

Towards a Practical Approach to Regulating Marine Genetic Resources¹



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I. Introduction

Negotiations are currently underway for a new international legally binding instrument (ILBI) under the United Nations Convention on the Law of the Sea (UNCLOS) for the conservation and sustainable use of marine biodiversity beyond national jurisdiction (BBNJ).² The General Assembly has authorised negotiations on four elements of a “package”. One part of the package is the legal framework for the exploitation of marine genetic resources (MGRs) in areas beyond national jurisdiction.³ The precise definition of MGRs is currently subject to negotiation, but the Convention on Biological Diversity defines genetic material as any material of plant, animal, microbial or other origin containing functional units of heredity.⁴ Genetic resources are genetic material of actual or potential value. It should be noted that the MGRs regime is unlikely to apply to fish caught as a commodity for food or other uses such as fish meal.

¹ This comment is based on a chapter published in A. De Paiva Toledo and V.J.M. Tassin (eds) *Guide to the Navigation of Biodiversity Beyond National Jurisdiction* (Editora D’Plácido, 2017).

² At time of writing, two of four planned sessions of the Intergovernmental Conference (IGC) have been held.

³ The other elements of the package – area-based management tools including marine protected areas, environmental impact assessment and capacity building and technology transfer – are not addressed in this comment.

⁴ Convention on Biological Diversity, article 2

The purpose of this Reflection is to argue that any legal regime should not create different legal principles for MGRs located in the seabed as opposed to those in the water column. Instead an integrated, or functional, approach should be preferred. This Reflection will discuss why this is, and comment on some possible practical options for a functional approach in the ILBI.

Over the course of the BBNJ discussions many views have emerged about the legal principles that apply, or should apply, to MGRs. The key arguments relate to whether the common heritage of mankind principle or the freedom of the high seas principle applies to MGRs beyond national jurisdiction. Among the proponents of common heritage of mankind, one approach is that the principle should apply to MGRs located on the seabed (consistent with mineral resources) and the principles of the high seas should govern MGRs found in the water column. However, in recent discussions in the Preparatory Committee and the first two sessions of the Intergovernmental Conference, a growing number of states have argued that the legal regime for MGRs in areas beyond national jurisdiction should apply to all genetic resources, regardless of where they are located. This comment argues that this is the best approach from a practical perspective.

This Reflection will demonstrate that any distinction between resources in the water column and the seabed, although superficially attractive, is bound to result in considerable practical and legal difficulties. Marine organisms cannot be neatly divided between those found on the ocean floor and those in the water column. This comment argues that a bifurcated regime, while appealing, would not be workable or efficient. Second, this comment briefly discusses possible alternative structural options for a potential *sui generis* regime that might apply to MGRs. The conclusion is that an approach to MGRs that integrates the legal regimes for the water column and seabed into a single regime would be ideal, although there are clear political obstacles to achieving this. No particular recommendation is made as to the legal principles which would apply to that regime, as that is beyond the scope of this comment and a matter for political negotiation.

II. The Origins of the Seabed/Water Column Distinction

UNCLOS makes several distinctions between the legal principles that apply to the water column and the seabed, thus creating bifurcated legal regimes. Although no such distinction appears in the

territorial sea, beyond that, the seabed/water column appears in relation to the continental shelf, exclusive economic zone (EEZ), high seas and the Area.⁵

The first distinction, in relation to the continental shelf, developed following the Second World War, when growing demand for oil and gas and improvements in technology prompted the United States to claim jurisdiction over the resources of the continental shelf.⁶ By 1958, when the Convention on the Continental Shelf was signed, the idea that coastal states controlled the resources of the continental shelf was firmly entrenched in international law.⁷ Because the continental shelf extended beneath the high seas, this was the first instance of the bifurcated approach to maritime zones, where the legal regime differed between the resources of the water column and the seabed.

Of particular interest in this context is that, following the 1958 Convention, certain living resources on the seabed came within the coastal state's jurisdiction. Article 2(4) of the 1958 Convention (repeated in Article 77(4) of UNCLOS) provided that coastal states have sovereign rights to the natural resources of the continental shelf including sedentary species. Sedentary species are "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 subsoil."⁸ This was, ultimately, a rather clumsy attempt to identify living resources that came within coastal state jurisdiction rather under than the high seas regime.

