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ARTICLES

Navigating Shifting Regimes of Ocean Governance

From UNCLOS to Sustainable Development Goal 14

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ABSTRACT: Recent decades have seen a rapid increase in the diversity of ocean uses and threats, leading to the Anthropocene ocean: a place fraught with challenges for governance such as resource collapse, pollution, and changing sea levels and ocean chemistry. Here we review shifts in ocean governance regimes from the United Nations Convention on the Law of the Sea, the first legal regime for the global ocean, to Sustainable Development Goal 14 and beyond. This second period represents a merging of growing international interest in the ocean as part of the global sustainable development agenda—characterized by a focus on knowledge, collaboration, and the formation of alliances between diverse actors and institutions of environmental governance. To conduct this review, we analyzed literature on changing actors, regimes, and institutional arrangements for ocean governance over time. We conclude with a summary of challenges and opportunities for future ocean governance.

KEYWORDS: actors, Anthropocene ocean, climate change, conservation, governance, Sustainable Development Goals

The ocean is facing unprecedented threats from natural and anthropogenic activities, drastically changing physical and environmental conditions, and affecting the people who rely on them. While science has enabled exciting discoveries about previously unknown ocean species and processes, we are simultaneously uncovering the scale of devastation (Kullenberg 2010; Merrie et al. 2014; Neumann et al. 2017; Stead 2018). Finding ways to mitigate these threats is critical. Humanity's relationship with the ocean and its resources is rooted in a long and complex history of mutual dependence, where it has provided humans with food, means of transportation, inspiration for art and literature, and, for some cultures, a place to call home (Bennett 2019; Kullenberg 2010; Mawyer and Jacka 2018; Steinberg 1999). With the advent of technology, humans have managed to increasingly encroach on and exploit this relationship based on the premise that it would always be there (Merrie et al. 2014). However, while we once thought the ocean was too big to fail, we are quickly discovering that it is instead too big to ignore (Lubchenco and Gaines 2019).

"In the past century, human use of the world's ocean areas increased exponentially, reflecting a pattern of intensification of historical ocean uses" (Juda 2003: 161). Growing intensity and diversity of activities in the ocean at a global level triggered the development of a complex ocean governance framework. However, its large-scale, multistakeholder, and three-dimensional nature make the ocean particularly challenging to govern. These challenges are exacerbated by what some scholars are calling the Anthropocene ocean: a novel geological epoch characterized by human domination of the ocean in which the environmental, biological, physical, and chemical alterations to ocean ecosystems and spaces are largely anthropogenic and driven by social, economic, psychological, and political forces (Aswani et al. 2018; Malhi 2017). Characteristics of the Anthropocene ocean include, among others, changes in ocean conditions such as a floating garbage patch in the middle of the Pacific Ocean (Lebreton et al. 2018), coastal waters with reduced oxygen and pH levels (Pinheiro et al. 2019), unprecedented shifts in the range and distribution of species (Pinsky et al. 2018), and consecutive years of elevated water temperatures that affect corals and other heat-sensitive species (Hughes et al. 2017).

This is a crucial moment for the future of ocean governance, defined here as the level and manner in which power and authorities are exercised not only by governments but also by nongovernmental institutions such as industry and civil society (Berkhout et al. 2002; Campbell et al. 2016). Aiming to articulate the structural challenges and opportunities for navigating the future of ocean governance in the Anthropocene, here we review and analyze shifts in ocean governance regimes over time. For this review, we conducted a systematic topical search on Web of Science for the following terms: ocean governance, Anthropocene ocean, law of the sea and ocean governance, SDG 14, and blue economy, which generated a result of 389 peer-reviewed journal articles. Next, we reduced the initial sample to about 150 articles by deleting duplicates and applying the following exclusion criteria: articles on a specific country or region, unless they specifically related to how that country's policies have influenced or have been influenced by global ocean governance or if they addressed gaps in the approach to global ocean governance (e.g., inclusivity, tribal knowledge); articles that were primarily about physical or ecological aspects of marine resources; articles that evaluated management in the context of broad governance principles; and articles that were not available online or through Oregon State University's Interlibrary Loan system. We then added relevant sources, as needed, for clarification.

For the analysis, around which the review is structured, we identify key actors (and their characteristics), regimes, and the main sources of law for ocean governance. We then explore how these regimes shifted over time, proposing two key eras of ocean governance: the first era emerged with the United Nations Convention on the Law of the Sea (UNCLOS) in 1982, and the second with the launch of the global Sustainable Development Goals (SDGs), specifically SDG 14: Life Below Water. Inherent to these two eras, we demonstrate the evolution in ocean governance from a top-down to a more participatory and representative process. Finally, we summarize key challenges and opportunities for navigating the future of ocean governance and conclude with a summary of the differences between the two eras: highlighting critical elements, beyond structural changes, that might enhance the potential for governance in the Anthropocene to secure resources and human well-being.

Environmental Politics of Ocean Governance: Actors and Sources of Law

Actors of Ocean Governance

Among existing international institutions with oversight over the ocean, the United Nations System is the largest, most encompassing, and most influential. Notably, it hosts UNCLOS. Within

the UN System, the International Maritime Organization (IMO) and the Intergovernmental Oceanographic Commission (IOC) are exclusively concerned with ocean affairs, focusing on research and shipping, respectively. Additional UN entities include ocean-related issues within their scope of work. For instance, the UN Environment Programme promotes conservation and sustainable use of ocean resources and created the Regional Seas Programme (Grip 2017). The UN Development Programme is critical for sustainable development, dedicating part of its action plan to ocean governance through SDG 14. The Food and Agriculture Organization leads efforts to achieve food security, with fisheries being one of the most significant sources of protein worldwide (Ehlers 2016). The World Meteorological Organization promotes international cooperation concerning atmosphere-land-ocean interactions and collaborates with the IMO to provide information related to ocean safety. The United Nations Educational, Scientific and Cultural Organization promotes scientific research and houses the IOC. The United Nations Conference on Trade and Development supports developing countries in accessing the benefits of a globalized economy, explicitly helping them identify opportunities from the blue economy. The International Seabed Authority organizes and regulates seabed mining activities in areas beyond national jurisdiction (ABNJ) (Harrison 2011). Recent UN efforts to integrate ocean concerns include the Ocean Conference and the declaration of the Decade of Ocean Science for Sustainable Development (2021–2030). Lastly, multilateral funding agencies such as the World Bank facilitate the flow of capital internationally through loans for development projects that can be ocean focused.

