South delegations. Some Global South governments only had one representative and difficulties following parallelly-held sessions. Scientists were in most cases part of Global North delegations, while the generally smaller state delegations from the Global South often did not include scientists, and were reaching out to scientists on site. Delegations overall mentioned the need to be informed by science throughout the negotiations, as technical questions could in many cases only be answered by experts on the topic. Small delegation size has been identified as an overall disadvantage for developing states (B. Haas et al., 2023), as shown with lack of scientific advisors on Global South delegations within the BBNJ negotiations.

Results show that epistemic inequalities (Hornidge, 2023) were prominent in the opportunities to produce and access science in the framework of the BBNJ negotiations. Pathways of scientific input were conditioned by financial and technical possibilities to conduct (deep-sea) research, publish in renowned academic journals and attend the intergovernmental conferences. Epistemic inequality was oftentimes enhanced through the use of existing contacts or “own national scientists” for scientific advice, and in this way, prioritising certain scientific input over other (A. C. Morgan, Economou, Way, & Clauset, 2018). Personal contacts within the negotiations risked to marginalise science of less well-connected scientists (Byscov, 2021). Direct involvement of the authors on site at the conferences, as seen with 35 of the 99 first authors of the BBNJ literature review personally attending at least one IGC, required substantive funding for transportation and accommodation costs, and was therefore limited to the researchers with access to such funding.

9.2 Complexity of Scientific Input

9.2.1 *Unsystematic Scientific Input*

While having formal structures on scientific output, such as the Global Ocean Assessments through the regular process in place (Evans et al., 2021), the UN Secretariat did not provide for a systematic scientific guidance throughout the negotiations in form of a guidance panel or advisory board. Rather, scientific groups formed bottom up and organised themselves to be present on site, publish policy briefs for the delegates, with some of them being part of national delegations to advice first-hand or grouped into scientific alliances, such as DOSI. For the most

part, informal ways, which were not initiated by the Secretariat, including established contacts of state delegates and social interactions, played a crucial role, as findings explore. This triggers questions of what happened to research from institutions that were not perceived as “prestige”, that was not published in English peer-reviewed journals, or by scientists who did not get funded to attend the negotiations, who did not know the policy-makers personally, or those who were unaware of the negotiations.

State delegations in the BBNJ negotiations often consulted scientists for advice who they maintained established contacts with on the national or personal level. This finding indicates that policy-makers might consider *national* research institutions as more legitimate (Cash et al., 2002), as it was common practice throughout the BBNJ negotiations: In interviews, negotiators referred to their “own scientists” and research institutes in their home countries when asked about their sources of scientific input. Policy-makers getting advice from national science sources, such as national research institutes, puts states that do not have strong national scientific expertise at a disadvantage.

Moreover, findings point to the agency of individuals in the negotiations, from both policy-makers and scientists in engaging in practices of scientific input. Even though UN structures are up to this point not systematically channelling scientific input into the negotiation stage, individual actors in the BBNJ negotiations did engage on their own initiatives and contributed to scientific input into the agreement-making. Some individual scientists distributed their findings on site and in the intersessional period, and individual policy-makers proved to be particularly interested in understanding and integrating science into the discussions. NGO actors (Betsill & Corell, 2008) played a key role in scientific input and bringing actors from science and policy together in events and meetings beyond the formal negotiation sessions (Bansard, 2023).

Particularly during the COVID-19 pandemic, when negotiations were postponed, but also generally the time in-between conference sessions – the intersessional period – was crucial for scientific input throughout the negotiation stage. Several interviewees emphasised the opportunity for scientific input on national and regional levels. Online exchanges on the topic increased during the COVID-19 pandemic (Langlet et al., 2022) and offered an additional pathway for scientists to inform the negotiations, but also for scientists and policy-makers to get in contact and connect for future collaborations.

9.2.2 Science-Policy Interactions

Social interactions between actors in the negotiation stage were observed (van den Hove, 2007), which contributed to scientific input and use in the negotiations. Social interactions and discussions of scientific findings led to state delegates perceiving scientific findings differently – namely more relevant to the ongoing negotiations. The negotiations themselves facilitated the production of scientific output and encouraged policy-relevant publications through co-production of science (Wyborn et al., 2019). The example of ecological connectivity highlighted that joint production of knowledge between actors from science and policy can generate findings to increase the perception of relevance of scientific concepts in the negotiations. It proved beneficial to the negotiations to have experts in science and policy working together, or in some cases “blurring” the line between science and policy to point to connections more directly, resulting in policy-makers of other delegations perceiving the findings as relevant for the negotiations.

On-site interaction between scientists and policy-makers emphasised the advantage of in-person participation for scientific input. As CEE explores, further locations, actors and dynamics are relevant in agreement-making, besides the formal negotiation sessions (Hughes & Vadrot, 2023), many of which happen on site and around the venue while the conference is taking place. Bilateral meetings between state delegations, but also additionally between state delegations and NGOs, side events and informal chats after hours are crucial to take into account when seeking to understand the final outcome of the agreement. The importance of in-person attendance and social interactions on site implies a disadvantage for delegations and scientists with financial constraints to attend these meetings in New York, particularly representatives from the Global South (B. Haas et al., 2023). As empirical findings and the literature review show, with regards to representation of Global South actors in the BBNJ negotiations, not only are there fewer national experts, due to the financial and technological requirements for undertaking deep-sea research in Global South countries currently, but there is the additional barrier of travel and accommodation costs to participate in the two-week long UN conferences in New York.

9.2.3 Blurred Science-Policy Interconnections

Scientific input and use are connected to the question whether or not science needs to be produced separately from politics in order to be included into the negotiations. Going against theoretical assumptions that negotiators rather turn to epistemic communities for advice who have produced their findings separately from the policy-making process (P. M. Haas, 1993), empirical data from the intergovernmental conferences show how science and policy blurred in

several ways throughout the negotiations. The lines between science and policy blurred in the joint science production by scientists and policy-makers and the different roles that scientists took on within the negotiations. Authors of scientific publications on BBNJ not only attended the negotiations, but in some cases were negotiators themselves. A few publications were written jointly with scientists or solely by policy-makers of BBNJ. State delegations with engagements in science production to link science and policy were in the BBNJ negotiations part of CARICOM, the EU, Eritrea, Micronesia and Vanuatu (Brogiato et al., 2014; Brogiato et al., 2018; Hassanali, 2018, 2021; Hassanali & Mahon, 2022; Marciniak, 2020; Mulalap et al., 2020; Popova et al., 2019; Yadav & Gjerde, 2020).

The finding that science was produced in cooperation between scientists and policy-makers during the BBNJ negotiation stage sheds new empirical light on science-policy interfaces in ongoing multilateral negotiation settings. Rather than policy-makers simply using or not using scientific knowledge, they actively engage in the scientific *production* by being scientists themselves or encouraging scientists for joint policy-oriented research on BBNJ topics. Hence, the negotiation process reflected back into the science circles and resulted in a contribution of joint publications of practicing scientists and representatives of state delegations (Wyborn et al., 2019). As CEE data and interview material with the negotiator and the scientist who jointly published on a BBNJ-relevant topic in scientific journals shows, the interaction and cooperation on the topic led to policy-relevant findings that were used in the negotiations. This shows an interconnectedness of science and policy even within the scientific papers, which form part of the BBNJ scientific output.

Sometimes, the lines of science and policy also blurred in the individuals involved in the negotiations: BBNJ actors held different roles throughout the BBNJ negotiation stage, but also sometimes within one IGC. Professional diplomats can have a previous scientific career and continue to publish in academic journals, scientists are part of all different delegations, able to represent states, IGOs, NGOs, or scientific alliances. No official scientific badge identified scientists throughout the negotiations.

9.3 National Relevance of Science

Different regions are affected distinctly by environmental problems, e.g. coastal states suffer from pollution getting to their shores and reductions in fish populations are felt most severely by those most depended on them (often small island developing states and local coastal communities) (Lubchenco & Haugan, 2023). The use of science was shown to be dependent on perceptions of relevance by negotiators. Actors argued for the inclusion of the same scientific

concept into legal text by mentioning different rationales. Findings indicate that actors perceived science more relevant to decision-making when direct links to their geographical, political, cultural and socio-economic situation existed.

Results show, that state delegates' rationales to include the ecological connectivity concept into legal text were linked to their national situations, which differ in the distinct geographic, political, socio-economic and cultural contexts. Delegates mentioned local examples to emphasise the importance of the inclusion of the ecological connectivity concept for their delegation: Marine pollution from elsewhere affecting the Galapagos Islands was highlighted by Ecuador; the link to migratory connectivity of economically important fish species to coastal states was mentioned by Eritrea; and the need to account for regional and sub-regional characteristics in line with connectivity and to include the knowledge of Indigenous Peoples and local communities was raised by states with such expertise, such as PSIDS. The use of the concept was in all cases strongly connected to the relevance that the actor prescribed to the scientific concept and national implications (E. Morgan, 2014). Those results point to the increased probability of the use of science in the negotiations when findings are directly relevant to the national situation and circumstances, showing that knowledge use is intertwined with political and societal factors (Turnhout & Gieryn, 2019).