Even in a fisheries context the definition of sedentary species has proved problematic to apply. There can be no doubt that corals and oysters are immobile on the seabed, but other commercial species have sparked disputes among states. In particular, crustacea such as lobsters and crabs caused considerable confusion as they can swim in some situations. State practice has developed to the point that many species of crustacea that do not strictly meet the definition of sedentary species are now accepted as such.⁹

UNCLOS took a bifurcated approach in relation to the seabed and water column in several ways. First, the creation of the EEZ expanded coastal states rights to the resources of the water column as well

⁵ The Area is comprised of the seabed beyond the limits of national jurisdiction. See UNCLOS, article 1

⁶ Policy of the United States with Respect to the Natural Resources of the Subsoil and Sea Bed of the Continental Shelf, Proclamation 2667 of 28 September 1945, 10 Fed. Reg. 12, 305 (1945).

⁷ See, for example, R. Young, "The Geneva Convention on the Continental Shelf: A First Impression" (1958) 52 *American Journal of International Law* 733-738.

⁸ UNCLOS, article 77(4) and 1958 Continental Shelf Convention, article 2(4).

⁹ See J. Mossop, *The Continental Shelf Beyond 200 Nautical Miles: Rights and Responsibilities* (Oxford University Press, 2016) 66-7.

as the seabed but this did not create an integrated legal regime. During the negotiations of UNCLOS, states rejected the option of merging the continental shelf and EEZ regimes and kept the legal principles governing the continental shelf in a separate part of the Convention. Article 56 (3) stipulates that the rights in relation to the seabed are to be exercised in accordance with Part VI, rather than Part V which deals with the EEZ more generally. The relationship between the water column and the continental shelf regimes has been described as “autonomous but intimately linked”.¹⁰ In practice, however, most states would approach the management of their EEZ and continental shelf within 200 nautical miles effectively as a single zone.

The second way in which UNCLOS perpetuated a bifurcated approach is that Part VI provides for the extension of coastal state rights to the continental shelf beyond 200 nautical miles in circumstances where the physical shelf continues past the EEZ.¹¹ On the extended continental shelf, the water above is governed by the high seas regime.

Finally, and most significantly, Part XI of UNCLOS applies the principle of common heritage of mankind to the resources of the Area. The International Seabed Authority was established to manage applications for exploration and exploitation licences, and to ensure that the monetary benefits of activities in relation to the resources were returned to the international community. However, Part XI defines the resources of the Area as ‘minerals’, with no reference to living resources.¹² This has led to the question of what legal principles apply to the genetic resources found on the seabed.

If one were devising a legal regime to manage the living resources of the ocean from first principles, it is unlikely that the current framework would be chosen. This is because the ocean is comprised of a series of interconnected ecosystems which do not easily fit into a seabed/water column approach, or indeed into other jurisdictional silos.¹³ The current bifurcated legal framework for the water column and seabed therefore is less than helpful as a starting point for a discussion about regulating genetic resources. Nevertheless, it exerts a powerful normative influence on the discourse due to the fact that the principles that emerged as a result of this ad hoc development have been fully established as part of treaty and customary international law for many decades.

¹⁰ D. Attard, *The Exclusive Economic Zone in International Law* (Clarendon Press, 1987) 139-140.

¹¹ Article 76, UNCLOS.

¹² See Article 133, UNCLOS.

¹³ Jung-Eun Kim, “The Incongruity Between the Ecosystem Approach to High Seas Marine Protected Areas and the Existing High Seas Conservation Regime”, (2013) 2 *Aegean Review of the Law of the Sea and Maritime Law* 1-36.

III. Problems with the Seabed/Water Column Distinction for Living Resources

There are considerable difficulties in creating a regulatory system for living or genetic resources that distinguishes between the seabed and the water column. It is difficult to identify organisms that are solely found in the seabed. A variety of ecosystems may be located on the seabed beyond national jurisdiction, including seamounts, hydrothermal vents and cold seeps.¹⁴ Scientists are interested in the genetic properties of organisms found in those ecosystems due to their extreme living conditions and responses to environmental factors. However it is not easy to separate those organisms into those that are located on the seabed as opposed to in the water column.

Seamounts, hills and mounds rise from the seabed and can be found on the abyssal plains as well as in areas of volcanic activity. It has been estimated that there may be as many as 30,000 seamounts that rise more than 1000 metres above the seafloor. Seamounts are frequently home to invertebrates such as coral, sponges and molluscs.¹⁵ Some of these species are sessile (unable to move) but others are mobile. A range of fish species may gather in the vicinity of the seamount due to its relatively high biodiversity compared to other areas. As a result, seamounts are often described as biological “hot-spots” in the ocean.

