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CHAPTER 3

CONSERVATION OF THE MARINE ENVIRONMENT AND THE EXPLOITATION OF THE SEABED

«The Ocean, Climate Change and Marine Biodiversity of the Benthic Zone: Joining the Dots»

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RÉSUMÉ: *L'application d'une approche intégrée est largement reconnue comme un aspect essentiel de toute politique et de tout régime juridique pour la conservation des ressources naturelles. La relation complexe entre les ressources marines vivantes, le climat et les océans a été maintes fois soulignée au niveau scientifique et même politique. Le concept de «frontières planétaires» a mis en évidence la relation inextricable par laquelle la planète «se régule» comme un écosystème holistique.*

En pratique, ce concept reste toutefois quelque peu confiné à la science et à la rhétorique politique. En vertu du droit international, le changement climatique, les océans et la biodiversité marine continuent d'être réglementés de manière distincte les uns des autres. Malgré la volonté renouvelée de la communauté internationale, au cours des dernières années, de réglementer de manière plus ambitieuse et plus efficace le changement climatique ainsi que la gouvernance des océans, y compris la conservation de la biodiversité et des habitats marins, l'élaboration de normes internationales continue à évoluer en «silos». La présentation souligne le besoin urgent du droit international d'adopter une approche intégrée efficace

pour réglementer un aspect de la gouvernance des océans, à savoir l'utilisation durable des ressources vivantes des fonds marins, menacée par les impacts négatifs du changement climatique. Le changement climatique est un facteur de menace multipliant les problèmes actuels liés aux fonds marins (par exemple, le blanchissement des coraux) ainsi que la cause de nouveaux risques (par exemple, la rupture d'hydrates de méthane) pour l'océan et ses ressources. Ce chapitre examinera d'abord les sources de droit international applicables à la recherche de normes multilatérales applicables, puis la pertinence de celles-ci pour la protection de l'océan contre les risques liés au changement climatique.

Le chapitre vise à démontrer que, si la multitude de normes internationales existantes, bien appliquée, améliorerait considérablement la santé des océans et de ses ressources, des normes de fond et de procédure «novatrices» pourraient assurer une meilleure résilience et une préparation permettant d'adapter la gouvernance des océans aux effets du changement climatique. Un manque d'action dans cette direction mettrait en péril la gouvernance durable des océans conformément à la règle de droit. Reprenant le thème de la Conférence sur la conservation du milieu marin et l'exploitation des fonds marins, cette contribution, dans sa conclusion, suggère des techniques juridiques susceptibles de concilier l'application des principes/normes juridiques internationaux, avec les mesures d'atténuation et d'adaptation requises pour prévenir éventuellement les changements géophysiques, chimiques et biologiques océaniques que le changement climatique peut provoquer et les effets que ces changements ont sur l'humanité et la biodiversité. L'inclusion de ces normes dans l'accord d'application de la Convention des Nations Unies sur le droit de la mer de 1982, au-delà des espaces sous juridiction nationale, actuellement en cours de négociation, ou même d'un nouvel instrument juridique, pourrait permettre de créer un nouvel instrument juridique multilatéral qui intègre la régulation des fonds marins, en tant qu'habitat de la biodiversité marine et du changement climatique.

Mots-clés: *gouvernance des océans; changement climatique; espèces benthiques; approche intégrée.*

ABSTRACT: *The application of an integrated approach is widely acknowledged as an essential aspect of any policy and legal regime for the conservation of natural resources. The intricate relationship between living marine resources, climate and the ocean has been repeatedly stressed at the scientific and even at the political level. The concept of the «planetary boundaries» has highlighted the inextricable relationship via which the planet «regulates itself» as one holistic ecosystem.*

In practice, however, it remains somewhat confined to science and political rhetoric. Under international law, climate change, the ocean and marine biodiversity continue to be regulated distinctly from one another. Notwithstanding the international community's renewed focus in recent years to regulate more ambitiously and effectively climate change as well as ocean governance, including the conservation of marine biodiversity and habitats, international norm-making continues to evolve in «silos». The presentation highlights the urgent need for international law to adopt an effective integrated approach in regulating one aspect of ocean governance namely, the sustainable use of the living resources of the seabed, threatened by the negative impacts of climate change. Climate change is a threat multiplier of current problems relating to the seabed (e. g., coral bleaching) as

well as the cause of new risks (e. g., breakdown of methane hydrates) to the ocean and its resources. The paper will first examine applicable international law sources in search of applicable multilateral norms and whether they are fit for purpose in protecting the ocean from the risks of climate change.
The paper aims to demonstrate that while the multitude of existing international norms, if well implemented, would greatly enhance the health of the oceans and its resources, «innovative» substantive and procedural norms may ensure better resilience and preparedness to adapt ocean governance to the effects of climate change. Lack of action in this direction would jeopardize sustainable ocean governance according to the rule of law. Using the Conference theme on the conservation of the marine environment and the exploitation of the seabed, the paper in its conclusion will suggest possible legal techniques that would dovetail the application of International legal principles/norms with mitigation and adaptation measures required to harness and where possible prevent oceanic geophysical, chemical and biological changes that climate change may cause and the effects which these changes have upon humanity and biodiversity. The inclusion of these norms into the Implementation Agreement on Biodiversity Beyond National Jurisdiction to the 1982 United Nations Convention on the Law of the Sea, currently under negotiation, or a new legal instrument altogether, may serve to generate, a new multilateral legal instrument that effectively integrates the regulation of seabed as a habitat of marine biodiversity and climate change.