Results of paper 3 show that actors in the BBNJ negotiations strategically used the concept of ecological connectivity to underpin different interests. Some actors highlighted the concept to advocate for conservation (ecologic rationale), others underlined the vulnerability of certain regions (socio-economic rationale), or called for increased rights of certain states (juridic rationale) and recognition of other types of knowledge (epistemic rationale). Non-state actors used the concept to convince state actors (Betsill & Corell, 2008) to develop a stake in the new agreement by connecting high seas governance to their domestic situations. Thus, the use of science in intergovernmental negotiations was influenced by value judgements regarding the relevance of the particular scientific finding in question (E. Morgan, 2014). This confirms that policy-relevant science is actor and context-dependent. The strategic use of and efforts to produce relevant science for intergovernmental negotiations show how closely science and policy are connected. Contestations about scientific knowledge and implications "are not just about facts, but also simultaneously about values and interests" (Turnhout & Gieryn, 2019, p. 70). Being aware of value judgements in science-policy interfaces is important to understand whose knowledge counts, and on what epistemic systems the UN rests when taking decisions over the global commons.

9.4 Scientific Concepts questioning existing Legal Structures

Empirical findings of the dissertation highlight the power of scientific concepts to question existing legal structures. One of the overarching topics in the BBNJ negotiations, identified by the BBNJ literature review, was ocean connectivity. Scientific papers on ocean connectivity cannot easily be reconciled with the current legal framework that exists under UNCLOS. The maritime zones, established under UNCLOS, divide the ocean into different geographical areas of governance by diverse actors (Durussel et al., 2017). That the differentiation of ocean space into areas “beyond” and “within” national jurisdiction is a social construction (Ruggie, 1998; Steinberg & Peters, 2015) becomes particularly clear in the example of ecological connectivity, contrasting the scientific realities against human-made maritime borders. The scientific concept, in this way, questioned the widely-held assumption that the ocean and its resources are best managed through a zonal approach.

The scope of the negotiations was pre-defined to “biodiversity beyond national jurisdiction”; yet, the scientific concept of ecological connectivity was significantly discussed in the negotiations and questioned the separation of the ocean into different zones. While practices of dividing the ocean into different territories is only one way to organise, “they have become the established mode of doing so”, that “it becomes difficult to imagine managing the marine environment by any other means than planning via the striation and areal demarcation of space” (Peters, 2020). Scholars have pointed to the ineffectiveness of conservation and sustainable use measures with the logic of territorial boundaries (Maxwell et al., 2020), and called for an “ecosystem-based approach rather than [one] based on geopolitical divides and prior agreements” (Popova et al., 2019, p. 99). Interestingly, in the case of ecological connectivity in the BBNJ negotiations, scientific findings were weighed against already existing legal arrangements, which put into question the effectiveness of existing structures to deal with newly emerging or only recently-known environmental problems. The ethnographic fieldwork showed that, throughout the negotiation stage, delegates from state and non-state actors mentioned the concept of ecological connectivity and included it as the subject of side events. Over the course of the negotiations, the concept was included in and excluded from the draft text. Several actors recognised the current limitations of the existing legal order of ocean governance and welcomed the need for regulations to govern an interconnected ocean. This could be seen by the request of several state delegates to address impacts on ABNJ from activities that are planned or conducted in areas *within* national jurisdiction in the framework of the new agreement.

The scientific concept of ecological connectivity shows that the current ocean governance framework with (imaginary) maritime borders dividing an interconnected ocean is a human construct (Peters, 2020; Steinberg, 2001), which goes unnoticed by the migrating biodiversity, ocean circulations and even the human passenger on a ship, unknowledgeable of UNCLOS. The way of structuring and understanding the ocean is a choice, that rests on human conceptualisations (Gray, 2018; Peters, 2020; Steinberg, 2001). Ecological connectivity challenged the current governance structure of maritime zones (Lambach, 2021): Artificial legal borders that serve for managing the ocean geographically are lacking consideration for ecological connections of the ocean – which might complicate a holistic approach to ocean governance and biodiversity conservation.

Results show, at the example of ecological connectivity, how scientific concepts that are discussed in intergovernmental negotiations can question existing legal and administrative structures that might appear static and definite in international law today but do have the potential to adapt in the future (Peters, 2020). While not in a position to legally change the delineations of the maritime zones established under UNCLOS, the BBNJ agreement has the opportunity to enhance cooperation and coordination among existing instruments, bodies, and frameworks and encourage a more holistic approach to marine biodiversity conservation and sustainable use.

9.5 Intergovernmental Negotiations as Sites of Study

This dissertation shows that science-policy interfaces can be studied in ongoing intergovernmental negotiations through the use of CEE and that the negotiation stage is a valuable object of study.

By including not only the traditional state actors and formal negotiation spaces into the analysis, but also accounting for the multiplicity of actors and spaces beyond the actual negotiation session (Hughes & Vadrot, 2023), CEE enables a more accurate understanding of the relevant dynamics, processes, actors and locations of agreement-making (Hughes et al., 2021).

Studying the negotiation stage of a legally binding agreement can identify dynamics and struggles over terminology “in the making” of the agreement with acknowledgement of the rationales of different actors and a closer look at their practices (Hughes & Vadrot, 2023). It also serves to open the black box of science-policy interfaces and can uncover existing epistemic inequalities and shortcomings in global environmental negotiation processes.

The data shows, that scientific input happened beyond epistemic communities (P. M. Haas, 1993) and sheds light on other pathways of scientific input, only traceable with CEE and by accounting for individual actors and social interactions in the negotiations. The identified pathways of scientific input include practices of science dissemination and communication, but also touch on the practices of knowledge production that are crucial to understand in the study on how science gets integrated into the negotiations.

Intergovernmental negotiations can be regarded as sites where scientific production emerges and, thus, constitutes an interesting research object for scholars studying science-policy interfaces. When seeking to understand science-policy interfaces, the sites of agreement-making (Hughes et al., 2021) are crucial, as they can encourage – and make possible – scientific production and interpretation, publications and problem solving that is not only well-informed by science, but simultaneously very timely and socially relevant to address global environmental problems.

9.6 A Systematic Way to study Science-Policy Interfaces in Intergovernmental Negotiations

This study can be applied beyond the example of marine biodiversity negotiations, and can be used to study science-policy interfaces in other intergovernmental negotiations. The systematic approach to understand science-policy interfaces in negotiations by studying *science output, input and use*, is valuable for academic scholarship on global environmental politics and international negotiations more broadly.

The dissertation showed how science-policy interfaces can more systematically be studied with the concepts “voices of science”, “pathways of scientific input” and “transformative scientific concepts”, relating to the three steps of analysis. Firstly, identifying the voices on specific topics is crucial to understand who is part of the academic discourse and contributes with knowledge to the issue under investigation. Secondly, studying the pathways of scientific input serves the analysis to understand whose voices are heard at the negotiations and which practices are used by actors to integrate this knowledge into the negotiations. Thirdly, those voices that enter the fora of intergovernmental negotiations can be studied as regards the underlying rationales of why they are discussed and the extent of their transformative power to change the status quo of global governance. Some scientific concepts will be able to significantly alter traditional ways of governing, calling into mind the social construction of existing legal frameworks.

The systematic study of science-policy interfaces in intergovernmental negotiations goes beyond contributions to the research community. With insights on current science-policy

dynamics it is valuable for actors interested in taking a more active role in science-policy interfaces, offering pathways and concrete practices of scientific input that were used throughout the negotiation stage. Moreover, such systematic research on science-policy interfaces in agreement-making can offer recommendations to UN Secretariats on how to adjust current structures to offer a more equal, just, and inclusive way to design international agreements for the future protection and use of the planet.

10. Limitations of the Research

While the research design comprehensively covered how science shaped the negotiations, there are other aspects of science-policy interfaces that this PhD research did not address within its scope. The following section outlines limitations of the research, followed by a section on ideas for future research.

10.1 Research Changes due to COVID-19

10.1.1 Research Design

The initial research design incorporated two additional themes: science institutionalisation (regarding the role of a scientific and technical body) and science uptake (scientific terms and concepts included in the final legal text). Due to a postponement of negotiations during the COVID-19 pandemic and an extension of the negotiations by two additional sessions, those two themes were taken out of the thesis and provide opportunity to be researched in future work.

