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MARINE GENETIC RESOURCES IN THE AREA BEYOND NATIONAL JURISDICTION

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ABSTRACT: *The next hot topic, the exploitation of Marine Genetic Resources [MGR] in the 'Area beyond National Jurisdiction' [ABNJ], and what legal regimes can or could be used in its governance, is an ongoing and heated debate in international circles. The term 'Genetic Resources' [GR] lacks a concise definition (Greibner). In general, GR can be understood to mean biological processes or living things, or components thereof, which are hereditary in nature and which have real or potential value (Leary, Greibner, Drankier). GR is one form of 'living resources' [LR], but unlike food or other LR, GR, being "genetic", is by its definition connected directly to the process of inheritance or to the materials relating to inheritance (such as DNA or RNA), and as a "resource" has either 'real' or 'potential' value (Vierros). Enzymes taken from sea anemones, biological processes replicated from undersea microbes, and genes harvested from Arctic fish are all examples of MGR (Leary). These exciting new resources represent a vast new source of wealth for humanity; but how they should be harvested, what legal regimes should define their use, what benefit sharing should occur, and how these resources should be conserved are all questions that have yet to be answered. Even the nature of how these unique resources should be classified in the current legal framework has yet to be answered. Current legal regimes were not written with 'MGR' in mind (Vierros). The massive presence of biota in the ABNJ that we know exists today was not fully understood at the time that most of the legal mechanisms we live under today were written (Churchill). The four most important international legal instruments relevant to this do not even make direct reference to MGR (Drankier, Greibner), namely: 1.) The United Nations Convention on the Law of the Sea (UNCLOS); 2.) The Convention on Biodiversity (CBD), and its subsequent Nagoya protocol; 3.) The three components of Antarctic Treaty System (ATS): the original Antarctic Treaty, the Protocol on Environmental Protection (Madrid protocol), and the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR); and 4.) modern international instruments relating to intellectual property rights (IPR) such as WTO regulations, TRIPS, and WIPO among others. The term 'Marine Genetic Resources' does not even appear in the text of the UNCLOS, the most important of these four instruments (Greibner). The other instruments discuss either GR or LR in a more general sense, not necessarily in relationship to the Ocean; or else MGR in a more localized area. These instruments, upon which our modern, international regime of Ocean use rests, contain a 'legal lacuna' in regard to MGR and its governance; nevertheless, it is in precisely these instruments that we must search for a means to fill this gap. While not related to*

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MGR as such, the United Nations Food and Agriculture Organization [FAO]'s International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), also known as the 'seed treaty', is another legal instrument of interest, as its multilateral benefit sharing program [MLS] relating to land based plant genetic resources, has some applicability in the legal debate surrounding MGR in the ABNJ. This paper will discuss in detail the controversy surrounding MGR in the ABNJ from a variety of legal perspectives surrounding these international instruments, which remain at the heart of this debate despite having sparked it through their own paucity on this subject. It will touch on key issues relating to these documents and will discuss some of the suggestions being made on how to resolve the current gap.

KEYWORDS*:* Area Beyond National Jurisdiction [ABNJ], The Area, Marine Genetic Resources [MGR], United nations Convention on the Law of the SEA [UNCLOS].

INTRODUCTION

The Ocean represents one of the Earth's most precious resources. Classical exploitation of the Ocean by human beings hinged upon its use for fishing and transportation, and legal regimes reflected this. The presumption, however implicit or innocent, was that the Ocean was an inexhaustible resource, at least relative to human consumption, and so would offer up boundless resources for all time. With the advancement of science and technology however, human capacity to harness the Ocean has also advanced, with the law continuing to play catch-up. The potentially damaging consequences of human use of the ocean currently have limited checks and balances. Legal regimes governing human use of the oceans within a country's jurisdiction are still evolving – and those governing human use outsides of national jurisdiction have yet to be written.