Intergovernmental organizations also influence ocean management and knowledge generation. The International Council for the Exploration of the Sea advances scientific knowledge on marine ecosystems and informs decision-making. Regional Fisheries Management Organizations facilitate fisheries management by establishing and enforcing rules for specific species or advising members within a defined region. Additional examples include the International Whaling Commission, charged with the conservation of whales and management of whaling activities worldwide, and the Ramsar Convention for the conservation and sustainable use of wetlands.

Nation-states are essential for ocean governance as implementing agents of international agreements. A national approach to ocean governance refers to the actions carried out within individual countries. It combines the development of nationwide strategies with the implementation of international agreements to which nations subscribe. Within each country, actors include national and local governments, as well as entities and programs whose jurisdiction spans across entire nations (including ocean spaces and resources). National governments facilitate coordination between national and local ocean-related authorities, and promote a collaborative decision-making system linking all ocean stakeholders, including international agencies and civil society (Juda 2003).

Civil society comprises actors that are neither government nor industry, such as nongovernmental organizations, scientists, and communities. NGOs vary in the scope and scale of their work. The work of national NGOs is essential within their base countries in promoting sustainable ocean development. They can influence local and national governments in favor of sound ocean management and often serve as a connection between the ocean ecosystems, communities, and the private and public sectors. At regional and global scales, NGOs can act as coordinators between governments, and they can also coordinate activities with national-level NGOs and other actors (e.g., the High Seas Alliance). At the local level, governance can also occur through community-based initiatives and scientific institutions that help inform and enforce ocean resource management. These actors often contribute technical knowledge and information on traditional practices of indigenous and local communities to policy and decision-making.

Local communities and other members of civil society can also share responsibilities with national governments (Chen and Ganapin 2016).

Ocean industry actors contribute to global and local economies through the provision of food, natural resource use, and generation of energy (Van den Burg et al. 2019). Among the most prominent commercial activities that rely on the ocean are tourism, fisheries, aquaculture, energy (renewable and nonrenewable), shipping, and seabed mining (Ehlers 2016; Haas et al. 2019; Merrie et al. 2014; Young 2015), often represented by individual corporations or industry alliances such as the World Ocean Council.

Sources of Law for Ocean Governance

Sources of law are the origins of the binding rules and regulations that guide behaviors concerning the ocean and its resources. "The law of the sea provides a legal framework for ensuring international cooperation in marine affairs, thereby safeguarding the common interests of the international community as a whole" (Tanaka 2015a: 4). Notably, UNCLOS establishes fundamental norms such as sovereign rights over resources and economic activities in the exclusive economic zone (EEZ), safeguards for international navigation within territorial waters, assignment of state responsibilities related to marine pollution, coastal state control over research in the EEZ, processes for dispute resolution, freedom on the high seas, procedures for the settlement of disputes, and the concept of resources in parts of the ocean known as the "common heritage of mankind" (Miles 1999).

At global and regional levels, a complex web of binding and nonbinding multinational treaties regulates various aspects of ocean governance (Al-Abdulrazzak et al. 2017; Friedheim 1999). Importantly, Article 311 of UNCLOS states that any negotiations over international agreements and coordination between treaties must consider general provisions of the Law of the Sea (Friedheim 1999; Pyć 2016). The 1993 Convention on Biological Diversity (CBD), for example, a legally binding multilateral treaty, provides a detailed conservation regime that expands on the resource conservation guidelines outlined in UNCLOS (Ntona and Morgera 2018; Rees et al. 2018; Wolfrum and Matz 2000). Other types of treaties or action plans are nonbinding. The United Nations Framework Convention on Climate Change (UNFCCC), for instance, sets nonbinding limits on greenhouse gas emissions for individual nations and outlines specific negotiation procedures for international treaties. Similarly, the Intergovernmental Panel on Climate Change (IPCC), a body of the UN, delivers objective scientific information on the political, economic, and environmental impacts and risks of climate change as well as potential options for response. Other examples include the 1995 Global Program of Action for the Protection of the Marine Environment from Land-Based Activities, and the 1994 Barbados Program of Action for Small Island Developing States (SIDS), both of which resulted from the 1992 United Nations Convention on Environment and Development (UNCED) (Grip 2017). Additional international agreements include nonbinding programs that emerged from subsequent sustainable development meetings: the 2002 World Summit on Sustainable Development (WSSD), and the 2012 United Nations Conference on Sustainable Development (UNCSD).

Ocean Governance: The Era of the Law of the Sea

The codification of ocean governance principles in UNCLOS in 1982 was a unique moment in global ocean politics. Here we refer to this as the beginning of the modern era of ocean governance. UNCLOS was the result of geopolitical negotiations about resources and control over the

ocean space in the interest of national security and power. The various iterations of UNCLOS, starting with the first UN Conference on the Law of the Sea in 1958, illustrate the centuries-long debate over open versus closed seas and highlight the tension between the power of individual nation-states and that of globalization (Miles 1999). Negotiations emerged at a time of growing competition over living marine resources and the technological ability to exploit genetic and mineral resources in remote areas of the ocean (Campbell et al. 2016; Mansfield 2010; Pauly 2018). Through a mix of detailed regulations on some topics (e.g., maritime zone delimitations) and guidance on others (e.g., conservation), UNCLOS effectively created an international regime of sovereign rights and responsibilities over ocean spaces and resources (Hyvarinen et al. 1998).