<i>Identification of science in the BBNJ process</i>	<i>Methods</i>	<i>Sources</i>
<i>Science Institutionalisation</i> Role of the science-policy interfaces after completion of the agreement (set-up of a Scientific and Technical Body)	• Event Ethnography • Digital Ethnography • Document Analysis • Literature Review	• MARIPOLDATA • Fieldnotes • interview transcripts • draft texts • Recommendations in BBNJ scientific publications
<i>Science Uptake</i> Scientific terms and concepts or references to scientific institutions in treaty texts	• Document Analysis	• Final UN Documents from all meetings (from Ad Hoc Open-Ended Working Groups- Last IGC)

Table 14: Methods and data for the identification of science in the BBNJ process beyond the dissertation

10.1.2 Data collection

In light of unforeseen circumstances during the COVID-19 pandemic, the research team encountered restrictions of access to the negotiations, introduced for non-state actors, including my participation on site. Under these unforeseen circumstances, the research collection method had to be slightly adapted (Vadrot, 2023). While not having in-person ethnography data from IGC4, negotiation sessions were broadcasted to registered participants and our CEE research team followed the negotiations virtually from the office in Vienna. Due to the time difference, fieldnotes had to be taken partly at night, which is why we adapted our days to the New York time zone. We started the fieldwork when the conference sessions started in New York, which was generally at 4 pm Vienna time. Changing not only the time on our laptops to New York time zone, but also structuring our days accordingly, helped to be able to go through the fieldwork day by day in its entirety.

Not being there in person resulted in significant changes for data collection: No conversations with actors on site were held, no interviews conducted and no on-site ethnographic artefacts collected. Therefore, significantly less data was generated through digital CEE at IGC4 than in person at the other IGCs. On the positive side, no parallel meetings were held, which enabled my comprehensive coverage of all discussions.

10.2 Limitations of the Individual Papers

The first paper is a literature review on what was published by the scientific community on BBNJ. It constitutes a systematic review with clear guidelines of inclusion and exclusion of publications in the sample. The sample of academic work on BBNJ used for analysis was generated with the use of *Web of Science*, “the world’s leading scientific citation search and analytical information platform” (Li, Rollins, & Yan, 2018). Output displayed in the tool underwent peer-review from natural sciences, social sciences and law. Being described as the “world’s oldest, most widely used and authoritative database of research publications and citations” (Birkle, Pendlebury, Schnell, & Adams, 2020), it constitutes the “world’s leading scholarly literature in the sciences, social sciences, arts, and humanities”, according to Harvard Library²⁷. The Web of Science search was deliberately chosen, as the source is regarded a “legitimate form of science” in the Global North. The finding that there is lack of research from Global South first authors portrays the epistemic inequality within that system and points to inequalities of knowledge recognition and potential usability for the negotiations.

²⁷ See: <https://library.harvard.edu/services-tools/web-science>

Yet, the sample is restricted to peer-reviewed papers in English language – a body of literature that excluded representations of other forms of knowledge or scientific findings published in other languages. Grey literature, including reports, policy and technical briefs and blogs, published by UN institutions and non-governmental organisations are a valuable addition to consider when identifying the BBNJ science output. Negotiations to regulate global commons require the inclusion of a variety of actors, including civil society at large, which are mostly not represented in peer-reviewed scientific publications. Global UN assessments, including the IPBES and Global Ocean Assessments (IPBES, 2019; UN, 2016, 2021), are a valuable addition to the peer-reviewed literature on BBNJ that is relevant to take into consideration when deciding on the regulation of the global ocean commons.

Moreover, through the keyword search in Web of Science, publications mentioning the BBNJ negotiations or with direct relevance thereto, were included into the sample for analysis. The overview of the sample showed that there was a lack of natural science publications in the BBNJ science output. Natural science articles which did not make the explicit link between science and policy of BBNJ were excluded. This is a shortcoming, as further existing marine biodiversity literature (Tolochko & Vadrot, 2021) would be valuable to link to the political process of BBNJ. As much as it is a shortcoming to this research, it is a call for scientists to consider making the link between their research and ongoing political negotiations that regard their research fields.

The second paper is based on CEE data to identify pathways of scientific input into the negotiations. While formal and informal practices could be comprehensively covered in this specific negotiation, these pathways are dynamic and can adapt with time, as seen during the unforeseen circumstances with COVID-19. Moreover, they could differ in other negotiation settings on diverse themes of international relations. This research defined pathways for this specific BBNJ negotiation but cannot necessarily be assumed to be identical in other regional or global intergovernmental negotiation processes. Representation of actors and engagement of the Secretariats as regards the inclusion of scientists and their representational status can vary between different negotiation processes. The identified pathways offer a good basis and entry point, on which scientific input into other negotiations can be studied, rather than providing an ultimate, static set of formal and informal practices that can be generalised to all negotiations.

The third paper engages with rationales of actors for the inclusion of the scientific concept of ecological connectivity. Rationales studied included only those mentioned in the course of the negotiations – i.e. official arguments for the position of delegations. Official rationales of actors

can leave out confidential or politically sensitive information. The CEE method helps to uncover the black box of how science is referred to, but cannot – and does not intend to – look behind diplomatic scenes. It does not portray any secret information that might be attached to a country position, but analyses official statements made by delegates on behalf of their government or institution. Interview material offers a good addition to the fieldnotes, however, is also restricted to the information that the interviewee agrees to share publicly (See Section 10.3.2).

10.3 Methodological Limitations

Methodologically, the thesis comprehensively addressed the overall research question and the three sub-research questions. Limitations of the approach are elaborated in the following section.

10.3.1 Limitations to Collaborative Event Ethnography

The method of CEE has the limitation that dynamics and processes of the negotiations are to be captured, while there are many situations and spaces to be followed simultaneously. A division of tasks among members of the research team can attempt to cover what is happening on site at the conferences, but is by no means an entirely comprehensive coverage of the dynamics and happenings at negotiations (Gray et al., 2023). There surely were meetings that we did not know were happening, information from conversations behind closed doors which did not reach us, or events missed due to overlaps in schedules, BBNJ actors we did not manage to interview, or stories untold by the interview participants. The research team could comprehensively cover the statements made by BBNJ actors throughout the IGCs, through digital and in-person CEE with the systematic fieldnote-taking matrix. Side events could be covered, but not entirely, as the team did not follow the session IGC1 in person, and too many parallel side events were happening in sessions IGC2 and IGC3 to be comprehensively followed by the CEE team. However, prioritisation of the side event topics within the team prior to the conference facilitated the coverage of side events for the purpose of the PhD thesis, and interview material served as a way to reconstruct side events that I did not personally attend.

Interpretations of events observed can vary with the ethnographer; therefore, collective discussions and interpretations within the CEE team served the analysis (Gray et al., 2023). Each CEE researcher will have a slightly different experience, with having attended different sessions, talked to different people and heard different narratives. This was particularly clear towards the end, when my research colleague and I split for specific topics, and mostly followed a particular theme – this meant we would also be in contact with a certain group of negotiators (large delegations divided themselves on the topics as well), ending up with a distinct group of

actors and topics to shadow. Coming together and discussing the happenings in the other meetings of course helped the study, but cannot be compared to an entirely comprehensive overview, which was rather the case in IGC3 and IGC4, when no parallel meetings were held.

While being aware of the limitations of CEE, it served as a way to open the black box of the BBNJ intergovernmental negotiations and scientific-policy interfaces in a way that has not been done before and is only emerging among scholars in international relations today.

10.4.2 Limitations to the Method of Interviews

As the author, I am aware of limitations of the results that I gain from the interview data. Besides the need to reflect on me as the researcher, choosing the questions, the interview partners, and interpret the responses (See Section on interviews 6.2.2), I assume that responses are given in the contexts of the individual respondents who are coming into the interview with their experiences, opinions and worldviews. My results can therefore not be universally generalised, but rather portray the opinions and meanings that individual respondents attach to the issues under investigation. I face the criticism that policy-makers might not share the complete information available to them, but act as government representatives with a certain position on matters, and could in this way to a certain extent be constrained in their responses. While this cannot be prevented and I only used information that was shared with the consent to publish it, there were certain aspects I included into the study to reduce the bias of the mentioned limitations: Being aware of this limitation, I asked open questions to make participants explain their practices in their own words, which enabled me to map the context of the issue. Certain facts mentioned by the interviewees, such as the representation of scientists on national delegations or side event engagements, were crosschecked with academic literature, the draft text, participant lists and other official UN documents, as well as information shared by other actors to ensure validity of the data.