Hydrothermal vents are located in areas of volcanic activity such as mid-oceanic ridges. Seawater is heated by molten rock and the extremely hot water is expelled from the seafloor along with metals and sulphides. These vents are known to be host to a range of species including limpets, clams, tubeworms, shrimps, crabs and fish – some of which are sessile, and others mobile.¹⁶ Scientists are increasingly interested in the genetic properties of microbes found at hydrothermal vents and other seafloor features.

¹⁴ E. Ramirez-Llodra et al., “Deep, Diverse and Definitely Different: Unique Attributes of the World’s Largest Ecosystem”, (2010) 7 *Biogeosciences* 2851-2899; T. Koslow, *The Silent Deep: The Diversity, Ecology and Conservation of the Deep Sea*, (UNSW Press, 2007).

¹⁵ J. Anthony Koslow, “Chapter 51: Biological Communities on Seamounts and other Submarine Features Potentially Threatened by Disturbance”, *First Integrated Global Marine Assessment*, United Nations, 2015, 26 p. available at www.un.org/Depts/los/global_reporting/WOA_RegProcess.htm; Malcolm Clark et al, “The Ecology of Seamounts: Structure, Function and Human Impacts”, (2010) 2 *Annual Review of Marine Science* 3-25.

¹⁶ C.L. Van Dover, *The Ecology of Deep-sea Hydrothermal Vents*, (Princeton University Press, 2000).

The first problem with trying to classify organisms located in such ecosystems is that organisms do not easily fit into clear seabed/water column categories. Some species are usually fixed in one place but are capable of movement in certain circumstances. Even organisms closely related to one another may differ in their movements. For example, some sea cucumbers have small “legs” and walk across the seafloor, while others swim above the seafloor.¹⁷ Microbes at vents can be found inside vents; suspended in the water above the vents, located in mats on the rocks or sediments, or in symbiosis with other organisms.¹⁸ In such ecosystems, the close interrelationship of species and organisms makes it peculiar to divide organisms among legal regimes according to whether they are “seabed” or “water column” species.

An even bigger difficulty in treating MGRs differently depending on where they are found relates to the life cycle of such organisms. Some micro-organisms, including bacteria, exist within the sediments on the seafloor and so are easily recognisable as belonging solely to the seafloor. However, this is not the case for all organisms associated with the deep seabed. Many organisms spend part of their life-cycle in the water as eggs or larvae before they settle in one place as adults. Some larvae may remain in the vicinity of the parent organism, while others may be distributed in the water over great distances.¹⁹ The genetic properties of these species are the same at various stages of development. So, a species that spends most of its life on the seabed may also spend some of it in the water column, where it may be collected for bioprospecting purposes.

Finally, recent developments in DNA sequencing mean that scientists often no longer require actual specimens in order to obtain useful DNA. Environmental DNA is DNA that is collected from the environment. It is possible to find DNA from marine organisms in seawater even when the organisms themselves are not present because their skin, faeces and mucus may be left behind.²⁰ Seawater sampled near the seabed may well contain DNA from sedentary species. The information collected from environmental DNA is of use in monitoring biodiversity.²¹ However, if this source of

¹⁷ P. Castro and M.E. Huber, *Marine Biology* (7th ed, McGraw-Hill Education, 2008).

¹⁸ A. Vanreusel et al., “Biodiversity of Cold Seep Ecosystems along the European Margins”, (2009) 22 *Oceanography*. 110-127, 117; N. Le Bris et al, “Chapter 45: Hydrothermal Vents and Cold Seeps”, *First Integrated Global Marine Assessment*, United Nations, 2015, available at www.un.org/Depts/los/global_reporting/WOA_RegProcess.htm, at 3.

¹⁹ J.S. Levinton, *Marine Biology* (4th ed, Oxford University Press, 2014).

²⁰ M.A. Barnes and C.R. Turner, ‘The Ecology of Environmental DNA and Implications for Conservation Genetics’, (2016) 17 *Conservation Genetics* 1-17.

²¹ P.F. Thomsen and E. Willerslev, ‘Environmental DNA – An Emerging Tool in Conservation for Monitoring Past and Present DNA’, (2015) 183 *Biological Conservation* 4-18.

genetic material is used to develop biotechnology, it makes the seabed/water column distinction even more difficult to apply in practice.