The concept of res nullius, or ownerless property, dominated the imaginaries of European exploration throughout most of human history. In contrast, under UNCLOS, access to and use of ocean resources combined socially constructed perceptions of the ocean as res communis (i.e., common property that is open to all), res publica (i.e., public property), and space over which individual coastal states could exercise total sovereignty. In practice, the bundle of property rights over the ocean and its resources differs across regions, where sovereignty and jurisdiction decrease as the distance from the coastal state baseline increases. Indeed, as Elisabeth Borgese (1999: 985) points out, UNCLOS "*transforms* sovereignty by disaggregating the concept into a bundle of rights ranging from 'sovereign rights' (Article 60) to 'exclusive rights' (Article 81), 'jurisdiction and control' (Article 94), and 'jurisdiction' (Article 79) which is shared." Importantly, across all jurisdictional zones established by UNCLOS, with the exception of most internal waters, the freedom of navigation remains a crosscutting right maintained primarily for international trade and commerce (Tanaka 2015b). Nation-states, thus, simultaneously own resources and seascapes and share responsibility over resources and seascapes held in the interest of all nations, highlighting the importance of collaboration between national and international actors.

The structure of this modern era of ocean governance is further based on the idea of the ocean as a global resource (simultaneously a provider of goods and services to individual nations, a geographic space of shared international responsibilities, and as a common heritage of humankind), essential for establishing or reestablishing geopolitical power (Vallega 2001). Indeed, UNCLOS negotiations occurred in parallel to important global events such as decolonization, conflicting unilateral claims to ocean spaces and resources (e.g., the 1945 Truman Proclamation, the 1952 Santiago Declaration), and the Cold War. Ocean governance was embedded in a global system that, at the time, was intent in shaping global development institutions, reconfiguring power relations between developed and developing nations, and had started to recognize the role of the environment in both these efforts. UNCLOS thus emerged at a time of shifting global powers (Suárez de Vivero et al. 2015) that allowed the international community to coalesce around a set of rules, spatial and functional, for using and managing the ocean.

Spatial Governance

UNCLOS successfully organized the ocean space into three areas: sovereign territory, areas under national jurisdiction, and ABNJ. The sovereign territory encompasses areas over which individual nations can exercise "complete legislative and enforcement jurisdiction rights and responsibilities of all places and people in an exclusive manner" (i.e., internal waters, territorial seas, international straits, and archipelagic waters) (Harrison 2011; Tanaka 2015a: 6). Areas under national jurisdiction refer to spaces where actions are limited to sovereign rights over resources, and where international law establishes the responsibility of collaboration with other

nations (i.e., contiguous zone, EEZ, and continental shelf). Finally, ABNJ refers to those in which actions are guided primarily by the principles of freedom of the sea and common heritage of humankind, and, currently, jurisdiction is almost exclusively the purview of flag nations (i.e., high seas, the area or seabed, and subsoil beyond national jurisdiction). The extents of the territorial sea, the contiguous zone, the EEZ, and, in some cases, the continental shelf are all measured from a baseline defined in UNCLOS as the low water line along the coast that is formally recognized by coastal states and marked on official maritime charts. UNCLOS also outlines special considerations for determining baselines in a variety of particular circumstances, such as with ports, deltas, bays, river mouths, fringing reefs, and roadsteads (Athanasiou et al. 2016; Harrison 2011). Finally, according to the principle of the "land dominates the sea" stated by the International Court of Justice, the attribution of maritime areas to a nation-state's territory is a legal process that is based solely on the possession of territory which encompasses a coastline (Papanicolopulu 2018).

Regional structures, another form of spatial governance, are not necessarily mandated by UNCLOS but do encompass multiple jurisdictions at supra- or subnational levels that are usually formed by multilateral agreements or established by government partnerships. In contrast to functional governance (defined in the next section), regional governance includes efforts to govern shared and often overlapping geographical spaces such as the Baltic and Mediterranean seas, and island groupings such as the Wider Caribbean or the South Pacific (Knecht 1994). The success of these efforts typically depends on the degree to which nations are able to cooperate in the framework of a given international agreement, or, in the case of subnational arrangements, the degree to which managers can effectively coordinate across different levels of government and address management issues that occur at a scale beyond the region (Grip 2017; Knecht 1994; Miles 1999). Despite shared geographies, systematic fragmentation and the complexity of coordination across agencies and international agreements often challenge the nature of these regional structures and limits their effectiveness. However, with conflicting visions, and nations being signatories to a range of treaties, it is not surprising that inertia sets in as they, especially developing nations, are challenged by having to make sustained decisions about how to reconcile these conflicts (Al-Abdulrazzak et al. 2017). Scholars and practitioners of global environmental governance have recognized these limitations, and one response has been to extend regimes into functional areas to tackle specific problems.

Functional Governance

Functional approaches to ocean governance recognize the mismatch between legal boundaries and ecologically defined functions in the ocean space. They emphasize the formation of coalitions to address issues that nations could not address individually and are ultimately in the interest of the global ocean community (Tanaka 2015a). The most important event related to the environment and human development was the UNCED in 1992, which introduced legally binding international agreements on conservation (CBD) and climate change (UNFCCC) that supported UNCLOS guidelines on fisheries, marine pollution, conservation, and climate change. The first three themes were, to varying degrees of specificity, addressed in UNCLOS, while the CBD and the UNFCCC more explicitly addressed conservation and climate change.