11. Impact of own Research on the Negotiations

As a researcher studying science-policy interfaces at negotiations sites, I am reflective of my own impact on the negotiations that are the object of study. As part of the event ethnography, we attended the negotiations, conducted interviews and exchanged views with actors on site and throughout the intersessional period. Broader responsibilities within the MARIPOLDATA project included publishing academic papers and blogs on the topic of BBNJ, conduct fieldwork at other negotiation sessions (Convention on Biological Diversity) and marine laboratories that are connected to the topic of marine biodiversity (Scripps Institution of Oceanography) and attend academic conferences to present our work. On my own initiative, I engaged with the

MARIPOLDATA Ocean Seminars²⁸ to discuss recent ocean issues and connect different actors within the global ocean community, as well as attended other intergovernmental negotiations relevant to marine biodiversity (Plastics Treaty Negotiations). This section serves to reflect on the potential impact of my research on the BBNJ negotiations.

The first PhD paper was published in 2020 and is an open access literature review on the BBNJ negotiations which might have contributed with facilitating smooth navigation through – and in this way increased knowledge for BBNJ actors on existing BBNJ science, recommendations and new avenues for research. My various blogs (See Appendix 16.5) also communicated research findings of the MARIPOLDATA team in a more concise format, which are potentially more accessible to policy-makers than the lengthier and more technical scientific publications. Yet, the actual impact that my research had over the course of the negotiation stage will remain unknown. This section still provides two examples of how I reflected on myself as a researcher, and event ethnographer, not only researching the science-policy interfaces, but becoming part of them. As a researcher participating in the negotiation setting, meeting and exchanging with the delegates also contributes to a certain impact (intentional or unintentional). This section provides an overview of my impact as a PhD researcher in the negotiation stage and my possible impacts on the negotiations.

11.1 Interview Questions spurring Delegates' Views and Engagement

Interview questions are generally a way for the researcher to gather information about the negotiation space, their actors and internal dynamics, or an individual's perception of an issue. It can clarify information by experts and provide the bigger picture from experienced practitioners. But at times (arguably always), the interview also generates something back to the individual who is being interviewed. I asked the interview questions in a very open manner, but still, at times, I realised, I initiated a conversation about topics that were new to the interviewee or generated interest in exploring them further.

In one particular case, I conducted an interview with a state delegate and we ended up discussing the issue of Indigenous knowledge. We then went our separate ways and everyone rushed to the next meetings. I attended a side event and, in the end, the same delegate, who I interviewed just before, asked for the floor in the Q&A session of the side event and explained the importance of Indigenous knowledge in the negotiations, mentioning the same points that were discussed in the interview. While it is possible that this might have been the intention anyways, or the side event discussions triggered this comment, I was convinced that the interview was

²⁸ See: <https://www.maripoldata.eu/newsevents/#oceanseminarseries>

the reason for that intervention. It shows how we as researchers can have an impact (intentionally or unintentionally) on actors in these spaces, by mentioning new issues – or mentioning issues that were previously known but only then perceived as relevant to the negotiations.

In some instances, while there might not be a direct impact on the negotiations, interviews can trigger state delegates to reflect on certain themes, which might then, as a result, impact the negotiations at a later time. In one of my ecological connectivity interviews, one state delegate mentioned:

“And, you know, after this conversation, I certainly want to go back and look at the document to see, you know, where we're falling short of what we say we're committed to and committed to more from a practical perspective than, you know, than just an ideological perspective. So, yeah, I would have to reflect a little bit.”

(State delegate, April 2021)

11.2 Connecting Scientists and Policy-Makers

In my research on science-policy interfaces, I actively engaged in organising and coordinating the MARIPOLDATA Ocean Seminar Series, under the supervision of Assoc. Prof. Alice Vadrot. The seminars offered a virtual space for the global ocean community of academics, policy-makers, and representatives of intergovernmental organisation and the private sector, as well as interested civil society to discuss recent ocean issues. While the aim of the seminars was to bring different actors together and initiate discussion of these topics, I never saw the actual outcomes of such interactions until one time, this came up in one of my interviews:

“Unfortunately, from my perspective, the BBNJ was approached by Law of the Sea specialists, and fishery-related specialists, more so than the biodiversity and climate-related specialists. And that had a great impact on the negotiations. I think one person said "most of what we're talking about is a negotiation of sovereignty, rather than a negotiation of biodiversity." I think that really rings true for me, it was really many times difficult to even get delegates and negotiators to engage on the topic of biodiversity, or its interrelationship with climate, as the ocean is critical to carbon services globally, and it's under-appreciated. And it was very under-appreciated in the BBNJ negotiations, where it should be paramount, given the relationship of biodiversity to climate services undertaken by the ocean, primarily areas beyond national jurisdiction. [...] But,

for example, (delegation of interviewee) took an engaged role on the issue of climate. And that was very important for (delegation of interviewee). It was informed by ocean scientists. And we took on information, even at the 11th hour from them to help understand it. [...] My appreciation for climate came through a MARIPOLDATA Wednesday webinar and that led to active engagement with the presenter, who then we went on to co-author, I shouldn't say co-author because I had such a minimal role, in a policy brief, that I hope helped, to a certain degree, raise the profile of the climate issues and carbon services into the agreement. Whether that's the case or not, I'll leave it to other people to judge.”

(State delegate, March 2023)

This statement not only underlines the findings of this thesis that interaction among actors in the negotiations, particularly between scientists and policy-makers, can lead to the perception of relevance of scientific findings in the negotiation in question, initiate co-production of science, and include scientific concepts into the negotiations; it also highlights the role of us as researchers in impacting the negotiations while researching them.

12. Future Research Ideas

The original research design of the dissertation additionally included a study of the *science institutionalisation* and *science uptake* in the BBNJ negotiations, which are valuable future research avenues. Throughout the negotiations, a future scientific and technical body was discussed to support the implementation of the agreement. The negotiations are important for the overall design of the subsidiary body. The final treaty text gives a broad description of the need for geographical representation, and the inclusion of different disciplines and gender, however, leaves much detail open for the COP to decide. The decision-making power, characteristics, and different elements of the new scientific and technical body remain an interesting and timely area of research. Regarding the science uptake, the final treaty text could now be analysed and specific concepts traced throughout the negotiations with the use of the matrix CEE data. In this way, specific concepts could be traced over actors and time (and across different negotiations, e.g. the Convention on Biological Diversity meetings) and final uptake studied. This can shed light on the actors that successfully brought the concept in and those who changed positions. Analysing the final draft text in light of the BBNJ literature review would be beneficial to see whether or not ultimately, calls from the scientific community who published recommendations were taken up.

Several further interesting potential future research areas can be identified. This study looks at how science shaped the negotiation process for the new legally binding agreement for the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction. We can assume that these processes play out similarly in other fora. The work in MARIPOLDATA also offered insights into negotiations on biodiversity more generally in the framework of the Convention on Biological Diversity. Yet, further research could address these questions in other multilateral negotiations, such as in the ongoing negotiations for a legally binding agreement on plastic pollution. Identified pathways of scientific input could be validated in these cases and potential new avenues explored.

Future research would also be valuable in studying the effectiveness of certain pathways in informing international policy-making, namely the scientific impact. Which pathways of scientific input can be identified as most influential to impact the final text? Does this differ between negotiations of different topics? Effectiveness of the pathways could then also be compared across different fora, including intergovernmental negotiations at regional levels.

13. Contribution

13.1 Contribution to the Academic Debate

My contribution with this dissertation to the academic field is threefold: First, the thesis provides a manual for studying science-policy interfaces in intergovernmental negotiations by following the steps of scientific output, input and use. In this way, it can uncover whose voices are heard and overheard, shed light into science-policy interfaces in all types of UN negotiations on different topics, while accounting for differences in the production and access of science among world regions, as well as identify different perceptions of relevant knowledge for policy-making.

Second, this study contributes with a new methodological approach to study science-policy interfaces in global governance, namely CEE. By focusing on the negotiation stage, which has been largely neglected by scholars of science-policy interfaces within the field of IR, the complex web of actors, processes and dynamics of agreement-making can be understood. By closely following the negotiations *in the making* and identifying actors, and their practices, the black box of science-policy interfaces within the negotiation stage can be empirically studied.

Third, my dissertation identifies the negotiation stage, including the negotiation site itself and the intersessional period not only as an opportunity for science to shape the agreement but also as an origin of science production. To my knowledge, negotiation sites have not been studied in the light of their scientific production potential. Social interactions among scientists and

between scientists and policy-makers need to be considered in order to understand science-policy interfaces in global politics, identify (un)represented actors, and different perceptions of the relevance and legitimacy of knowledge forms.

13.2 Contribution to Policy

While the thesis contributed to the state of the art in the above-mentioned fields, it extends its impact and is also relevant beyond the scientific community.²⁹ My dissertation is directly relevant to the implementation of the sustainable development goals (SDGs). By making this negotiation my research object, it contributes directly to SDG 14 on life below water. By understanding the science-policy interfaces in UN negotiations, the dissertation can provide valuable suggestions for reforming UN processes – also in other thematic areas. Moreover, the research looks into integrating science into UN-level discussions for the decision-making over global commons, and, in this way, supports equal research opportunities and participation in UN negotiations. By ensuring inclusive science-policy interrelations in the negotiations, the study, thus, also indirectly addresses SDGs on gender equality (SDG 5) and reduced inequalities (SDG 10) in the world. With my dissertation supporting the path towards a healthy ocean, the study also contributes to SDG 13 on climate action.