IV. Possible Approaches to MGRs and the Seabed/Water Column Distinction

The following section discusses possible options for legal regimes for MGRs in light of the problems posed by the seabed/water column distinction. First, states could decide to continue with a seabed/water column distinction based on sedentary species, although this approach would lead to serious difficulties in practice. Second, states might choose to apply an approach based on regulating particular ecosystems such as hydrothermal vents or seamounts. Thirdly, a *sui generis* regime could be created that applies to all MGRs beyond national jurisdiction. This final option is the most practical outcome, but also the most difficult to achieve in negotiations.

1. The Sedentary Species Approach

Assuming the international community insists on making a distinction between the legal regime for MGRs in the seabed and water column, an obvious legal precedent to follow would be the sedentary species definition in Article 77 as it is a familiar concept in UNCLOS.

Despite the superficial attractiveness of using the sedentary species approach, the definition is completely unsuitable to be applied in a MGRs context. First, it seems counter-productive to have different legal principles applying to species that are co-located and interdependent in the same ecosystem. Within a vent ecosystem, some species will be clearly sedentary, and others not. This “fractured regulatory approach”²² would require considerable effort to identify which legal principles apply to which organisms collected by researchers. It also poses significant challenges for enforcement and compliance.

The second problem is that there may be considerable doubt as to how to apply the sedentary species definition to organisms found on vents or seamounts. Two aspects of the definition are particularly problematic when applying it to MGRs.²³ First, what is the “harvestable stage” of an organism when it is harvested for its genetic properties? Is it when the organism is at its adult stage, or at the point at

²² H. Korn, S. Friedrich and U. Feit, *Deep Sea Genetic Resources in the Context of the Convention on Biological Diversity and the United Nations Convention on the Law of the Sea*, (Bundesamt für Naturschutz, 2003) 40.

²³ J. Mossop, above n 9, at 114.

which it is collected? As discussed above, the genetic material of an organism is similar at all stages of its lifecycle, some of which will be spent in the water column. Allen has suggested that the answer would be to consider the harvestable stage the point at which the organism is collected,²⁴ but this leads to an odd outcome whereby different legal principles apply to the same organisms depending on where it is collected. Second, if the focus is on the adult form, how does one determine whether the organism is “immobile” or “unable to move except in constant physical contact with the seabed” when there is so much variety between and within species? It must be remembered that samples of deep seabed species are taken on short expeditions which may not easily resolve questions about an organism’s mobility and habitat.

Given these challenges, an entirely new approach to the legal framework would be more practical. However any alternative approach that was not based on high seas freedoms would require modifying the expectation of many states that living resources in the water column are subject to such freedoms. This would be a very difficult concept to reach agreement on.

2. Ecosystem-Based Distinctions

Some have suggested that legal principles should be developed for regulating access to certain types of ecosystems, particularly hydrothermal vents. These scholars have pointed to the incongruity of using a sedentary species approach and instead suggested that vent sites as a whole should be subject to specific regimes. For example, Leary has proposed that a regime for the equitable utilisation and sharing of benefits could be created in relation to hydrothermal vents.²⁵ Following this approach, the international community could identify the sorts of ecosystems that it considers worth protecting (such as vents), and create a *sui generis* system for regulating access and benefit sharing to MGRs around the ecosystem as a whole, removing the need for a legal distinction between “sedentary” and “non-sedentary” species.

An approach based on types of ecosystems does have the advantage of moving away from the unworkable seabed/water column distinction and recognises that ecosystems are a better starting point for categorising marine organisms. However, there are also limitations to this approach. The

²⁴ C. Allen, “Protecting the Oceanic Gardens of Eden: International Law Issues in Deep Sea Vent Resources Conservation and Management”, (2001) 13 *Georgetown International Environmental Law Review*, 563-660, 626.

²⁵ D. Leary, *International Law and the Genetic Resources of the Deep Sea* (Martinus Nijhoff Publishers, 2007) at 228.

starting point would be accurately defining the ecosystems to which the regulatory regime would apply. This may not be easy to do in the abstract, as the parameters of similar types of ecosystems may differ depending on their depth and location.

It might be possible to define the ecosystems descriptively rather than based on arbitrary distances based on generalisations. However, one problem is that, so long as one legal regime applies to one category of organisms and a second legal regime to others, the definition will always create debate about organisms at the boundary of the regimes. In addition to the organisms that clearly fall into one or other category, there is likely to be a number of organisms which are not easily categorised. If there is a significant difference in the legal consequences of categorisation, then this is likely to lead to conflict.