Fisheries

Fisheries were one of the functional aspects of ocean governance addressed explicitly in UNCLOS. Under UNCLOS, rights over fish stocks are considered either exclusive to coastal states, shared across states' EEZs, straddling the high seas and EEZs, or highly migratory. All

UNCLOS signatories have rights to exclusion within territorial waters, as well as rights and responsibilities related to conservation of natural resources within their EEZs, and are required to cooperate on the conservation and development of living marine resources in the high seas (despite all nations simultaneously having the right to fish freely in this space) (Harrison 2011; Tanaka 2015a). In this framework, the allocation of resources that are exclusive to nations is straightforward. However, guidance on how to allocate resources across states is vaguer and ultimately up to stock-sharing states (Hoel and Kvalvik 2006). The challenges of resource allocation and weaknesses in explicit policies and management mechanisms spurred supplemental fishery-specific efforts such as the 1995 UN Fish Stocks Agreement in support of regional governance coordination efforts and the 1995 FAO Code of Conduct for Responsible Fisheries.

Pollution

Before UNCLOS, several treaties dealt with marine pollution in the ocean, focusing on harmful substances and waste coming from marine-based industries such as shipping, oil and gas, and seabed activities. These culminated in the International Convention for the Prevention of Pollution from Ships (MARPOL), the primary instrument for regulating pollution from ships. MARPOL also extended the scope of other treaties to cover the regulation of dumping and marine pollution from land-based sources, and to the protection of certain regional marine areas (Tanaka 2015a). The ratification of UNCLOS gave rise to a new regime that emphasized the international community's obligation to address pollution by establishing a comprehensive legal framework for the regulation of ocean industries and land-based pollution.

Conservation

The conservation of living marine resources, as initially spelled out in UNCLOS, referred to the intention of ensuring the sustainability of resources instead of the prohibition of their use. In other words, living marine resources were instrumental because they supplied food for human populations and were crucial to the maintenance of trade and industry. Thus, their conservation was supported by UNCLOS through the definition of jurisdictional zones (i.e., legal framework necessary for devising appropriate conservation policies), through the establishment of the duty of nation-states to cooperate, as necessary, for conservation of living resources, and more explicitly, through the fisheries regime. However, specific conservation actions, broadly defined to include issues such as genetic resources, biodiversity, and life-supporting ecosystems, were considered in more detail in other international fora or by individual nation-state laws. A holistic vision for the conservation of ocean resources was integral to the UNCED and was first mentioned in 1994 at the first meeting of the Conference of the Parties (COP) to the CBD, and subsequently expanded in future COP meetings. Notably, the CBD covers both terrestrial and marine biodiversity, although preliminary negotiations for the CBD excluded the latter.

In contrast to fisheries governance, where it is possible to target specific species, conservation invokes spatial management that is further complicated by the principle of freedom of the sea. Conflicts emerged between UNCLOS and the CBD in terms of when and where nations were able to make their own decisions vis-à-vis required international cooperation for conservation (e.g., within the nation's EEZs vs. in ABNJ). Additionally, while both UNCLOS and the CBD expressed interest in the conservation of ocean resources, specific institutions, and arrangements to operationalize those intentions were less clear (Wolfrum and Matz 2000).

Climate Change

Climate change was not a salient issue at the time of UNCLOS negotiations. However, the recognition of the links between atmospheric and ocean changes suggest that certain parts of

UNCLOS could be invoked for pollution reduction and dispute resolution between parties. As in the case of conservation efforts, the role of the UNCED and its resulting agreements was the driving source of law at the time for issues related to climate change and the ocean, mainly through the UNFCCC.

Changes in Ocean Governance

Joy Hyvarinen et al. (1998: 326) suggest that by the dawn of the twenty-first century, there seemed to be an "overcrowding of the international ocean management scene," and call for a reassessment of strategies for international policy-making to avoid overlapping and recycled ideas. Similarly, Dalal Al-Abdulrazzak and colleagues (2017: 247) refer to this as "treaty congestion," and Douglas Johnston and David VanderZwaag (2000: 143) call it an era of "unparalleled diversity of legal, quasi-legal, and political commitments incurred by participating states, and indirectly by the institutions of 'civil society.'" The range of fora for ocean governance resulted in a lack of effective coordination between agreements (namely their goals and organizational structures) and challenged nations' ability to implement or manage their various commitments and responsibilities. Requirements for treaty negotiations focused on national governments and were less suited for participation by other actors. Furthermore, the relatively recent emergence of organized civil society actors at the time, such as environmental NGOs, suggests there was some variation in their ability to accurately represent the needs and interests of a broader set of ocean stakeholders (Borgese 1999). Donald Boesch (1999) also showed that, although scientific reports helped document the rapid decline of resources (Pauly 2018), science played a lesser role in informing governance at the international level. By the end of the twentieth century, however, continued degradation of the marine environment evidenced the need for innovation in ocean governance. Jurisdictional zones and a functional approach were useful, but not sufficient to address emerging environmental, social, and political changes.

Governance for the Anthropocene Ocean: SDG 14 and Beyond

The Anthropocene ocean is characterized by transboundary environmental degradation, rapid technological development, and an emerging narrative about the economic potential of the ocean (Campbell et al. 2016). In contrast to strategic goals of naval power and control that influenced UNCLOS negotiations, this new era is firmly grounded in and driven by competition over resources, innovation, and knowledge (Suárez de Vivero et al. 2015). While the principles of jurisdiction and sovereignty established in UNCLOS are still foundational, the grand challenges of development and sustainability such as climate change, poverty, communities, knowledge, and technology shape alliances to govern the ocean. Maturing global sustainability efforts, namely through the UN's 2030 Agenda for Sustainable Development and its SDGs, provide a unique platform for this new ocean governance era.