The dissertation not only researches, but also provides opportunities for pathways to facilitate science input in intergovernmental negotiations. It does so, by shedding light on ways for scientists how they can engage and policy-makers how they can access science, while pointing to shortcomings that can be addressed by the UN Secretariat, namely, the suggestion for a scientific advisory board, available during the negotiation stage.

The thesis encourages reforms at UN level in regards to the negotiation stage for the conclusion of future legally binding instruments. Results show the need of scientific input into the negotiation stage and point to current inequalities in producing and accessing knowledge. My research encourages adaptations to UN processes for greater inclusion and diversity of stakeholders and different disciplines and forms of knowledge to be considered when negotiating new regulations that regard global commons. It uncovers science-policy interfaces and calls on policy makers and UN agencies to reflect on science production, integration and use, opening the black box of how science interacts with policy. The findings stimulate debate on to what ends and to whose advantage science-policy interactions are currently taking place and encourage ideas for further improvement. In this way, the dissertation can spur a

²⁹ Recognised through the Impact.Award of the City of Vienna, June 2023

constructive discussion on more just and inclusive science-policy interfaces that can extend to other areas of environmental governance and international relations more broadly.

My research also further strengthened science-policy interfaces through the organisation of events, such as panel discussions at academic conferences³⁰ or the MARIPOLDATA Ocean Seminars to connect scientists and practitioners, which proved to have facilitated the understanding of BBNJ topics and even contributed to generation of new BBNJ science output.

14. Conclusion & Recommendations

The majority of the ocean legally falls under *areas beyond national jurisdiction*, namely “international waters”. Regulations regarding activities affecting the marine biodiversity of those areas need to be decided upon multilaterally. Overexploitation of marine resources and a fragmented framework to govern the ocean required adjustments of existing rules to guarantee sustainable ocean governance. The legally binding instrument for the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ) was adopted at the United Nations in June 2023.

This dissertation was dedicated to studying science-policy interfaces in the BBNJ negotiations. Focusing on the negotiation stage – namely the intergovernmental negotiations and the intersessional period – science-policy interfaces could be studied *in the making* of the agreement. Rather than evaluating the final outcome of legal text or the role of science for the implementation of legally binding instruments, researching the negotiation stage provided deeper insights into science-policy interfaces, regarding the actors that produced, included and used science, their rationales for doing so and opportunities to uncover values and norms, as well as epistemic inequalities in the production, integration and use of science into intergovernmental negotiation processes prior to the adoption of the agreement.

Scientific input during the negotiation stage was shown to be a) needed by state delegations and b) used in cases where the scientific content related directly to the BBNJ negotiations and policy-makers perceived the scientific findings as relevant to their national situations. Yet, the study of science output and input into the negotiations showed an epistemic inequality (Hornidge, 2023) between countries of the Global North and the Global South in science production and access.

³⁰ See: Panel: “United Nations Negotiations for the Future of Marine Biodiversity. A Conversation among Academics and Practitioners”, Earth System Governance Conference,

<https://drive.google.com/file/d/1gKOzjbhPOgG7QraxrMywHAY25M2uBa5e/view>

With no official representation of science at the BBNJ negotiations, scientific input was voluntary and only partly formalised, leaving most of the pathways depended on informal practices. Both formal and informal practices of scientific input were conditioned by national structures and their financial, technical and scientific capacities, as well as individual effort of BBNJ actors.

Comprehensive solutions in environmental governance require a diversity of disciplines and knowledge forms at the decision-making table to identify environmental problems, point to solutions and evaluate existing approaches, and possibly adapt existing measures. Indigenous and local knowledge are to be recognised alongside scientific knowledge to inform policy-making (Drew, 2005; Mulalap, 2020; Poto et al., 2022). When it comes to global challenges in environmental governance, “we need to make the optimum use of all knowledges, some of which are obscured and devalued by epistemic injustice, and to make sure that all voices are heard” (Cummings, Dhewa, Kemboi, & Young, 2023, p. 1966). In this regard, the inclusion of different disciplines and forms of knowledge take a justice angle, in light of international agreements to be created jointly amongst all. Inclusivity of disciplines and knowledge forms, hence, need to be established as a basis for international decision-making on the global commons.

Values are important when producing, interpreting and using science and other forms of knowledge (Lélé & Norgaard, 1996). Within the UN system, a variety of actors converge with their interests, ideas, values and worldviews in the negotiation on future regulations regarding human activities to protect or use the ocean, which forms the existential basis for life on Earth for current and future generations, as well as for non-human living beings. Results found that decision-makers in BBNJ were using science in light of their national perspectives, rather than taking a more universal approach to evaluating joint benefits for humans and the planet as a whole. After not having achieved the CBD Aichi targets (Butchart et al., 2016) or reaching the Millennium Development goals and currently showing no success in meeting the Sustainable Development Goals (UN, 2023; Leal Filho et al., 2020), taking a broader, long-term perspective on environmental governance in future negotiations would enable opportunities to better meet political commitments for sustainable development and biodiversity protection (Tessnow-von Wysocki, et al., 2023). It also encourages to reflect on ideas to extend the *legitimation* of knowledge for decision-making over the global commons to more actors than state representatives, enabling Indigenous Peoples, Youth and currently marginalised actors to have an equal voice at the decision-making table over what knowledge counts.

As findings showed, scientific findings can challenge existing ways of structuring and managing the (marine) environment and can introduce new frameworks and solutions. With the realisation that human constructs of ocean space and ocean management (Steinberg & Peters, 2015) can change and adapt to new knowledge, current governance can significantly be transformed. In international law, this puts importance on science-policy interfaces in identifying such cases to initiate transformative change (Diaz et al., 2019) and approach a more sustainable human-ocean relationship.

The UN system would therefore benefit from providing a continuous scientific guidance during ongoing intergovernmental negotiations and enabling a wide participation of different disciplines and knowledge forms (Wyborn et al., 2019). The UN is encouraging scientific guidance and advice *after completion* of multilateral agreements, but as results of this thesis show, a continuous guidance *during* multilateral decision-making processes – prior to the adoption of an agreement – would be beneficial. This can be transferred to agreements of other topics, beyond multilateral environmental negotiation processes. Science-policy interfaces within intergovernmental negotiations could be more balanced and inclusive through an expert panel that is accompanying the negotiation process and which is available for giving advice on issues discussed. Research on science-policy interfaces in ongoing intergovernmental negotiations with the use of CEE are valuable to understand the actors, their social interactions and dynamics of agreement-making. With this approach, findings can open the black box of science-policy interfaces and uncover inequalities in the process, including in knowledge production, integration and use to inform decision-making on the global commons. Not only is such research contributing to important academic debates in the field of international relations, it also generates timely recommendations for scientists, policy-makers and other science-policy actors and offers opportunities for UN reform to enable more just and inclusive science-policy interfaces along the way towards new international agreements.

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16. Appendix

16.1 Abstract in German

Schnittstellen zwischen Wissenschaft und Politik für Meeresschutz

Das Beispiel der internationalen Verhandlungen zum Schutz und nachhaltiger Nutzung der Meeresbiodiversität von Gebieten außerhalb staatlicher Rechtsprechung (BBNJ)

Ina Tessnow-von Wysocki

Abstrakt

Am 4. März 2023 haben die Vereinten Nationen ein neues Abkommen für die Ozeane finalisiert. Der rechtlich bindende Vertrag soll den Schutz und die nachhaltige Nutzung von Meeresbiodiversität von Gebieten außerhalb staatlicher Rechtsprechung (BBNJ) garantieren.

Akademiker und politische Entscheidungsträger sind sich einig über die Notwendigkeit, internationale Entscheidungen über globale Umweltprobleme unseres Planeten auf wissenschaftlicher Grundlage zu treffen. Allerdings fehlt es momentan an Forschung zur Rolle der Wissenschaft in den BBNJ Verhandlungen.

Diese Dissertation betrachtet Schnittstellen zwischen Wissenschaft und Politik während der BBNJ Verhandlungen, um a) akademischen Output, b) Praktiken von wissenschaftlichem Input und c) die Nutzung von Wissenschaft in den BBNJ Verhandlungen zu verstehen.