Keywords: *ocean governance; climate change; benthic species; integrated approach.*

1. INTRODUCTION

The impacts of climate change upon the oceans, namely their warming, sea level rise, ocean acidification deoxygenation and resultant marine biodiversity loss are consistently highlighted in various scientific reports[1]. Scholars and academic networks from various disciplines have raised awareness on the multifaceted and complex relationship between the ocean, and climate change[2]. Earth scientists describe how the climate and oceans relationship accentuates the complexities of the natural world. It is a classic example of how planetary boundaries[3], such as global warming, ocean acidification and marine biodiversity loss, interact to exacerbate the negative impacts caused by human behaviour[4].

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[1] Letcher, T. M. (ed.) (2015), *Climate Change: Observed Impacts on Planet Earth*, Elsevier, B.V, 2nd Edition, 3-7.

[2] Stern, N. (2007), *The Economics of Climate Change: The Stern Review*, Cambridge University Press, 2007; Kahn, B. (2016), «Ten Years On, Climate Economists Reflect on Stern Review», Climate Central, *https://www.climatecentral.org/news/climate-economists-stern-review-20827*.

[3] Through the progression of Earth systems science, humans have been able to identify a number of environmental thresholds, namely the «Nine Planetary Boundaries». These non-linear boundaries interact to serve as a guide for humans, determining the level which certain planetary systems must not cross to remain «non-hazardous». Rockström says that, «the planet is a complex, self-regulating system» (TEDGlobal, 2010, 9:51).

[4] Tommen, M. (2014), «A Wicked Problem: Controlling Global Climate Change», The World Bank, 2014 *https://www.worldbank.org/en/news/feature/2014/09/30/a-wicked-problem-controlling-global-climate-change*. See also Huntjens, P., and Nachbar, K. (2015), «Climate Change as a Threat Multiplier for Human Disaster

Outcomes from related conferences and even applicable treaties acknowledge that a cross sectoral and integrated ecosystem approach is key to achieve good governance of these natural resources[5]. The current international policy and norm-creating pathways, however, remain too fragmented to deal effectively with the interface between biodiversity, oceans and climate change[6]. Although fragmentation of the law is a common occurrence even at the national level, municipal law has the advantage of being scrutinised by a central law-making body like parliament, which can facilitate the adoption of an integrated approach and the harmonisation of conflicting norms, when and if the situation arises. Matters are of course more challenging at the international level not only because there are many more players but also because of the nature of international law and policy-making, which relies instead on acquiescence and consensus by all parties in the absence of centralised governance[7].

In international fora, negotiators are given a specific mandate and they deliberately refrain from delving into issues, which fall within the remit of other international institutional bodies and treaties. At best they call upon the need for collaboration with other bodies or treaties that are interrelated to their task. Sticking to the forum's or the treaty's mandate is a methodology founded upon a centuries old legal practice based on delineated roles, which cannot interfere with the «reserved domain»[8] of other subjects of international law and with the specific mandate of other international fora entrusted with the negotiations of other multilateral legal instruments. Science, however, is showing us that despite all the pain-staking efforts to reach ambitious substantive obligations spelt out in the Paris Agreement and various conservation treaties, results will not be as effective if this «silo approach» methodology persists.

Can international law emulate the natural interface between these three Planetary Boundaries by adapting its current working modalities to integrate effectively the regulation of their conservation, rather than just pay lip service to it? Three steps can help to identify pathways for multilateral norm-making, which lead to an effective integrated approach, these are:

— Stocktaking of applicable International law sources,

— tracing the legal issues arising from the linkages between the natural resources in question,

— identifying any legal conflicts and filling the gaps.

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and Conflict», The Hague Institute for Global Justice, Working Paper 9, *https://www.thehagueinstituteforglobaljustice.org/wp-content/uploads/2015/10/working-Paper-9-climate-change-threat-multiplier.pdf*.

[5] See for example Paris Agreement (2015) Preamble, paragraph 13.

[6] Mumba, M.; Munang, R., and Rivington, M., (UNEP)/Macaulay Lnd Use Research Institute (2014), «Ecosystem Management: The Need to Adopt a Different Approach Under a Changing Climate», *World Resources Report*, Washington, World Resources Institute, *https://www.wri.org/our-work/project/world-resources-report/ecosystem-management-need-adopt-different-approach-under*.

[7] Borg, S. (2012), *Conservation on the High Seas, Harmonizing International regimes for the Sustainable Use of Living Resources*, Edward Elgar, New Horizons in Environmental and Energy Law, 5.

[8] Brownlie, I. (1990), *Principles of International Law*, Oxford, Oxford University Press, 4th Edition, 290-292.

Stocktaking is an important first step. The plurality of norms that regulate the ocean, biodiversity and climate reflect the specialised legal principles, such as liability for environmental harm and the precautionary principle that render international law fit for purpose to address environmental issues of international concern[9]. The development of these principles highlights the dynamism of international law, which has evolved to suit the particular nature of environmental problems. States are obligated to implement applicable norms relating to climate, marine biodiversity and the ocean, found in treaties, customary international law and general principles of international law, they have acquiesced to. If implementation is effective, the amelioration in the conservation status of one resource, would benefit also the others. For example, if parties to the Paris Agreement live up to their obligations and achieve carbon neutrality by the end of the century, this should mitigate ocean acidification and hence reduce marine biodiversity loss caused by this «other CO_2 problem»[10]. Tracing the linkages regarding the cause and effect of negative impacts which one resource would have on another would highlight the need to tweak and revise existing norms to reflect more recent scientific data observations and to replace norms that may conflict, as these would undermine progress and lead to further resource degradation.

This paper focuses upon the risks to benthic biodiversity as one of the forms of collateral damage which climate change is considered to have upon the ocean. The paper will follow the three steps indicated above, to suggest legal options that may serve to fill in gaps and overcome conflicts that stand in the way of an integrated approach for the conservation of benthic biodiversity, within the context of ocean governance in an era of climate change.