A second problem is related to the fact that very little is known about the biology of the deep sea. New discoveries are constantly being made. Attempting to define, in advance, ecosystems which are subject to a special regime risks omitting important ecosystems and organisms that have not yet been discovered or adequately described.

A third problem is related to any definition based on distance from a feature. If the distribution of a particular species is sufficiently widespread, some organisms may be found outside the spatial extent of the “ecosystem”, resulting in different legal outcomes depending on where it was found.

None of these problems would be as difficult as responding to a sedentary/non-sedentary paradigm for legal categorisation, however. Nevertheless, under this approach distinctions between organisms would have to be made which is inherently difficult. Scientific advice in creating the distinctions would be vitally important.

An alternative to this option would be to define a “benthic zone” near the seabed, within which a special regime could be applied.²⁶ This might apply a *sui generis* set of principles to all organisms within a certain distance of the seafloor and can be based on scientific advice about the usual boundaries between the benthic and pelagic zones. It would focus only on genetic resources and so exclude the collection of fish for commercial fishing purposes. This would have the advantage of certainty and

²⁶ The benthic zone refers to the seabed and associated organisms. The pelagic zone describes the ecological region above the benthos, including the water column to the surface.
www.newworldencyclopedia.org/entry/Benthic_zone.

ease of application. Nevertheless, it is still relatively arbitrary and could also lead to unusual distinctions.

Finally, Oude Elferink has suggested that features, and even water (such as that expelled from a hydrothermal vent or found in brine pools on the seafloor), closely associated with the seabed should be considered as part of the Area.²⁷ Living organisms found within those features should also be considered as part of the resources of the Area. This is somewhat similar to the ecosystem approach but limited to specific features that are closely associated with the seabed. However, this still requires identifying a boundary between species subject to the seabed and the water column legal regimes.

In any case where different legal principles apply to MGRs found in a particular zone or area, compared to those outside, there will be an incentive to “find” the organism in the “right” place. Independent verification of the original location of the organism when collected would be very difficult to achieve.

3. An Integrated Approach

A third approach would be to move away from a legal regime based on types of organisms, and instead focus on the activity to be regulated. Under this approach, any sort of sampling of living creatures on the high seas or in the Area with the ultimate goal of using the genetic material of an organism would be subject to a *sui generis* regime. It is beyond the scope of this comment to set out the content of the regime – a number of options have been proposed. However, the important feature of this *sui generis* regime is that it would apply to *all* living organisms located beyond national jurisdiction, creating a much simpler and streamlined legal framework.²⁸

This option is the only one that avoids the problems identified with the sedentary species and the ecosystem-based distinctions. However, it does require compromise and a departure from the bifurcated approach that has characterised the law of the sea for many decades. Whether it is acceptable will depend on the potential advantages to be gained from moving in that direction. Such advantages would include certainty of legal principles for researchers operating beyond national

²⁷ A.G. Oude Elferink, “The Regime of the Area: Delineating the Scope of Application of the Common Heritage Principle and the Freedom of the High Seas”, (2007) 22 *International Journal of Marine and Coastal Law*, 143-176, 149.

²⁸ T. Scovazzi, “The Negotiations for a Binding Instrument on the Conservation and Sustainable Use of Marine Biological Diversity Beyond National Jurisdiction”, (2016) 70 *Marine Policy* 188-191, 190.

jurisdiction. It would also possibly allow for the development of a “package” of measures supporting protection of biodiversity beyond national jurisdiction.

V. Conclusion

A key obstacle for reaching agreement on an integrated regime for the water column and the seabed is related to the strongly held position that access to living resources, including MGRs, is governed by the principle of the freedom of the high seas. While some may be willing to accept a specific regime MGRs of the seabed on the basis that this will represent a limited proportion of the overall MGRs pool, it seems a much bigger leap to accept limitations on the use of MGRs found in the water column. However, a growing number of states now see an advantage in developing a *sui generis* regime for all MGRs beyond national jurisdiction. Such an approach would be a welcome departure from the strict seabed/water column distinction which may be suitable in governing the use of mineral resources, but not in relation to marine genetic organisms. Of course, such an approach does not eliminate the need to distinguish between organisms located within national jurisdiction and those in areas beyond national jurisdiction. However, the goal should be to devise a legal framework that minimises uncertainties and potential for conflict, ensures equity, and facilitates marine scientific research into MGRs.

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