Zu diesem Ziel, gibt als erstes eine umfassende Literaturübersicht über wissenschaftlichen Output einen Überblick über Schwerpunktthemen und Empfehlungen aus akademischen Kreisen. Die Probe umfasst 140 peer-review geprüfte Veröffentlichungen aus 42 Journals, verfasst von 99 Erstautoren, die bis 2020 auf englischer Sprache verfasst wurden. Ergebnisse zeigen, dass Output von Veröffentlichungen überwiegend von Ländern des Globalen Nordens verfasst worden und Empfehlungen nur zu einem bestimmten Ausmaß in die Entwurfstexte eingeflossen sind.

Zweitens, bietet die Dissertation eine umfassende Studie über Wege des wissenschaftlichen Inputs in die BBNJ Verhandlungen, durch die Identifizierung der Akteure und ihre Praktiken der Schnittstellen zwischen Wissenschaft und Politik mit Hilfe von Kollaborativer Event Ethnographie. Ergebnisse demonstrieren, dass ein linearer Ansatz in Sinne von “Wissenschaft informiert Politik“ begrenzt ist und der Komplexität der Schnittstellen zwischen Wissenschaft und Politik in den BBNJ Verhandlungen nicht gerecht wird.

Eine Vielzahl von Akteuren trägt zur Einbeziehung von Wissenschaft in die politischen Diskussionen bei und ein Fallbeispiel zeigt, dass Wissenschaft und Politik durch gemeinsame Wissensproduktion im Rahmen der BBNJ Verhandlungen verwoben sind.

Drittens, wird die Nutzung von Wissenschaft am Beispiel eines bestimmten wissenschaftlichen Konzeptes untersucht - das Konzept der Ökologischen Konnektivität. Der Literaturüberblick und kollaborative Event Ethnographie stellten das Konzept als ein übergreifendes Thema der BBNJ Verhandlungen dar, welches von staatlichen und nicht-staatlichen Akteuren mit verschiedenen Argumenten genutzt wurde.

Ergebnisse deuten auf eine strategische Nutzung von Wissenschaft der BBNJ Akteure hin, und die Möglichkeit eines wissenschaftlichen Konzepts, existierende rechtliche Rahmenbedingungen in Frage zu stellen. Dies zeigt, dass die Nutzung von Wissenschaft in den internationalen Verhandlungen in Werturteile eingebettet ist und daher nicht eindeutig von Politik getrennt werden kann.

Im Großen und Ganzen zeigt die Dissertation, dass ein vernetztes und komplexes Zusammenspiel von Akteuren aus der Wissenschaft und Politik zu Wissensgenerierung und -integration in die BBNJ Verhandlungen beiträgt.

Diese Studie begrüßt die Diversität und Komplexität von Schnittstellen zwischen Wissenschaft und Politik, berücksichtigt epistemische Ungleichheiten und kontextualisiert Wissensintegration und -nutzung in den Verhandlungen.

Diese Dissertation kombiniert die Studie von wissenschaftlichem Output über die BBNJ Verhandlungen mit einer tiefen ethnographischen Analyse der Schnittstellen zwischen Wissenschaft und Politik vor Ort und im Zeitraum zwischen den Konferenzen, um Klarheit darüber zu gewinnen, wie und von wem Wissenschaft im BBNJ Prozess produziert, integriert und genutzt wird, wie Wissenschaft und Politik im Verhandlungsprozess interagieren und durch welche Faktoren diese Beziehung bedingt ist.

Am Beispiel der Verhandlungen für ein neues rechtlich-bindendes Abkommen über den Schutz und die nachhaltige Nutzung von Meeresbiodiversität von Gebieten außerhalb staatlicher Rechtsprechung, demonstriert diese Arbeit, dass Schnittstellen zwischen Wissenschaft und Politik in intergouvernementale Verhandlungen als gegenseitige Dynamiken verstanden und epistemische Ungleichheiten und limitierende Bedingungen in Erwägung gezogen werden müssen.

Die Studie trägt so zu der Literatur der Umweltgovernance bei und bietet wertvolle Empfehlungen, wie Schnittstellen zwischen Wissenschaft und Politik in den Vereinten Nationen reformiert werden können.

16.2 Formal Interview Documents

The following section compiles the formal documents that were used to conduct interviews. The project overview of the MARIPOLDATA project was provided in English, Spanish or French, depending on the interviewee's preference. A consent form, which was produced by the MARIPOLDATA Team and approved by the ERC Council, prior to my employment at the University of Vienna, was handed out to the interviewee, clarifications were given and it was signed by both Parties. During the interview, an interview guide served as guidance and was shared on request with the interviewee prior to the interview. The content of the interview guide was continuously adjusted in collaboration with MARIPOLDATA team colleagues between the conference sessions, depending on research questions of the team members and developments in the negotiations.



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Information Sheet ERC Research Project MARIPOLDATA

Research project title: *The Politics of Marine Biodiversity Data: Global and National Policies and Practices of Monitoring the Oceans (MARIPOLDATA)*

[Research investigators names REMOVED]

[Department Address REMOVED]

[Email Address REMOVED]

[Contact Details REMOVED]

About the Project:

MARIPOLDATA is an ERC Starting Grant project running from November 2018 to October 2023. A research team led by the Principal Investigator Dr. Alice Vadrot develops and applies a new interdisciplinary and multi-scale approach to study new forms of power at the intersection between science, and politics. The project uses ongoing negotiations on a new international legally binding instrument under the United Nation Convention on the Law of the Sea (UNCLOS) on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ) to study these processes in action. **Research conducted at UNCLOS BBNJ Meeting:**

Research conducted at UNCLOS will include participant observation in side events, plenaries and working group sessions and semi-structured interviews with national delegates, experts and observers. Dr Alice Vadrot will be responsible for data collection (the identification and recruitment of interviewees, the distribution and explanation of the project, its aims, the ethics and data protection measures).

Ethics and data:

The project was approved by the ethics panel of the ERC and the ethics commission of the University of Vienna. MARIPOLDATA has implemented a set of technical, organisational and security measures to protect the privacy and rights of participants and to meet the criteria of the General Data Protection Regulation 2016/679 of the EU. Participants of MARIPOLDATA are not vulnerable persons. Research participants will be function owners and the project is exclusively interested in collecting non-sensitive data, respecting the privacy of each participant. Participants will not be exposed to any risk that exceeds the risk that participants expose themselves by participating in international negotiations, where they will be interviewed. MARIPOLDATA will not collect or process sensitive data and respect the privacy of each participant by following the principle of confidentiality.

Data collection:

- Ass.-Prof. Alice Vadrot is responsible for the overall project and for data collection at UNCLOS
- Data that will be collected is non-sensitive data

- Data will be collected through participant observation at side events, plenaries and working groups and interviews with participants.
- Participants will be identified and recruited by Ass.-Prof Alice Vadrot and her team
 - Before each interview, the researcher will explain the research project and inform the person about his or her rights. She will hand an information sheet to the interviewee, including an “informal consent form”, which will be signed by the research participant and the researcher.
 - The interviewee will be verbally and in written form informed that the participation in the study is voluntary and that he/she can refuse to participate at any time, without having to give a reason, or also withdraw his/her agreement to participate once the study has already started and there will be no negative consequences for him/her if he/she refuses to participate or if he/she withdraws from the study early.
 - The researcher will ask the participant to take time to read the information provided in the consent form carefully and ask any questions they want. The research in charge informs the participant about the fact that he/she should only sign the declaration of consent
 - if he/she has fully understood the type and procedure of the study,
 - if he/she is willing to give your consent to participate, and
 - if he/she is aware of her/his rights as a participant in this study.
- The research participant will be informed that the researchers do not anticipate that there are any risks associated with his/her participation, but that he/she has the right to stop the interview or withdraw from the research at any time.
- The research participant will be asked to sign the form and he/she will be informed about how to reach the PI in case of any further questions or information about the data and its use/the project results/the deletion of data.

Data protection:

- The project has implemented a set of technical, organisational and security measures to protect the privacy and rights of participants and to meet the criteria of the General Data Protection Regulation 2016/679 of the EU.
- Records and transcripts will be stored separately and different anonymization and pseudonymisation techniques used to protect the privacy and rights of interviewees.
- In order to protect the rights and privacy of the interviewees, data will be anonymised and pseudonymised. Research participants can decide on the use of their data in publications, by initial next to a set of statements that he/she agrees with regarding the use of quotes etc.
- In case sensitive data will be collected (e.g. when an interviewee refers to his/her family, personal values, preferences), this data will be deleted (e.g. we will only transcribe those parts of the interview, which contain data relevant to the project and not transcribe those parts, where interviewees accidentally share sensitive data).
- The University of Vienna has appointed a Data Protection Officer [Contact details REMOVED]

For more information, please contact maripoldata.erc@univie.ac.at
or visit <https://www.maripoldata.eu/>

This research has been reviewed and approved by the ERC ethics panel and the ethics commission of the University of Vienna.