2. STOCKTAKING: THE REGULATION OF BENTHIC BIODIVERSITY UNDER INTERNATIONAL LAW

These last few decades the international community has focused upon biodiversity loss as an issue of global concern that merits immediate political and legal action[11]. Marine living resources feature prominently where legal efforts to address biodiversity loss are concerned, both at the national and international level, culminating more recently in the establishment of an International Negotiating Committee with a mandate to formulate an Implementation Agreement to the 1982 Convention on the Law of the Sea on Biodiversity Beyond National Jurisdiction.

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[9] Birnie, P.; Boyle, A., and Redgwell, C., *International Law and the Environment*, Oxford, Oxford University Press, 3rd Edition, 115.

[10] Dooney, S. C., Fabry,V. J., Feely, F. A., and Keypass, J. A. (2009), «Ocean Acidification: The Other CO_2 Problem», *Annual Review of Marine Science*, 1:1, 169-192. See also *https://www.compoundchem.com/2017/01/18/ocean-acidification-co2/*.

[11] The United Nations 3rd Global Biodiversity Outlook Report (2010), IUCN and Secretariat Convention Biological Diversity.

On a parallel note, the Paris Agreement obligates State Parties to enhance sinks of greenhouse gases (GHGs) in meeting their commitments for a carbon neutral Earth by mid century. The ocean is the largest CO_2 sink, but the climate treaties do not venture any further on how the ocean can be enhanced as a sink of CO_2, leaving the matter in the hands of State parties to adopt the adaptation measures they deem necessary. Nor is there any mention of good governance of the ocean and its resources in any of the climate treaties.

Zooming in upon international norms that address benthic biodiversity, one has to look into the evolution of the law of the sea. The seabed is subject to the national jurisdiction of the coastal State for up to 200 nautical miles[12]. The 1982 United Nations Convention on the Law of the Sea (UNCLOS) reiterated what the 1964 Convention on the Continental Shelf had established: the coastal States' exclusive rights over their continental shelf[13]. The continental shelf regime under the 1982 UNCLOS, is considered to be a codification of customary international law[14]. The coastal State has exclusive rights to explore and exploit the resources of the continental shelf including the living resources which fall under the scope of the continental shelf regime, namely those «organisms belonging to sedentary species, that is to say organisms, which at the harvestable stage, either are immobile on or under the seabed or are unable to move, except in constant physical contact with the seabed or the sub-soil»[15].

The regulation of the seabed beyond national jurisdiction, referred to as the «deep seabed», has been subject to acrimonious debates during the negotiations that led to the 1982 Convention. The 1982 UNCLOS regulates the deep seabed under Part XI. It establishes that mineral resources located therein, are excluded from appropriation by States and are subject to global management by the International Seabed Authority (ISA) as the «common heritage of mankind»[16]. Major industrialised nations involved in deep sea mining, refused to agree to UNCLOS Part XI, which enshrined the legal status of deep seabed mineral resources, as being vested in «mankind as a whole»[17] and would be subjected to global management by the International Seabed Authority (ISA) on whose behalf (mankind), the ISA «shall act»[18]. No State under Part XI has any legal rights of access over mineral resources. The major industrialised States, whose multinational were involved in seabed mining beyond national jurisdiction shunned the ratification of

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[12] Coastal States with naturally broad shelves have the potential if they follow the procedure stipulated under Article 76 (5) of the same Convention, be allowed to extend their claim up to 350 miles instead of the standard 200 miles.

[13] Ashfaw, S. (2010), «Something for Everyone: Why the United States should Ratify the Law of the Sea Treaty», *Journal of Transnational Law and Policy*, 19 (2) (Spring), 357-399.

[14] *https://www.unclosdebate.org/argument/855/us-already-abides-unclos-matter-customary-international-law-and-domestic-policy*.

[15] UNCLOS, Art. 77 see especially subparagraph (4).

[16] 1982 UNCLOS, Art. 136.

[17] *Ibid.,* Art. 137 (2).

[18] *Ibid.*

the 1982 UNCLOS because the same Convention does not allow any reservations to Part XI. An Implementation Agreement, concluded in July 1994, managed to unravel the deadlock and enable deep seabed mining points in accordance with Part XI of the 1982 UNCLOS[19].

Part XI makes no mention of «sedentary» species on the deep seabed outside national jurisdiction but «only to flora and fauna of the marine environment»[20], whose protection forms part of the ISA responsibility to ensure the conservation of the marine environment[21]. It must be noted that UNCLOS defines «resources of the Area» subject to the common heritage of mankind as the mineral resources of the deep seabed»[22], namely «all solid, liquid or gaseous mineral resources in situ»[23]. Benthic living resources occurring in this same area are therefore excluded from the scope of the common heritage regime. Under Part XI, the ISA has the legal responsibility to protect benthic living resources during its operations as it is obligated not to harm the marine environment and to prevent «damage to the flora and fauna of the marine environment»[24]. Nevertheless, neither the 1982 Convention nor the 1994 Implementation Agreement regulate the prohibition or any form of access regarding the exploitation of benthic living resources beyond national jurisdiction. In sum, since living resources of the seabed beyond national jurisdiction fall outside the scope of the common heritage regime, they are neither subject to global management nor to non-appropriation by any State, as is the case with mineral resources.

2.1. Benthic species beyond national jurisdiction

Benthic species in areas beyond national jurisdiction were not an issue of concern when UNCLOS was being negotiated but are of particular concern in this day and age, due to various anthropogenic activities. Species have been discovered on seamounts and around deep sea hydro-thermal vents not only on the outer limits of continental shelf but also on other parts of the deep seabed. The unregulated taking or harvesting of these unique components of marine biodiversity, is of international concern because if one keeps in mind how terrestrial species located within national jurisdiction, have suffered unsustainable harvesting to support the commercial need for genetic material, one can imagine that the risks for marine sedentary species beyond national jurisdiction are much greater.