We identify the adoption of SDG 14 as the starting point of this new era, particularly with governance actors increasingly positioning the ocean as a major development concern. Narratives about the ocean present it as threatened and vulnerable, and simultaneously a space of opportunity and growth (Suárez de Vivero et al. 2015; Voyer et al. 2018). This space is characterized by emerging formal international institutional arrangements (e.g., negotiations around establishing a new regime for ABNJ) (Houghton 2014; Popova et al. 2019), fora for encouraging voluntary commitments to sustainability (e.g., UN Ocean Conference, Our Ocean Conference) (Unger and Neumann 2019), the hegemony of the blue economy as a concept that supports

market-based solutions to global environmental problems (Ehlers 2016; Silver et al. 2015; Voyer et al. 2018), the recognition of the importance of science and data for decision-making (see Harden-Davies 2018; Morgera and Ntona 2018; Turner et al. 2017), and by the emergence of new, powerful, and diverse actors of environmental governance (Cohen et al. 2019; Gissi et al. 2018; Howard 2018; Suarez de Vivero and Rodriguez Mateos 2010; Unger and Neumann 2019; Voyer et al. 2018).

Emergence of SDG 14: History, Actors, and Themes

Several international efforts to raise the stakes for the ocean on the global environmental governance agenda preceded SDG 14. Chapter 17 of Agenda 21 (from the UNCED) addressed the importance of the ocean and coasts for people and nature and recognized the ocean as one of the few places left on our planet that was suited for sustainable development efforts. Ten years later, the WSSD highlighted the role of integrated management, ecosystem approaches, and other mechanisms to more effectively coordinate efforts related to the ocean (Cicin-Sain et al. 2011). The UN adopted the Millennium Development Goals (MDGs) in 2000 to reinforce the global community's commitment to helping the most vulnerable populations (Kullenberg 2010). Realizing the limits to achieving MDGs by their target date of 2015 and expanding on the concept of strong sustainability, participants during the 2012 UNCSD conceptualized 17 SDGs as the follow-up strategy that would become the 2030 Agenda for Sustainable Development (Neumann et al. 2017; Visbeck et al. 2014). The outcome document from the UNCSD, *The Future We Want*, acknowledged the critical role of marine and coastal ecosystems in supporting sustainable development objectives. This aspiration was explicitly committed to through SDG 14 (Neumann et al. 2017; Virto 2018). In 2017, in an effort to mobilize engagement around SDG 14 and its targets, the UN held the first Ocean Conference, resulting in the adoption by consensus of an intergovernmental declaration: *Our Ocean, Our Future: Call for Action*; a summary report that emphasized partnerships, cooperation, and scaling up of successful initiatives; and more than one thousand commitments from nations, industry, civil society, and other stakeholders (UNGA 2017).

Comprehensive Governance for the Anthropocene Ocean

The current governance era builds on UNCLOS's jurisdictional zones while emphasizing an extended functional governance approach. Specifically, SDG 14 expands on the prior era's functional governance themes (e.g., pollution, fisheries, conservation, climate change) to include emerging climate change impacts like ocean acidification, securing economic benefits for developing countries and SIDS, and increased scientific knowledge and capacity for research (Virto 2018). Notably, the articles we reviewed addressed governance under SDGs broadly in the context of sustainability (e.g., Mohammed et al. 2018; Morgera and Ntona 2018; Neumann et al. 2017; Stead 2018; Virto 2018; Wilson and Forsyth 2018) or focused on a specific theme such as conservation or fisheries (e.g., Diz et al. 2018; Haas et al. 2019; Rees et al. 2018). This suggests that the vision for governance is more comprehensive, both within the specific targets and indicators of SDG 14 and across all SDGs (Ntona and Morgera 2018; Singh et al. 2018). Governance for the Anthropocene ocean thus reflects a new paradigm of sustainable development for the ocean, where crosscutting themes like climate change and conservation are paramount, and functional aspects such as fisheries and pollution increasingly intersect.

Climate change is likely the most pressing and crosscutting issue of Anthropocene ocean governance. Governance for climate change requires regulations around a variety of issues such

as the ocean's capacity to absorb carbon dioxide from the atmosphere and the resultant changes in pH levels, community responses to deoxygenation, mitigation of impacts of sea level rise and other hazards on SIDS and other coastal nations, and adequate management for shifting fisheries ranges (Cheung et al. 2017; Mumby et al. 2017; Pinsky et al. 2018; Wilson and Forsyth 2018). Because of the complexity of climate change impacts, scholarship on this issue tends to be specific to particular impacts or ecosystems, such as fisheries, coral bleaching, or shellfish and ocean acidification (Mumby et al. 2017). As a result, there has been an increased consideration of the ocean in international fora. Climate diplomacy debates before the twenty-first COP to the UNFCCC, at which the Paris Agreement was signed and adopted in 2015, seldom considered ocean issues (Gallo et al. 2017). Indeed, the Paris Agreement notes "that it is important to ensure the integrity of all ecosystems, including oceans" in its preamble (UN 2015: 21). Similar to the SDGs voluntary commitments, the Paris Agreement called for signatory nations to file Nationally Determined Contributions (NDCs) toward meeting established goals concerning global temperature rise. About 70 percent of NDCs acknowledged some aspects concerning the ocean, including mangroves, coral reefs, coastal management, and fisheries, as well as the high-risk synergistic impacts of ocean warming, acidification, deoxygenation, changes in primary productivity of the ocean, and imminent threats to SIDS (Gallo et al. 2017).

While the UNFCCC's COP agreements and IPCC reports are critical for securing global commitments to mitigate climate change, Meriwether Wilson and Catherine Forsyth (2018) highlight the importance of leveraging sustainability efforts that better align international governance with local capacities. The former consideration supports the development of compatible regulations while fostering robust local economies, governments, and partnerships. The UN SDGs and the Paris Agreement opened up the stage to do just this, as international, local, and regional ocean actors from government, civil society, and the private sector coalesce and propose ocean-related actions to tackle the effects of climate change in the Anthropocene.