16.2.2 Consent Form Template



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Interview Consent Form

Research project title: MARIPOLDATA: The Politics of Marine Biodiversity Data: Global and National Policies and Practices of Monitoring the Oceans

Research investigator: [REMOVED]

Research Participants name:

Dear participant,

We would like to invite you to participate in the study mentioned above.

Your participation in this study is voluntary. You can refuse to participate at any time, without having to give a reason, or also withdraw your agreement to participate once the study has already started. There will be no negative consequences for you if you refuse to participate or if you withdraw from this study early.

This kind of study is necessary to gain new, reliable academic research results. However, your written consent to participate in the study is an indispensable prerequisite for us to conduct this study. ***Please take time to read the following information carefully and do not hesitate to ask questions.***

Ethical procedures for academic research undertaken from EU institutions require that interviewees explicitly agree to being interviewed and how the information contained in their interview will be used.

This consent form is necessary for us to ensure that you understand the purpose of your involvement and that you agree to the conditions of your participation. Please only sign the declaration of consent

- if you have fully understood the type and procedure of the study,
- if you are willing to give your consent to participate, and
- if you are aware of your rights as a participant in this study.

What is the purpose of this study?

The central objective of MARIPOLDATA is to overcome shortcomings in our understanding of the role of data in marine biodiversity politics by developing and applying a new multiscale methodology for grounding the analysis of science-policy interrelations in empirical research. An interdisciplinary team, led by Dr Alice Vadrot, collects and analyses data across different policy-levels and spatial scales by combining 1) ethnographic studies at intergovernmental negotiation sites with 2) a

comparative analysis of national biodiversity monitoring policies and practices and 3) bibliometric and network analyses and oral history interviews for mapping marine biodiversity science. The interview will take 30 to 40 mins. We do not anticipate that there are any risks associated with your participation, but you have the right to stop the interview or withdraw from the research at any time.

Would you therefore read the accompanying information sheet and then sign this form to certify that you approve the following:

- the interview will be recorded and a transcript will be produced
- you will be sent the transcript and given the opportunity to correct any factual errors
- the transcript of the interview will be analysed by Ina Tessnow-von Wysocki as research investigator
- access to the interview transcript will be limited to
- Ina Tessnow-von Wysocki and academic colleagues and researchers with whom she might collaborate as part of the research process
- any summary interview content, or direct quotations from the interview, that are made available through academic publication or other academic outlets will be anonymized so that you cannot be identified, and care will be taken to ensure that other information in the interview that could identify yourself is not revealed
- the actual recording will be saved respecting the requirements of the GDPR

Quotation Agreement

I also understand that my words may be quoted directly. With regards to being quoted, please initial next to any of the statements that you agree with:

I wish to review the notes, transcripts, or other data collected during the research pertaining to my participation.

I agree to be quoted directly.

I agree to be quoted directly if my name is not published and a made up name (pseudonym) is used.

I agree that the researchers may publish documents that contain quotations by me.

All or part of the content of your interview may be used;

- In academic papers, policy papers or news articles
- On our website and in other media that we may produce such as spoken presentations
- On other feedback events
- In an archive of the project as noted above

By signing this form, I agree that:

1. I am voluntarily taking part in this project. I understand that I don't have to take part, and I can stop the interview at any time;
2. The transcribed interview or extracts from it may be used as described above;
3. I have read the Information sheet;
4. I don't expect to receive any benefit or payment for my participation;
5. I can request a copy of the transcript of my interview and may make edits I feel necessary to ensure the effectiveness of any agreement made about confidentiality;
6. I have been able to ask any questions I might have, and I understand that I am free to contact the researcher with any questions I may have in the future.

Printed Name

Date_____

Participants Signature

Date_____

Researchers Signature

Contact Information

This research has been reviewed and approved by the University of Vienna's Research Ethics Commission and complies with the ethics requirements of the European Research Council (ERC).

If you have any further questions or concerns about this study, please contact:

[Name REMOVED]

[Email Address REMOVED]

Full address:

[Department Address REMOVED]

[Contact Details REMOVED]

Email: maripoldata.erc@univie.ac.at

You can also contact [name of PhD student REMOVED] supervisor:

Ass.-Prof. Mag. Dr. Alice Vadrot

[Contact Details REMOVED]

Interview Guide UNCLOS negotiations for a new legally binding instrument on Biodiversity Beyond National Jurisdiction (BBNJ)

New York, 15.08.-26.08.2022

Interview Type: Semi Structured, elite/expert interviews

Duration: 20-30 minutes

Sample: Government and NGO representatives and scientists (previously identified)

Thank you very much for taking time to talk to us. This interview is part of a 5 - year research project funded by the European Research Council and based at the University of Vienna. The project was approved by the Ethical Commission of the ERC and our university. First, I would kindly like to ask you to have a look at this informed consent form and to identify how you would like your interview to be used.

Now we will start with the interview and your personal background and then we will have some questions on your involvement in the BBNJ process and other related negotiation. In the end, we have some questions on the role of science within these processes.

I. Background information of interviewee and his/her involvement in BBNJ process

1. Can you please introduce yourself?

- 1.1. What is your role/function in your [organisation/agency/department]
- 1.2. What is your professional background?
- 1.3. Do you have a scientific education [in marine science]?

In the following, we will ask you to respond to questions regarding your involvement in past negotiations

II: Involvement in past/related negotiations

2. Did you attend previous negotiations related to the new instrument and if yes, in what capacity?

- 2.1. Which sessions did you attend (Preparatory Committee on the new instrument; First session; Second Session, Third Session)?
- 2.2. How do you see the progress made?

3. Are you also following other negotiations (ocean affairs)?

- 3.1. Did you attend them?
- 3.2. If yes, since when?
- 3.3. What was your role?
- 3.4. How do you see the link between these processes?

4. There are other negotiations related to marine biodiversity such as in the UN Convention on biological Diversity (CBD). Are you aware of these negotiations? *If no continue with block III.*

- 4.1. Did you attend them?
- 4.2. If yes, since when?
- 4.3. What was your role?
- 4.4. How do you see the link between these two processes?

Now we will turn to the current negotiations here

III. 5th Session of BBNJ

First let us talk about how you prepare for these negotiations

5. Could you please describe how you prepare the positions you present here?

- 5.1. Who is involved in this process? Who do you consult with for preparing the conference?
- 5.2. From whom do you get information? (Person and institution)
- 5.3. To whom do you hand on your information?
- 5.4. Do you involve ocean scientists or scientific communities?

6. Does your government/organisation generally support the establishment of a new instrument?

- 6.1. *If yes*, under which conditions?
 - 6.1.1. Which aspects of the new instrument are important to your government/organisation?
 - 6.1.2. Why?
- 6.2. *If no*, what are the main reasons for this?
- 6.3. What about the role of traditional and indigenous knowledge?
- 6.4. How do you perceive the debate over the common heritage in the text? What is your position on that?

7. How would you describe the current state of the negotiations?

8. Regarding the atmosphere: If 5 is positive, 1 negative, what would describe the current atmosphere?

8.1. Where do you see main lines of conflict in the negotiations?

9. Which side events do/did you attend as participant/speaker/host?

- 9.1. Why do you attend/organise side events?
- 9.2. With whom do you cooperate in organizing side events or other events during the negotiations?
- 9.3. How do you see the relation between side events and the negotiations? How do they influence each other? Can you give an example?

Now we have a few questions specially addressing the role of science in these negotiations

IV. Role of (ocean) science

- 10.** In general, how would you describe the role of science in these negotiations?
 - 11.** Would you favour an increased role of science in the negotiations?
 - 12.** On a scale from 1 - unimportant to 5 - extremely important, how would you rate the role of marine biodiversity related science in the BBNJ process?
 - 13.** At what stage in the BBNJ process do you regard marine science as relevant, and why? (before negotiations, during negotiations, implementation of the agreement)
 - 14.** Which actors or scientific organisations/communities/groups in your country are interested or actively involved?
 - 15.** How would you describe the potential effect of the new treaty on the scientific community in your country?
 - 16.** Do you have the impression that scientists are aware of potential effects?
 - 17.** What does your government do to create awareness and involve scientists?
 - 18.** What characteristics of a future Scientific and Technical body for BBNJ would you envisage?/ What would be its role?
 - 19.** By when do you expect the new instrument to be established?
- (On a scale from 1- not likely at all and to 5- very likely, how likely do you think the new instrument will be established?)

Thank you very much!

16.3 MARIPOLdatabase

The CEE matrix data will be made available open access under the following link:
<https://ucloud.univie.ac.at/index.php/s/5IKTPge3y48E3UP>

16.4 UN-Jargon

Over the decades of informal and formal negotiation sessions of BBNJ, specific terms have emerged that are commonly used by BBNJ actors. As these terms can be different across different UN fora, I developed a brief overview of the most common BBNJ-jargon, which was prevalent throughout my fieldwork.