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[19] Brown, E. (1995), «The 1994 Agreement on the Implementation of Part XI of the UN Convention on the Law of the Sea: Breakthrough to Universality?», *Marine Policy*, Volume 19, Issue 1, January, 5-20. See also Jaeckel, A. (2016), «Deep Seabed Mining and Adaptive Management: The Procedural Challenges for the International Seabed Authority», *Marine Policy*, Volume 70, August, 205-211.

[20] *Ibid.,* Art. 145 (b).

[21] *Ibid.,* Art. 145.

[22] *Ibid.,* Art. 133 and 136.

[23] *Ibid.,* Art. 133.

[24] See Art. 145 (b).

Bioprospecting is carried out mainly for appropriating these species' genetic resources either for research or for commercial purposes, although the demarcation line between these two motives of bioprospecting is often blurred[25]. In order to find a legal basis to regulate bioprospecting on the deep seabed under the 1982 UNCLOS, arguments have been made to classify this activity either, as fishing (harvesting), or as mining or as scientific research. Bioprospecting, however, is a *sui generis* activity. It cannot be classified as any of these activities because it overlaps with the three and is carried out for entirely different reasons than any of these activities.

If bioprospecting is classified as «harvesting», the benthic species outside development zone would be regulated under the freedom of fishing regime[26]. Access to these resources is therefore open and qualified by the need to take the necessary «conservation measures»[27]. The necessary conservation measures, which would apply the harvesting of benthic species outside national jurisdiction are those found in treaties, which the State, under whose authority the bioprospecting operations are taking place, is a party to. These would include the Convention on Biological Diversity (CBD) whose provisions apply to State parties wherever they may carry out operations under their control. The CBD Article 4, which establishes its jurisdictional scope, provides that «subject to the rights of other States, and except as otherwise expressly provided in this Convention, the provisions of this Convention apply, in relation to each Contracting Party: (b) In the case of processes and activities, regardless of where their effects occur, carried out under its jurisdiction or control, within the area of its national jurisdiction or beyond the limits of national jurisdiction».

One may argue that it may be beneficial to consider benthic species and bioprospecting as subject to the freedom of fishing on the high seas as international law has various sources that establish conservation measures which qualify States' freedom of access to living resources outside national jurisdiction. However, few, if any, treaties specifically regulate fishing for the types of benthic species occurring on the deep seabed. The most effective international law sources for the conservation of such species, other than the CBD, would be the regional agreements whose conservation obligations would be more specific and tailor made to address threats to regional benthic biodiversity.

The current negotiations on BBNJ[28], delve into the legal status of marine genetic resources with some States arguing in favour of subjecting such resources

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[25] UNCLOS, Art. 77(4).

[26] UNCLOS, Art. 87 (1) (e).

[27] UNCLOS, Art. 117.

[28] Kapil, N. (2016), «Ocean governance: strengthening the legal framework for conservation of marine biological diversity beyond areas of national jurisdiction», *Maritime Affairs: Journal of the National Maritime Foundation of India,* 12:1, 65-78, DOI: 10.1080/09733159.2016.1181394. See also Sunil, Kr. (2015), «A. Legal Issues in the Protection of Marine Biological Diversity Beyond National Jurisdiction», *Maritime Affairs: Journal of the National Maritime Foundation of India*, 11 (1), 84-98, DOI: 10.1080/09733159.2015.1037116.

to the common heritage regime and others insisting that common heritage applies only to mineral resources or that access to such resources is subject to the high seas freedoms. Another faction refers to the need for a hybrid or a *sui generis* regime under the new International Legally Based Instrument (ILBI) that is being negotiated. Whatever the outcome the new instrument under negotiation, the mandate given to the negotiating parties is to fill in the legal lacuna by regulating access to marine genetic resources on the deep seabed. The mandate also includes the establishment of area-based management rules for areas beyond national jurisdiction. This would provide a crucial legal basis for regulating the effects of climate change with respect to BBNJ. As discussed above, extraction/mining outside national jurisdiction for living benthic resources is not regulated at all, given that the common heritage regime applies only to mineral resources on the deep seabed. Although there are States who argue that benthic living resources are subject to the common heritage regime, as pointed out above, such a legal interpretation contrasts with the scope of application of the common heritage as specified under UNCLOS [29]. The argument that bioprospecting falls under marine scientific research under the high seas freedoms is also difficult to support, as it is difficult to draw the line when research is eventually used for commercial exploitation [30].

Apart from bioprospecting, anthropogenic activities affecting negatively benthic biodiversity beyond national jurisdiction include fishing operations on the high seas. Fishing using bottom trawl nets, destroy benthic species. Current technology allows trawling to depths of 1,200 metres but limited to slopes less than 30 degrees. Bottom trawling not only leads to the incidental catch but also to the destruction of sedentary species and their benthic habitat. Although regulated by various applicable treaties, fishing on the high seas remains afflicted by illegal, unreported and unregulated fishing (IUU). Apart from the geophysical difficulties, enforcement on the high seas, is hampered by abuse on the part of those flag States that do not monitor compliance with conservation measures and by flag States that do not chose to become parties to regional fisheries organizations or fisheries treaties that regulate conservation on the high seas. These two most frequent causes of IUU, also facilitate flag hopping as owners and operators of fishing vessels choose registries that have the least stringent fisheries conservation laws and/or those that do not have the capacity or the political will to monitor fishing vessels flying their flag participating in high seas fisheries. IUU is not directly related to climate change but climate change will serve as a threat multiplier in accelerating biodiversity loss caused by IUU as the physical and chemical status of the ocean as a habitat will be severely affected by climate change as discussed in Part 3 of this paper below.

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[29] Borg, S. (2012), *Conservation on the High Seas, Harmonizing International regimes for the Sustainable Use of Living Resources*, Edward Elgar, New Horizons in Environmental and Energy Law, 63-64.