Conservation through the establishment of marine protected areas (MPAs) and other effective area-based conservation measures is another crosscutting theme of Anthropocene ocean governance. The CBD's (2010) 10th meeting of the COP saw the adoption of Aichi Biodiversity Target 11, where "by 2020 . . . 10 percent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative, and well-connected systems of protected areas and other effective area-based conservation measures." SDG Target 14.5 reinforces the Aichi 10 percent target (Diz et al. 2018). There is extensive literature on the rapid expansion, at least on paper, of protected areas in the ocean (e.g., Alger and Dauvergne 2017; Diz et al. 2018; Grorud-Colvert et al. 2019; Rees et al. 2018; Spalding et al. 2016) in response to the 2020 protection goal, with estimates of more than 8.4 percent of EEZs considered being under some level of protection (Pinheiro et al. 2019). Despite broad scientific support for large marine protected areas as tools to achieve those targets, some critics argue that the race to establish MPAs (large and small) does not guarantee the success of desired conservation goals (Jones and De Santo 2016).

Beyond MPAs, conservation and sustainability narratives permeate other uses of and impacts on the ocean, such as fisheries, mining, energy development, and pollution control. Key to the development of a conservation regime for the Anthropocene is the history and evolution of a legally binding instrument for conservation and sustainable use of the biological diversity of marine areas beyond national jurisdiction (see Friedman 2019; Gjerde et al. 2013; Houghton and Rochette 2014; Merrie et al. 2014; Popova et al. 2019; Quirk and Harden-Davies 2017). The draft treaty acknowledges the general provisions of UNCLOS and focuses on topics such as marine genetic resources and the question of equity and benefit-sharing, the implementation of area-based management tools, environmental impact assessments and strategic envi-

ronmental evaluations, transparency using the best available science and information sharing, capacity-building coupled with the transfer of technology, and climate change. Additionally, it aims to foster cooperation between states and other ocean stakeholders to accomplish a robust management mechanism with strong global oversight. This instrument, currently under negotiation, represents an opportunity to build on the vision of UNCLOS and further strengthen crosscutting sustainability goals (e.g., marine biodiversity, stakeholder cooperation and equity, use of the best available science) for the Anthropocene ocean governance framework (Cremers et al. 2020; Wright et al. 2019). How this instrument will affect conservation depends on its interactions with the existing principles of freedom of the seas and benefit-sharing applied to areas traditionally understood to be the common heritage of humankind.

Long-standing ocean concerns of fisheries management and pollution control have also expanded in the Anthropocene ocean. In addition to the well-established fisheries management regime developed under UNCLOS, the international community is increasingly recognizing specific needs of small-scale fisheries. Furthermore, technological advances have influenced how the global community is addressing illegal, unreported, and unregulated fishing, including satellite tracking of vessels, highlighting the role of regional organizations, and designing tools to support compliance and enforcement of fishing regulations for transboundary and highly migratory species. The regime development for conservation of resources in areas beyond national jurisdiction will likely play a vital role in the latter as species migration and movement become less clear due to climate change, and as the issues of allocation and distribution of global fisheries among nations begin to receive increased attention (Gjerde et al. 2013; Haas et al. 2019; Hoel and Kvalvik 2006; Kumar et al. 2019; Mohammed et al. 2018; Morgera and Ntona 2018).

Similarly, governance of marine pollution has significantly expanded in scope since UNCLOS. In addition to the land and ship-based pollution regulations that have been in place for well over three decades, plastic pollution has emerged as an area of significant concern for ocean ecosystems, with no clear guidance on how to best manage it (Campbell et al. 2016). Peter Dauvergne (2018) points out that although discourse about the governance of plastics has evolved rapidly over the past decade, there is still limited implementation and coordination across scales, as well as weak international institutions. For pollution, the persistent and ubiquitous nature of plastics and the role of industry stakeholders in shaping the regime remains a significant obstacle (see also Campbell et al. 2016). New uses of the ocean by industrial sectors are also emerging, including offshore aquaculture, marine energy development, and deep seabed mining, mostly due to increasing technological capacities. As with the previously outlined issues, sustainability and the 2030 Agenda dominate scholarship on the governance of emerging uses of the ocean. Lisa Campbell et al. (2016) provide an excellent review of the governance landscape for this emergent sector.

Diversity of Actors

Actors of ocean governance in the Anthropocene are simultaneously more specialized in their focus on the ocean, and much more diverse in terms of participation. Starting in 2003, agencies within the UN System coalesced under the umbrella of UN-Oceans, an international interagency coordination mechanism that includes UN agencies and the secretariats of relevant international conventions. Nations and some regions also include an ocean-focused group of actors (e.g., US Ocean Policy Committee) in response to limitations of fragmented ocean policy scenarios in addressing the complexities of resource use in an increasingly crowded ocean space. As a result, at least 23 countries and four regions of the world are in the process of planning, formulating, or implementing national or regional ocean policies (Balgos et al. 2015).

Similarly, industry, technology, and science of the ocean have also become specialized. Private, public, and international agency funding has made the participation of these stakeholders possible by generating new knowledge and tools for knowledge generation, devising industrial best practices, and establishing public-private partnerships for the growth of maritime infrastructure and industries (Campbell et al. 2016).

Parallel to the evolution of ocean-specific governance frameworks, the UN established the High-Level Political Forum on Sustainable Development (HLPF) in 2013 to follow up on global commitments to sustainability, replacing the Commission on Sustainable Development, which had met annually since 1993. The HLPF, designed to broaden stakeholder participation and to allow member nations to develop partnerships, also encouraged member nations to conduct annual reviews and report on their voluntary commitments. Notably, the 2030 Agenda has an inclusive vision for participation. Both in their development and implementation, the SDGs recognize the role of a diversity of actors (e.g., women, children, indigenous peoples, farmers, trade unions, scientific institutions, industry) in achieving the desired outcomes. This broader base, known as major groups and other stakeholders, originated in the UNCED and focuses on advocacy, knowledge sharing, monitoring, projects, and other initiatives in support of the 2030 Agenda. More recently, the High Level Panel for a Sustainable Ocean Economy, established in 2018, brings together heads of state and world leaders in business, NGOs, intergovernmental organizations, ocean initiatives, and foundations. Through diversification, inclusivity, and transparency, the panel focuses on the role of the ocean in achieving sustainable development across the globe.