One interesting debate connected to the utilization of the Earth's oceans as a resource is the use of "Marine Genetic Resources" [MGR] in "Areas Beyond National Jurisdiction" [ABNJ]. Next year's hot topic, the exploitation of MGR in the ABNJ, and what legal regimes apply to its governance is an ongoing and heated debate in international circles. The term 'Area Beyond national Jurisdiction' [ABNJ] is a broad-brush term used by modern legal scholars to refer to any part of the seas not belonging to or controlled by a particular state. Under the modern regime of International Ocean Law, this would be a composite of two distinct areas: the 'High Seas', or international waters; and 'The Area', or the international seabed surface, sub-soil, substratum, *et. al.*

The term 'Genetic Resources' [GR] is a bit more difficult to define. GR lacks a concise definition, as Greibner puts it: "Defining what genetic resources are concretely has been a difficult exercise practiced by a large number of experts from international organizations, countries and nongovernmental organizations over the last 20 years." (Greibner). The Convention on Biodiversity [CBD] §2 offer three important points relevant to the definition of MGR:

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- *'Biological resources includes genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity.'*
- *'Genetic material means any material of plant, animal, microbial or other origin containing functional units of heredity.'*
- *'Genetic resources means genetic material of actual or potential values.'*

Put more generally, GR is one sub-set of 'living resources' [LR], but unlike food or other LR, GR being "genetic" is by definition connected directly to the process of inheritance or to the materials relating to inheritance (such as DNA or RNA), and as a "resource" has either 'real' or 'potential' economic value. Enzymes taken from sea anemones, biological processes replicated from undersea microbes, and genes harvested from Arctic fish are all examples of MGR. These exciting new resources represent a vast new source of wealth for humanity; but how they should be harvested, what legal regimes should define their use, what benefit sharing should occur, and how these resources should be conserved are all questions that have yet to be answered. Even the nature of how these unique resources should be classified in the current legal framework has yet to be answered.

Current legal regimes were not written with 'MGR' in mind. The prolific existence of biota in the ABNJ at the astounding magnitude we know exist today was not known or anticipated at the time that most of the legal mechanisms we live under today were written. The five most important international legal instruments relevant to the issue of MGR are as follows (Greibner):

1.) The United Nations Convention on the Law of the Sea [UNCLOS];
2.) The Convention on Biodiversity [CBD], and its subsequent Nagoya protocol;
3.) The three components of Antarctic Treaty System [ATS], which includes the original Antarctic Treaty, the Protocol on Environmental Protection [Madrid protocol], and the Convention on the Conservation of Antarctic Marine Living Resources [CCAMLR];
4.) Modern intellectual property rights [IPR] regimes, such as the Budapest Treaty, WTO regulations, TRIPS, and WIPO regulations among others; and
5.) While not related to the Law of the Sea as such, the United Nations Food and Agriculture Organization [FAO]'s International Treaty on Plant Genetic Resources for Food and Agriculture [ITPGRFA], also known as the 'seed treaty' or 'FAO Treaty'.

None of the above instruments even make mention of MGR. The term '*Marine Genetic Resources*' does not even appear in the text of the UNCLOS, the most important of these five instruments (Greibner). The other instruments discuss either GR or LR in a more general sense, not necessarily in relationship to the Ocean; or else MGR in a more localized area. The CBD and modern IPR regimes would be examples of the former, while the ATS would be an example of the ladder case. The ITPGRFA has absolutely no connection to the sea and its legal regimes, however it is still of great significance due to its analogous regime governing plant genetic resources in agriculture. Its multilateral benefit sharing program [MLS] of land-based plant genetic resources is of great interest in the legal debate surrounding MGR in the ABNJ.

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Of particular interest in this debate is the question of what some call a "capacity gap". Only developed countries with applicable technology are even capable of performing scientific research or 'bioprospecting' in 'The Area'. A study showed that patents of MGR technology overwhelmingly come from three countries alone: the USA, Japan, and Germany (Vierros). Because only advanced economies such as these are even capable of harvesting MGR, only they profit from it, in turn allowing such countries to use such profits to invest more heartily into harvesting, creating a vicious circle. This "North-South" divide deeply informs the debate regarding the legal regimes of the ABNJ.

MGR reveals a "legal lacuna" within these treaties – treaties which our entire modern, international regime of ocean governance rests upon. Nevertheless, it is precisely within these legal instruments that we must search for a means to fill this gap. This paper will discuss in detail the controversy surrounding MGR in the ABNJ from a variety of legal perspectives. It will touch on key issues relating to these documents and will discuss some of the key suggestions being debated by experts today on how to resolve the current gap.