[30] *Ibid.*

2.2. Benthic species within national jurisdiction

The coastal State's rights to exploit the sedentary species on its continental shelf up to 200 miles are exclusive[31]. The non-scientific definition of sedentary species under Article 77 (4) does not include all benthic species, is rather restrictive and lends itself to arbitrary interpretation, which have led to disputes between States[32]. Some benthic species in dire need of protection from the effects of climate change such as corals, appear to fall under Article 77 of UNCLOS because corals consist of *living* species and *non-living* species. Article 77 in fact refers to «mineral and other non-living resources of the seabed and the subsoil together with living organisms belonging to the sedentary species»[33].

Species falling outside the definition would be considered as species subject to the exclusive economic zone (EEZ) or exclusive fishing zone (EFZ), whose exploitation and conservation falls under the responsibility of the coastal state when it has declared an EEZ or an EFZ. If the coastal State has not declared either of the two zones, the benthic species would be subject to the high seas regime as discussed above. Coastal states usually have an interest in favouring a wide interpretation of what falls under the definition of «sedentary species». Benthic species that qualify as «sedentary species» that would fall under the continental shelf regime rather than the EEZ or EFZ regime, would not be included for the purpose of calculating the Total Allowable Catch[34]. The coastal State therefore is not obligated to share the surplus with third States. Similarly, the UNCLOS provisions on fisheries conservation in the EEZ would not apply[35]. A particular peculiarity regarding Article 77 of UNCLOS, is the absence of any mention of conservation obligations on the part of the coastal State when exercising its exclusive rights of exploring or exploiting its natural resources. It needs to be pointed out, however, that under UNCLOS, States have a general obligation to protect and preserve the marine environment[36] and to protect rare and fragile ecosystems[37]. Furthermore, both under the EEZ[38] and the high seas regime[39], States whether they act in their capacity as coastal States or as participants in high seas fisheries, have an obligation to consider the effects on associated and dependent species. So one can argue that for conservation purposes, it turns out better if benthic species within national jurisdiction fall under the EEZ or the EFZ regime because the coastal State has

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[31] UNCLOS, Art. 77(1) and (2).

[32] Lobster wars and scallop wars see: *https://www.bing.com/videos/search?q=lobster+wars&view=detail&mid=D0D6F735B8D654DF2BD1D0D6F735B8D654DF2BD1&FORM=VIRE* and see also: *https://p.dw.com/p/34OP3*.

[33] UNCLOS, Art. 77 (4).

[34] UNCLOS, Art. 62, especially subpagraph (2).

[35] *Ibid.,* Art. 61 to 68. See especially Art. 68.

[36] *Ibid.,* Art. 192.

[37] *Ibid.,* Art. 194 (5).

[38] *Ibid.,* Art. 61 (4).

[39] *Ibid.,* Art. 119 (1) (b).

more stringent obligations under the EEZ or EFZ regime than it has under the continental shelf regime, when choosing which conservation measures to apply to «sedentary species».

The CBD can remedy the lacuna of not including conservation obligations with respect to «sedentary species» under UNCLOS' continental shelf regime. Article 4 (a) of the CBD establishes that, «subject to the rights of other States, and except as otherwise expressly provided in this Convention, the provisions of this Convention apply, in relation to each Contracting Party: (a) In the case of components of biological diversity, in areas within the limits of its national jurisdiction». The CBD bestows upon its parties the obligation *inter alia* of managing biological resources located within national jurisdiction to ensure their conservation and sustainable use *in situ*. This would include any form of exploitation of living resources, including benthic species and any operations to abstract their genetic material, carried out on the continental shelf. The CBD states that the convention's obligations must be applied consistently with the obligations under UNCLOS[40] reflecting Article 237 (2) of the 1982 Convention, which establishes that «specific obligations assumed by States under special conventions, with respect to the protection and the preservation of the marine environment, should be carried in a manner consistent with the general principles set forth in this Convention». But the CBD offers more impetus and legal comfort to preserve areas and components of significant biodiversity. Furthermore, the CBD provides a number of principles that address aspects of bioprospecting operations such as, access and benefit sharing arrangements for genetic resources. States are «to endeavour to create conditions to facilitate access to genetic resources by other States, the establishment of mutually agreed terms for access as well as transfer of technology under favourable terms and exchange of information»[41].

The CBD establishes that genetic resources are subject to the sovereign rights of the State where located and thus subject to the State's right to exploit them pursuant to its environmental policies[42]. The expectation is that where States obtain benefits from the exploitation of biodiversity they will be encouraged to ensure sustainable use of its components. The CBD recognition of States' rights to determine access by other nations to the genetic resources within a state's jurisdiction would include the outer continental shelf. In practice, it is difficult for a coastal State to monitor what happens on the outer limits of its continental shelf, so it may be more beneficial to enter into agreements with foreign companies involved in research, including locals, to participate, promote capacity building and be in a position to assert its rights when it has better scientific knowledge. Under the auspices of the CBD, States have continued to develop principles and guidelines to assist States and companies in negotiating access and benefit sharing arrange-

[40] CBD, Art. 22.
[41] CBD, Art. 15 (2).
[42] *Ibid.,* Art. 15 (1).

ment. The 2010 Nagoya Protocol strengthens the CBD's commitment to equitable distribution of benefits arising from successful bioprospecting. The Protocol calls for benefit-sharing «by appropriate access to genetic resources and by appropriate transfer of relevant technologies»[43].

3. BENTHIC SPECIES AND LINKS WITH CLIMATE AND OCEAN GOVERNANCE

The stocktaking exercise on the current state of play regarding the conservation of benthic species under international law, serves to highlight the imminent need to take immediate action in this direction. Climate change as a threat multiplier will exacerbate even further the precarious state of benthic species due to the intricate relationship between climate and oceans. The main category of harmful effects climate change will have upon the ocean can be categorised into three types, which are interrelated.