Diversity of Approaches for Sustainable Development in the Anthropocene Ocean

Our review of the literature on ocean governance since SDG 14 suggests that three highly discussed approaches stand out. The first, the role of voluntary commitments in ocean governance, is process-oriented, whereas the other two, the blue economy and the role of marine spatial planning as a tool of ocean governance, are concepts broadly used to frame sustainability efforts. As seen in the climate change governance regime (Pattberg et al. 2019), governance institutions have called for voluntary commitments from stakeholders other than national governments and international agencies regarding the ocean and the 2030 Agenda. As a result, the UN Ocean Conference resulted in more than 1,400 commitments, while between 2017 and 2018, the Our Ocean Conference netted more than 740 voluntary commitments (Grorud-Colvert et al. 2019; Unger and Neumann 2019). In the context of global targets, however, the effectiveness of these voluntary guidelines and commitments remains in question.

The concept of the blue economy reflects growing attention on ocean industries as a model for economic growth. Jennifer Silver et al. (2015) outline the origins of the term from the 2012 UNCSD, offering four competing discourses about the ocean: as provider of natural capital, as good business, as integral to SIDS, and as supportive of small-scale fisheries livelihoods. Because there is no single definition for the blue economy, the concept lends itself to multiple interpretations across actors (see also Mulazzani and Malorgio 2017; Voyer et al. 2018). The overarching narrative about the blue economy, however, suggests it will support economic growth, foster sustainable development, and promote marine ecosystem health, while securing pro-poor economic growth (Barbesgaard 2018; Cisneros-Montemayor et al. 2019; Ertör and Hadjimichael 2020). Despite critiques of the concept as a neoliberal and exclusionary agenda (see Barbesgaard 2018; Cohen et al. 2019), the blue economy agenda has aligned itself with the SDGs, specifically focusing on SDG 14, encouraging governments to link economic growth with ocean conservation and attract investments from a variety of sectors and actors (Brent et al. 2018; Lee et al. 2020).

Finally, tools and approaches for the comprehensive and sustainable management of ocean resources have evolved in parallel to the two eras of ocean governance described in this review. Sold as one such tool, marine spatial planning (MSP) scholars suggest it may provide a participatory process for decision-making about siting and regulations of ocean activities (Lombard et al. 2019). Mara Ntona and Elisa Morgera (2018) explore how MSP, in the context of SDG 14 and the 2030 Agenda, can be used to provide transparency, improve well-being, and reduce conflict across users by spatially representing the environment, helping identify ideal siting for different activities, and providing information about the regulatory framework in place for each of those activities. While MSP is often touted by scholars and practitioners as a helpful tool for the efficient distribution of uses across ocean spaces, it less adequately addresses governance concerns about identifying the right actors and managing the interactions between them, designing adequate institutional arrangements for optimal decision-making processes, and ensuring accountability and equity (Lombard et al. 2019).

Challenges and Opportunities for Navigating the Future of Ocean Governance

Both eras of ocean governance have experienced challenges. However, the onset of the Anthropocene provides opportunities for improvement by redefining narratives about the ocean, creating novel institutional arrangements for inclusive participation in the management of shared resources, and thoughtfully incorporating interdisciplinary science and technologies (see Werle et al. 2018).

Challenges

Global Targets and Voluntary Commitments

Sustainability targets established in the UNCED, the WSSD, the UNCSD, and the MDGs were not self-implementing, raising questions about nations' capacity to execute commitments made toward those targets (e.g., Al-Abdulrazzak et al. 2017; Cicin-Sain et al. 2011). Kirsten Grorud-Colvert et al. (2019) and Hudson Pinheiro et al. (2019) further question the role of targets in achieving the desired outcomes, suggesting that targets alone do not guarantee effective conservation. For instance, they assert that despite the increase in overall spatial coverage of protected areas, these are not necessarily safeguarding biodiversity, adequately considering socioeconomic benefits, or addressing enforcement challenges. Additionally, proposed actions toward those global targets are increasingly in the form of voluntary commitments made by a range of actors, some of whom may not have the authority or jurisdiction for large-scale implementation. Recent scholarship on sustainability for the ocean suggests that while voluntary commitments constitute an innovative and potentially transformative tool for ocean governance, additional efforts are required to ensure they are upheld and that they fulfill desired expectations (Grorud-Colvert et al. 2019; Unger et al. 2017; Unger and Neumann 2019).

Spatial versus Functional Approaches to Ocean Governance

Scale remains a critical challenge for ocean governance, primarily because of misalignment between global mandates and national-level responsibilities, limited incentives for adhering to global agreements, and a lack of capacity to enforce agreements at the global level or to implement them locally. Spatial approaches reinforce these inefficiencies in a governance framework in which nation-states continue to be the primary regime-implementing actors. However, the

shift to a more comprehensive approach also presents accountability problems; possibly even more so as the growing diversification of actors suggests results in a less centralized mechanism for taking stock of actions and their outcomes (Unger and Neumann 2019). With ongoing negotiations for the expansion of a regime for ABNJ under UNCLOS, an emerging challenge is how to ensure that the guiding principles of freedom of the seas and the common heritage of humankind are respected (Sand 2007; Shackelford 2011). The role and nature of climate change as a defining factor in Anthropocene ocean governance further complicates the functional approach. As the impacts of climate change permeate all regions and sectors differently (Wilson and Forsyth 2018), they ultimately render a functional approach to climate change governance for the ocean a nearly impossible task.

