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Article

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.

Keywords

biodiversity of areas beyond national jurisdiction; diplomacy; ecological connectivity; intergovernmental negotiations; marine biodiversity; ocean governance; United Nations

Issue

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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 con-

text 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, sub-regional, and sectoral bodies (Yadav & Gjerde, 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 intergovern-

mental 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 ecological, 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 OEWDs 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 1) and analyses their rationales (Table 2).

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 policy-makers' 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

Table 1. Support for ecological connectivity concept by BBNJ actors.

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 University		Global Ocean Forum	DOSI	DOSI
		KIOST	IIED			IUCN	High Seas Alliance
		OceanCare	IUCN				IUCN
			UBC				SERR
							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.

(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.

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, socio-economic, 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 connec-

tivity 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

Table 2. Rationales for the use of the ecological connectivity concept by BBNJ actors.

Rationale		Actor
Ecologic	Representative/integrated/ecologically coherent networks of MPAs	IUCN Convention on Migratory Species
	Pollution crosses jurisdictions; dynamic conservation tools	OceanCare
	Establishment of ABMTs	Palau High Seas Alliance
	Mandatory EIAs	Eritrea
	EIAs and strategic environmental assessments	Belize (AOSIS)
	Protection of Galapagos	Ecuador
Socio-economic	Impact on/vulnerability of coastal states	Eritrea Ecuador Maldives
	Common heritage of humankind	Eritrea
	Food security	Ecuador
Juridic	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

by New Zealand (intergovernmental conference no. 3), and to interconnectivity between climate change and health, mentioned by Nauru (intergovernmental conference no. 3).

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 publica-

tions 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 intra- and 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.

Supplementary Material

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

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