The physical effects caused by warming of the oceans:

— melting of icecaps, ice sheets and glaciers,

— loss of albedo effect,

— sea level rise and inundation,

— effects upon currents and streams and upwelling,

— extreme weather events and surges.

The chemical effects caused by warming and absorption of excessive CO_2 in the atmosphere:

— acidification,

— deoxygenation,

— salinity,

— release of methane hydrates.

The biological effects caused by warming, acidification, deoxygenation:

— biodiversity loss,

— spread of alien species,

— algal growth,

— affects upon food pyramid and migratory patterns.

Since the ocean and the entire planet for that matter constitute one large ecosystem, all of these impacts are likely to have an effect upon benthic species, the paper will focus on the major negative effects.

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[43] Nagoya Protocol, Art. 5.

3.1. Warming of the oceans

With the exception of Antarctic sea-ice, recently increasing by 1% a year, nearly all the ice on the planet is melting. As the white surfaces decrease in area, less energy is reflected into space via the so called albedo effect and the Earth will warm up even more. The loss of Arctic ice is of particular concern. By exposing the ocean surface to sunlight, the water warms up. This melts the ice from underneath, while man-made CO_2 in the atmosphere warms the surface. Humidity also increases generating water vapour, which is a powerful greenhouse gas that will lead to more warming. More ice therefore melts, which exposes more water, which melts more ice from underneath. Albedo is a subject needing more research. At present, science cannot say as yet how climate change is affecting albedo, how it might be affected in the future, and what contribution to climate change it may make. This is definitely an area where the precautionary approach should guide States and international organizations to keep up the momentum in implementing the Paris Agreement, which aims for carbon neutrality to halt global warming caused by anthropogenic activity.

3.2. Warming of the ocean

Warming of the ocean would affect benthic habitat and species' conservation status. It would also affect the stability of gas hydrates on the ocean floor, where some forms of unique benthic species thrive. Loss of albedo in the Arctic could heat the water sufficiently to release methane, a greenhouse gas twenty times more potent than CO_2 stored in ice crystals called clathrates[44]. In very cold regions like the Arctic, methane hydrates occur on the shallow continental shelf (less than 200 metres of water depth) or on the land in permafrost, the deep-frozen Arctic soil. Methane hydrates also occur on the continental slopes, those areas where the continental plates meet the deep-sea regions. The conditions are favourable here as well because sufficient organic matter accumulates on the bottom and the adequate temperature and pressure prevail. While science demonstrates the destabilization of methane hydrates and thus to the release of methane are still subject to controversy, the possible impacts of a temperature increase to the release of deposits of methane hydrate is a matter that requires a precautionary approach. As a green house gas, methane is around 20 times more potent per molecule than carbon dioxide. An increased release of methane from the ocean into the atmosphere could significantly intensify the greenhouse effect. Scientific research into methane hydrates stability in dependence of temperature fluctuations, as well as of methane behaviour after it is released, are therefore urgently needed.

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[44] Methane hydrates and global warming, *https://worldoceanreview.com/en/order/*.

3.3. Sea-level rise and inundation

Whilst the above effects primarily warrant an integrated approach mainly in terms of scientific research, sea level rise and inundation, leading to partial and complete loss of territory, would raise unprecedented legal questions as to how International law would deal with statehood, nationality and maritime jurisdictional claims of States that may become submerged. This would include maritime jurisdiction claims over the continental shelf, EEZ and EFZ and therefore rights and obligations of these same States over benthic species. Sea level rise will lead to the displacement of entire populations from their nations, rendering them homeless and possibly stateless, apart from other devastating effects on coastal and marine living and non living resources. Coastal erosion and flooding may be considered as falling within the remit of domestic law, but international law would be invoked in human rights, any effects on maritime jurisdiction claims of submerged States and international solidarity issues such as loss of life, damages to property and infrastructure, would affect developing States and vulnerable groups more severely.

Sea level rise is an effect of the melting of the polar ice caps and the further warming of the oceans leading to thermal expansion and further rise in sea level would free the North West passage and other maritime areas from ice, opening new trade and shipping routes. The latter of course has positive repercussions for anthropogenic commercial interests but may have irreparable repercussions on benthic species in these fragile ice covered ocean areas, if their exploitation either via bioprospecting or any other form of harvesting remains unregulated. It may also lead to territorial disputes and environmental threats as previously inaccessible resources become available for exploitation. Additionally, new fossil fuel resources in the form of methane hydrates, referred to above, may become accessible but may also perilously impact upon benthic biodiversity and as mentioned above, destabilise this vast energy resource leading to further global warming risks. Inundation due to sea level rise will affect to a greater or lesser extent all coastal nations, where it will lead to loss of benthic habitats through increased coastal erosion, and sea water intrusion in coastal aquifers.

3.4. Ocean acidification and its impacts on the marine environment and living resources

Ocean acidification is probably the biggest threat to most benthic species. Oceans and forests are the major natural sinks that offset the concentration of carbon dioxide emissions in the atmosphere. There is, however, a marked difference when it comes to the side effects resulting from absorption upon the two carbon sinks. Forests suffer no harmful effects no matter how high the rate of absorption of carbon dioxide is and may replace other habitats as the conditions become more favourable. Ocean acidification results from excessive CO_2 absorption, due to an

escalated concentration of carbonic acid and a subsequent decrease in the amount of dissolved carbonate ions, thereby lowering the pH level of the oceans. Ocean acidification is a natural process, apart from the presence of CO_2 in the atmosphere, some coastal or underwater volcanoes also release CO_2 when erupting. Input from rivers usually stabilises the pH, because of dissolved chemicals from rocks found in the water but it appears that this natural replacement has failed to match the constantly accumulating levels of CO_2, which oceans are being forced to absorb due to higher concentrations of atmospheric CO_2 from anthropogenic emissions[45]. Throughout these last four decades, when climate change has dominated first scientific and later political fora, the focus of the discussion regarding climate change impacts on oceans has been predominated by concern over sea level rise. It is relatively recently that ocean acidification, has been recognised as the «other CO_2 problem»[46].