Lack of Comprehensive and Meaningful Action and Practice for Equity Considerations

Admittedly broad, this challenge was epitomized by the emphasis on negotiation and treaty creation in the UNCLOS era, as opposed to taking actions to address problems identified in the negotiation process (Hyvarinen et al. 1998). As ecological conditions, actors, and institutional arrangements for governance shifted, it became even more pressing to act. However, it was unclear which actors (or alliances of actors) were doing what or how actions could contribute to the overarching goal of sustainable ocean governance. This challenge is not about whether to do something (e.g., set targets) or how to do it (spatial vs. functional). Instead, it raises questions about the actions themselves. With the advent of the blue economy narrative (e.g., Burgess et al. 2018) and the use of governance planning tools such as marine spatial planning and ocean zoning (e.g., Sanchirico et al. 2010), the emphasis has shifted toward procedural efficiency and market-based solutions in disregard of equity considerations for vulnerable actors (Barbesgaard 2018; Bennett 2018).

Opportunities

At the turn of the twenty-first century, ocean governance scholars presented a range of suggestions to improve the then top-down, international-agreement-based approach, including increasing the role of global civil society (Borgese 1999). Scholars emphasized the goal of sustainable development (e.g., addressing population growth and climate change), integrating ocean development with national-level (including land-based) development planning, and the importance of creating adequate institutional structures to support national ocean policies (Miles 1999). Additionally, scholars pointed out the importance of integrating ecosystem characteristics in designing policies (Juda 2003) and establishing a more efficient and effective system for managing international fora, bodies, and instruments, informed by the UN General Assembly's annual ocean debate (Hyvarinen et al. 1998). Several of these recommendations, embodied in the era of governance for the Anthropocene ocean, still apply and can be summarized into three main themes: redefining ocean narratives, institutional arrangements, and promoting interdisciplinary ocean science and technologies.

Redefining Ocean Narratives

One approach to overcoming the previously outlined challenges to meaningful action and practice would be to critically and intentionally redefine the relationship between the ocean, people, and resources. Specifically, we might turn to Philip Steinberg's (1999) scholarship on the social construction of the ocean, and Gordon Winder and Richard Le Heron's (2017) critical geographic approach to the blue economy, to explore possible structures for future ocean governance around innovative stewardship roles for a diversity of actors. In response to the dom-

inant narrative of the ocean as an opportunity for growth, Barbara Neumann et al. (2017) call for reclaiming the environmental dimension of the sustainability goal of Anthropocene ocean governance by creating tighter links between SDG 14 and other environmental SDGs. Further critiques of the blue economy caution its promotion as an approach that has desirable outcomes for all ocean stakeholders. Mads Barbesgaard (2018) and Tor Benjaminsen and Ian Bryceson (2012) further propose the need for a critical look at empirical evidence on the differential local impacts of such a narrative.

Novel Institutional Arrangements

Increasing the governance capacity of nations and other relevant groups in a comprehensive, responsive, inclusive, participatory, and representative manner is essential to support efforts toward improved accountability of targets and meaningful outcomes of voluntary commitments, and to increase stewardship across diverse actors (Stead 2018). Diverse actors require support to create arrangements that ensure actionable commitments through, for instance, national ocean policies (Balgos et al. 2015) and diverse decision-making cultures (Stead 2018; Tutangata and Power 2002). Peter Ehlers (2016) further suggests the need for an integrated, UN-supported ocean strategy. Other scholars support the increased use of politics and diplomacy (e.g., Our Ocean Conference) (Barbesgaard 2018), call for a registry of ocean commitments and the establishment of ocean partnerships (Unger et al. 2017), propose the use of a framework for evaluating indicators (Virto 2018), and recommend securing adequate financial support to incentivize sustainability (Mohammed et al. 2018). Lastly, recommendations to overcome the tension between spatial and functional approaches through institutional changes include using comprehensive ocean zoning (Sanchirico et al. 2010) and a more integrative approach possibly guided by regional goals (Tutangata and Power 2002).

Interdisciplinary Science and Technology

Using science and technology to support evidence-based decision-making is an essential aspect of Anthropocene ocean governance. Andrew Merrie et al. (2014), Shankar Aswani et al. (2018), and Selina Marguerite Stead (2018) call for an increase in interdisciplinary collaborations between government, industry, and scientists as a mechanism for innovation and inclusivity in the practice of governance. Barbesgaard (2018) calls for further research to better understand the local implications of global narratives, and Merrie et al. (2014) suggest future research should focus on interrelated challenges and the unpredictable nature of environmental change. Importantly, these calls for the integrative application of research and technology would not be possible without commitments to long-term observation systems (Ehlers 2016) and the necessary cross-sector collaboration for global ocean sustainability.

Conclusion

The two eras of ocean governance identified in this review differ in the type and role of actors, and relevant institutional arrangements and processes. Broadly, we have shown that ocean governance evolved from a top-down to a more participatory and representative process. Importantly, the UNCLOS era emphasized the establishment of jurisdictional zones, negotiations for agreements over functional governance elements (e.g., fisheries, pollution, conservation, climate change), and the development of national strategies to address said agreements. Ocean governance in this era operated under a dual system of national sovereignty and shared responsibilities over ocean spaces and resources, where the main actors were nation-states and international

organizations. In the Anthropocene, rapid environmental change, technological advances, and a globalized capitalist system coalesced under a vision of the ocean as planet Earth's final frontier. However, scholarship suggests that reliance on targets and voluntary commitments, unnatural separation between spatial and functional approaches, and a lack of consideration for equity in light growing global inequalities remain important challenges.

The increasing impact of human activities on the ocean is another crucial consideration. Indeed, cross-cutting functional elements such as climate change and the growing demand for energy and resources will likely lead to intensification of ocean uses that, as evidenced by the ongoing negotiations over ABNJ, require additional negotiations over space and use rights. Additionally, the advent of the blue economy foreshadows considerable economic investment in the ocean, potentially at the expense of equity considerations. While continuing to rely on the foundations of spatial governance established under UNCLOS, ocean governance in the future must move beyond structural changes. Furthermore, it might benefit from leveraging existing opportunities to redefine ocean narratives around equity, and to develop inclusive institutional arrangements for decision-making that engage across ocean resource users and with scientific and technological advances.

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