<i>ABNJ</i>	Areas beyond national jurisdiction (under UNCLOS defined as areas beyond 200 nautical miles from the coast)
<i>AWNJ</i>	Areas within national jurisdiction (under UNCLOS defined as areas up to 200 nautical miles from the coast)
<i>Chatham House Rules</i>	Conversation format, in which participants in the room cannot be mentioned and contents of conversation cannot be connected to names and affiliations of speakers
<i>High Seas Treaty Dialogues</i>	Informal virtual dialogues open to all BBNJ interested participants. Originally developed to support the intersessional work during the COVID-19 pandemic when in person negotiations were not possible.
<i>IFBs</i>	Relevant legal instruments and frameworks and relevant global, regional, sub-regional and sectoral bodies
<i>IGC</i>	Intergovernmental Conference: describes the conference sessions that were formal sessions, held in the time period 2018–2023.
<i>Informal Informal</i>	Informal session, generally closed to observers, negotiation content cannot be linked to individual actors and cannot be published
<i>Informal working group</i>	Informal session, generally open to observers
<i>Intersessional Period</i>	The time between conference sessions
<i>Intersessional Work</i>	Often referred to during the COVID-19 pandemic, describing the online efforts of the UN secretariat to virtually and informally engage dialogue among registered BBNJ participants at a time when IGCs were postponed.
<i>Intervention</i>	Verbal statement at the microphone
<i>Plenary</i>	Plenary is the room where all participants of the conference get together; it also describes the meeting that takes place with all in that room and is generally open for all registered participants (and live streamed online to all – also non-registered participants) In the plenary, there is simultaneous translation into all UN languages (Arabic, English, French, Mandarin, Russian and Spanish)

16.5 Additional Publications relevant to the Research Field

I have contributed to further research in the field of intergovernmental negotiations and ocean governance. The research output is relevant to the dissertation topic at large, however, does not constitute a part of the core PhD work on science-policy interfaces for ocean protection. Blogs, published in the framework of the MARIPOLDATA project throughout the PhD, supported the communication of my research findings.

i) Scientific Publications

First-authored:

Tessnow-von Wysocki, I., Belhabib, D., & Le Billon, P. (2022). Undercurrents: illegal fishing and European Union markets. In D. M. A. Brombacher, G. Maihold, M. Müller, & J. Vorrath (Eds.), *Geopolitics of the Illicit: Linking the Global South and Europe* (pp. 239-274). Baden-Baden: Nomos Verlagsgesellschaft mbH & Co. KG.

Tessnow-von Wysocki, I., Agapakis, I., Anand, A., Kamara, G., Mozgova G., Niikkonen, K., Ovalle, M. J., Sirakaya, A. (2023). Strengthening Synergies for Transformative Change: Implementing the Kunming-Montreal Global Biodiversity Framework through Existing Biodiversity Agreements. In T. Honkonen (Ed.), *International Environmental Law-making and Diplomacy Review 2021*. University of Eastern Finland – Law School University of Eastern Finland, Joensuu Campus, P.O. Box 111, FI-80101 Joensuu, Finland.

Co-authored:

Langlet, A., Wanneau, K., Dunshirn, P., Ruiz Rodríguez, S., Tessnow-von Wysocki, I. & Vadrot, A.B.M. (2022). A matter of time: the impacts of Covid-19 on marine biodiversity negotiations. *Négociations*, 37, 39-65.

Langlet, A., Leiter, Tessnow-von Wysocki, I., & Thew, H. (2023). Experiences: Reflecting and Comparing Research on Negotiations. In H. Hughes & Vadrot, A.B.M. (Eds.), *Conducting Research on Global Environmental Agreement-Making* (pp. 249-266). Cambridge: Cambridge University Press.

Vadrot, A.B.M., Langlet, A., Tessnow-von Wysocki, I., Tolochko, P., Brogat, E., Ruiz-Rodríguez, S.C. (2021). Marine Biodiversity Negotiations During COVID-19: A New Role for Digital Diplomacy?. *Global Environmental Politics* 2021; 21 (3): 169–186. doi: https://doi.org/10.1162/glep_a_00605

Vadrot, A.B.M. Langlet, A. Tessnow-von Wysocki, I. (2022). Who owns marine biodiversity? Contesting the world order through the ‘common heritage of humankind’ principle. *Environmental Politics* 31(2): 226-250

Vadrot, A.B.M., Ruiz Rodríguez, S. C., Brogat, E., Paul Dunshirn, Langlet, A., Tessnow-von Wysocki, I., & Wanneau, K. (2022). Towards a reflexive, policy-relevant and engaged ocean science for the UN decade: A social science research agenda. *Earth System Governance*, 14, 100150. <https://doi.org/10.1016/j.esg.2022.100150>

ii) Selection of MARIPOLDATA Blogs

2023

Tessnow- von Wysocki. (2023). Life in the Ocean – a common heritage of the planet: Do we have a responsibility in the High Seas? MARIPOLDATA Blog.

<https://www.maripoldata.eu/life-in-the-ocean-a-common-heritage-of-the-planet-do-we-have-a-responsibility-in-the-high-seas/>

Tessnow-von Wysocki. (2023). Understanding Deep-Sea Life through marine scientific research: The case of Scripps Institution of Oceanography. MARIPOLDATA Blog.

<https://www.maripoldata.eu/understanding-deep-sea-life-through-marine-scientific-research-the-case-of-scripps-institution-of-oceanography/>

Wright, Tessnow-von Wysocki, Langlet. (2023). “The ship has reached the shore”: why the historic Agreement to protect the High Seas matters and what happens next. IDDRI & MARIPOLDATA Blog. <https://www.maripoldata.eu/the-ship-has-reached-the-shore/>

2022

Langlet, Tessnow-von Wysocki, Dunshirn, Ruiz Rodríguez, Sander, Vadrot. (2022). Finalizing an Ocean Treaty: Drowning in detail or sailing towards compromise? MARIPOLDATA Blog. <https://www.maripoldata.eu/finalizing-an-ocean-treaty-drowning-in-detail-or-sailing-towards-compromise/>

Langlet, Tessnow-von Wysocki, Vadrot. (2022). Where did the last negotiation round for a High Seas Treaty take us? MARIPOLDATA Blog. <https://www.maripoldata.eu/where-did-the-last-negotiation-round-for-a-high-seas-treaty-lead-us/>

Tessnow-von Wysocki, Langlet, Cremers, Dunshirn, Ruiz-Rodriguez, Vadrot. (2022). Too high hopes for a high seas treaty? MARIPOLDATA Blog. <https://www.maripoldata.eu/too-high-hopes-for-a-high-seas-treaty/>

Tessnow-von Wysocki, Langlet, Vadrot. (2022). Light on the Horizon? Negotiations to complete a new Marine Biodiversity Treaty resume. MARIPOLDATA Blog. <https://www.maripoldata.eu/light-on-the-horizon-negotiations-to-complete-a-new-marine-biodiversity-treaty-resume/>

2021

Tessnow-von Wysocki. (2021). When Science meets Policy to talk about Marine Biodiversity: Bringing together Academics and Practitioners in a Conversation about the Marine Biodiversity Negotiations. MARIPOLDATA Blog. <https://www.maripoldata.eu/when-science-meets-policy-to-talk-about-marine-biodiversity-bringing-together-academics-and-practitioners-in-a-conversation-about-the-marine-biodiversity-negotiations/>

Tessnow-von Wysocki (2021). Assessing the human’s footprint on Ocean Biodiversity. MARIPOLDATA Blog. <https://www.maripoldata.eu/assessing-the-humans-footprint-on-ocean-biodiversity/>

16.6 Creative Finish

“First you have to know that you have a problem [...] and with knowing comes caring and with caring there is hope that we can find an enduring place for ourselves within the natural system that supports us. But first, we have to know.”

- Sylvia Earle, oceanographer

Can Science make them care? To all policy-makers in negotiations...

Economic activities make whole species disappear,
Are we still thinking and valuing in “billion dollars a year”?

We have only started with innovations and ideas to exploit the sea,
By now, isn't there a need to define further to what degree?

We see annual plastic waste accumulate in the ocean around 14 million tonnes
– and that's only an assumption –
wouldn't that be a reason to reduce consumption?

Through destruction of the seafloor we are watching biodiversity declining,
The interest remains the same in deep-seabed mining?

Because of us the ocean and climate are warming –
Is that not sufficiently alarming?

If science is making policy-makers aware –
can science also make them care?

One might wonder why we engage in activities that lead to damage that cannot be
undone,
When we know that the ocean is just one.

It is easy to say, we can still change someday,
But it is now that sea-level rise leaves small island nations with nowhere to stay.

When the negotiations come to the finish line –
Just keep in mind, it is the ocean's future you design.

Poem by Ina Tessnow-von Wysocki, 2021