Ocean acidification severely damages the marine ecosystem, both as habitat and its living resources, leading to biodiversity loss. The species most at risk are coral reefs and species with shells, made from calcium carbonate forms, such as aragonite or calcite. A low concentration of carbonate ions in the oceans that is below saturation level, would affect growth and the very survival of species such as corals, molluscs and planktonic calcifiers, which depend on it to form protective skeletons. The increased acidity in the seawater will cause their skeletons to dissolve. Ocean acidification may even spread to affect larger marine organisms like finfish as well as habitats which depend upon marine calcifiers (such as coral reefs)[47]. All these variables will leave a noticeable change in the food cycle-eventually affecting human life and interests[48].

Ocean acidification harms the so called «intangible benefits» of benthic ecosystems, namely species and habitats, protected for their own intrinsic value and not for anthroprogenic reasons. Coral reefs, for instance, provide a habitat for many organisms. They are becoming an increasingly endangered species due to higher temperatures and acidity of the oceans. The lack of calcium carbonate, severely limits their growth and crafting because of increased friability. Furthermore higher ocean acidity contributes to the bleaching of these corals, due to an elevated ocean temperature and more ultraviolet radiation.

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[45] Orr, J. C. (2011), «Recent and Future Changes in Ocean Carbonate Chemistry», in Gattuso, J. P., and Hanson, L. (eds.), *Ocean acidification,* Oxford, Oxford University Press, 41-46.

[46] Doney, Fabry, Feely and Kleypas, 2009 , as cited by Henderson, 2006; Turley, 2005, 170.

[47] Certain marine ecosystems, such as coral reefs and oyster reefs, are referred to as «calcifiers» as they produce a form of «aragonite shell» from the calcium carbonate found in the water. Aragonite forms as a precipitate, an insoluble substance, from either physical or biological processes, occurring in the sea-water. From pre-industrial times, the global mean saturation state of aragonite in sea surface water has fallen from a value of 3.44 Ω_{arag} to 2.90 Ω_{arag} [Rockström *et al.* (2009) as cited by Guinotte and Fabry (2008)]. If the saturation state of aragonite falls below a value of 3, then the organism will undoubtedly begin to suffer, however, it falls even lower and below 1, the shell will dissolve («Ocean Acidification: Saturation State», n. d.).

[48] A geographical location heavily affected by ocean acidification, is the Mediterranean Basin. The Mediterranean offers a variety of marine services and amenities including, leisure facilities, mineral extraction, fisheries and navigation, all of which help the region to thrive economically. Consequently high income activities, such as tourism and fishing will suffer as a result of acidification.

If well implemented a number of existing sources of international law such as pollution control from land based sources, MARPOL's recent Protocol to increase energy efficiency in ships, management plans for biodiversity in marine areas and the fulfillment and upscaling of nationally determined contributions by State Parties to the Paris Agreement can already play a crucial part in mitigating acidification. The adoption of international action plans and norms would be a crucial first step for the international community to deal strategically with this threat. As ocean acidification is being mainstreamed in various fora, new norms may be formulated under different policy and legally binding instruments to meet with emerging scientific findings on ocean acidification.

4. FILLING THE LEGAL GAPS AND ELIMINATING NORMATIVE CONFLICTS

A number of International law scholars and academic networks have raised awareness on the multifaceted international law implications of the relationship between oceans and climate change[49]. International law's effectiveness is linked to its dynamic capacity to adapt to emerging circumstances. In this respect international law needs to become more coherent when addressing cross cutting threats of climate change such as sea level rise as well as ocean acidification and warming. Some existing norms under applicable sources of international law may need to be supplemented by more robust legal frameworks due to a fundamental change of circumstances brought about by the effects of climate change. For instance, ocean acidification will greatly affect benthic species, which compared to other living marine resources are very sparsely regulated under international law. The CBD and various regional treaties require State parties to take conservation management measures with respect to the marine environment within their jurisdiction and when conducting any operations under their jurisdiction and control wherever the latter may occur. If properly and seriously implemented, these international law sources could already provide better conservation measures for benthic species affected by sea level rise, ocean warming and acidification. Together with international norms controlling marine pollution from all sources as well as the reduction of fossil fuel emissions leading to carbon neutrality by mid-century, they would already address to some extent the effects of climate change upon the oceans and coastal areas from oceanic acidification. The latter is of course a best case scenario that is based on strict implementation of State party obligations found in applicable sources of international law.

Apart from the stocktaking exercise mentioned above, linkages with science would prescribe the need to tweak further existing pollution thresholds and conservation measures as well as the need to supplement them by more robust and

[49] Wolfrum, R., and Matz, N. (2000), «The Interplay of UNCLOS and the CBD», *Max Planck Yearbook of UN Law 2000*, 445-480.

specialised legal norms. An organized and institutionalized working relationship between law makers and scientists is essential to lead to the generation of international norms that would transform scientific recommendations into equitable legal obligations to prevent or mitigate and limit harm. Better coherence will, however, also necessitate new political modalities and preferably legal procedures specifically tasked with harmonizing applicable international regimes. So far, attempts in this direction have facilitated and improved relations between different international organizations and treaties with interrelated remits. It remains, however, an exercise based on goodwill. It is not at present imposed by an institutionalized, political and legal methodology which could effectively bridge legal gaps and resolve normative conflicts due to the fragmented nature of applicable norms.

The 2015 Paris Agreement, for instance, refers to the interlinkages between oceans and climate change but in conformity with usual international law- making practice, it skirts around regulating sectors that are subject to other international regimes such as ocean governance issues. It calls upon the competent institutions to pursue this role but refrains from elaborating any further[50]. Similarly the CBD, refers to the scope of the treaty's provisions on conservation as being limited to areas subject to the domestic jurisdiction, although in Article 4, it extends its scope to any operations wherever they may occur which are conducted by the parties under «their jurisdiction or control». In this manner, the CBD negotiating parties carefully steered away from an acrimonious political debate that would have dragged on for years, regarding the impact which the CBD's provisions would have on the high seas freedoms. UNCLOS itself refers to the freedom of fishing as being «subject to» *inter alia* the «treaties» to which States fishing on the high seas are parties[51]. It also ties the obligation of the parties to cooperate, when taking conservation measures on the high seas, to their entering into international agreements. UNCLOS Part XII, regulating the protection of the marine environment, refers to applicable «international rules and standards». For many years UNCLOS' obligations for States to «cooperate» in the conservation of living marine resources did not ameliorate the gaps in international norms particularly *vis a' vis* States which refused to enter into cooperation agreements with other participants in a high seas fishery or with coastal States with an adjacent exclusive economic zone. The same situation applies to marine pollution control from various sources, particularly with respect to pollution from land based sources, which remains poorly regulated at the regional level and even worse off when it comes to the implementation via domestic legislation. The linkages between conservation of living marine resources and the marine environment are dealt with separately under UNCLOS Parts VII and XII with no direct cross references underlining the inextricable dependence of the survival of the species and the maintenance of their habitat free from all sources of pollution and degradation.

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[50] Paris Agreement Preamble.
[51] UNCLOS, Art. 116 (a).

The multitude of fisheries treaties and regional seas treaties also jealously guard their turf and carefully avoid stepping upon each others' remit, although it is also true to say that certain sustainability concepts found in environmental multilateral and regional seas agreements have been integrated in fisheries treaties in recent years. The 1995 Fish Stocks Agreement may be the best attempt at harmonizing and integrating the various applicable regimes in regulating the conservation of high seas fisheries. It does so in three major ways. First, it establishes that the conservation measures in fisheries treaties applicable in various regional areas of the high seas are to be considered as the «necessary conservation measures». UNCLOS Article 117 imposes as the comitant obligation upon States, the taking of the «necessary conservation measures» when States exercise the right of access freedom of fishing, without elaborating further. Although the Fish Stocks Agreement targets migratory species, the current negotiations to the BBNJ Implementation Agreement may emulate it by providing a basic set of conservation measures applicable in areas beyond national jurisdiction and so targeting also benthic habitats and species. Second, the Fish Stocks Agreement entrenched the obligation of ensuring compatibility between conservation measures within and beyond national jurisdiction, which is implied under UNCLOS. Benthic ecosystems would also benefit from such compatibility measures. Third, the Fish Stocks Agreement also translated the precautionary approach into substantive conservation obligations that ensure effectiveness to address risks to marine species and habitats, even in the absence of scientific certainty. The risks posed to benthic species as a result of climate change require immediate action especially since their conservation status is also at risk from other anthropogenic activities, even if the extent of harm and the actual risks involved are hampered by gaps in scientific knowledge.

5. CONCLUSION: THE WAY FORWARD

International law sources, which are applicable if well implemented, would already go a long way to enhance the relationship between oceans and climate governance and therefore mitigate harm whilst facilitating the conservation of the benthic ecosystem from the negative impacts of climate change. These numerous impacts may to some extent be regulated under various legal instruments at the national and international level, but climate change adaptation measures required under the Paris Agreement may provide an excellent opportunity to provide an integrated legal and policy framework that addresses these variety of impacts. States have explored various ways to protect rare and fragile ecosystems both within and beyond national jurisdiction under UNCLOS. One of the most common suggestions, is the creation of marine protected areas outside national jurisdiction, which as mentioned above, is one of the key aspects of the mandate given to the BBNJ ILBI negotiators.

Adaptation measures for benthic ecosystems, however, cannot be considered in isolation from the applicable international norms discussed above as well as

other multilateral norms that regulate international navigation, maritime jurisdictional claims, as well as access to and exploitation of living and non-living marine resources. There are existing fora such as the Group of Experts commissioned by DOALOS[52] and a Committee of the International Law Association which will in time make proposals for the progressive development of the applicable international law rules *de lege ferenda* on the legal ramifications of these impacts and how they may be integrated and harmonised.

Nevertheless, it is crucial that if the Paris Agreement is to transform the planet into a carbon neutral and climate resilient economy and if the international community aims to effectively address environmental and socio-economic risks via substantive norms that aim for good governance of the ocean, treaty negotiators and international actors must work more in sync. A possibly option to ensure better integration between ocean and climate governance is the negotiation of a specific international legal instrument for ocean governance in an era of climate change under the aegis of the 1982 UNCLOS and the climate and biodiversity treaties.

If this option is too much to ask for, cooperation in a milder form between States, international organizations and non-state actors, remains the only solution as it will mobilise necessary funding and facilitate the exchange of information, compliance and possibly enforcement, capacity building, as well as ensuring consistency. To a certain extent, this is already happening with the organization of fora such as the United Nations Environmental Assembly, UN Oceans and conferences involving non-state actors such as Our Ocean. Multilateral agreements that venture into area-based management, the establishment of marine protected areas within and beyond national jurisdiction and linkages with climate adaptation commitments are on the rise. Cooperation does away with unilateralism, while allowing for flexibility such that States with different capacities and capabilities are equally enticed to engage in the process. The challenges are innumerable, but necessity is the mother of invention and if the political will allows, international law is dynamic enough to circumvent the odds and adapt to the current needs of humanity in meeting with the unprecedented demands of ocean and climate governance.

[52] *sdg.iisd.org/news/undoalos-calls-for-experts-to-participate-in-the-regular-process/.*