History of International Law of the Sea

For all of recorded history, and for some time before that, human beings have exploited the seas. While the current regime we live under, the United Nations Convention on the Law of the Sea [UNCLOS] wasn't ratified until 1982 (and didn't go into force until 1990) much of the corpus of this instrument derives from pre-existing legal regimes. UNCLOS did not occur in a vacuum; instead it represents the culmination of thousands of years of development in international ocean law (Churchill). As such an understanding of our modern legal regime requires an understanding of the development of international ocean law from antiquity until today. For a comprehensive look at the hstory of the Law of the Sea, please refer to Churchill and Lowe's "*The Law of the Sea*" (3rd Ed.), the paraphrase below is based on this work.

One of the first comprehensive legal regimes to be devised was *Mare Liberum* or "*The Free Sea*" devised by Dutch jurist Hugo Grotius (10 April 1583 – 28 August 1645) in 1609. Under this regime, the high seas are free to all nations and belonging to none. The notion of the high seas as beyond the jurisdiction of any one nation has survived into the modern UNCLOS. Today, UNCLOS allows for navigation, over flight, fishing, scientific research, construction of artificial islands, and the laying of submarine cables and pipelines in the high seas, the so called "freedoms of the high seas".

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Hugo Grotius
(10 April 1583 – 28 August 1645)
"*The Free Sea*"
Figure 1: Hugo Grotius

In the 1700s, Dutch jurist Cornelius van Bynkershoek translated Grotius's ideas into more applicable terms with such works as *De Iure Belli Ac Pacis*. It was Van Bynkershoek who devised the concept of the "Cannon Shot Law", or the idea that a state's mandate at sea extended to the point that it could fire a cannon from its shoreline. In the mediaeval logic of his day, Van Bynkershoek reasoned that a state could assert authority over the sea to the extent that it could exert force, ergo the maximum distance it could fire a cannon ball. At the time, the most advanced cannons could be fired 3 nautical miles, hence this became the de facto delineation of a state's territorial sea. Later, especially after the two World Wars, countries began declaring 12 nm territorial seas, based on this same concept but updated to consider advances in missile technology, especially German missiles. While the modern UNCLOS no longer follows the reasoning that territorial extent follows from force, it nonetheless incorporates the notion of a 12 nm territorial sea belt.

In 1930, the League of Nations (LoN) Convention on the Law of the Sea was convened. This represents one of the first international conventions convoked specifically to discuss developing an intentional regime to govern the seas. Nevertheless, no lasting agreements were reached.
With World War II drawing to a close, questions regarding new technology allowing for the exploitation of submarine resources began to be raised. In 1945 and again in 1947, President Harry S. Truman issued the so-called "Truman Proclamations". These controversial executive orders by President Truman declared exclusive American control of all resources on the continental shelf out to roughly 200 nautical miles from the US shoreline. The precedent for such an action is ambiguous and its legality was disputed by scholars of international law. Nevertheless, from 1946-1950, other nations followed suit and made similar declarations. Ultimately, the UNCLOS regime on the continental shelf [CS] has its origin in these declarations.

Similar to the US, three Latin American nations, namely Chile, Peru, and Ecuador extended economic control out to 200 nm. Specifically, the Presidential Declaration Concerning Continental Shelf of 23 June 1947 (El Mercurio, Santiago de Chile, 29 June 1947) and the Presidential Decree No. 781 of 1 August 1947 (El Peruano: Diario Oficial. Vol. 107, No. 1983, 11 August 1947) established these regimes. This was done to defend exclusive, historical fishing rights by these nations, which classically relied on the lucrative fishing in these areas to drive their economies. It is ultimately from these regimes that the modern system of "Exclusive Economic Zones" [EEZs] derives.
The first of three conventions relating to the modern UNCLOS was the Geneva Conventions on the Sea (UNCLOS I). This was the first truly successful international forum on the Law of the Sea. Convened in 1956 and concluded in 1958, UNCLOS I resulted in the following agreements:

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- Convention on the Territorial Sea and Contiguous Zone, entry into force: 10 September 1964
- Convention on the Continental Shelf, entry into force: 10 June 1964
- Convention on the High Seas, entry into force: 30 September 1962
- Convention on Fishing and Conservation of Living Resources of the High Seas, entry into force: 20 March 1966

In 1960, a second UNCLOS convention was convened, but no formal agreements were reached. In 1967, Maltese ambassador Avid Pardo brought concerns over exploitation and mining of the ocean substratum before the UN, this lead to further debate. Consequently, in 1973 UNCLOS III was convened, and in 1982 concluded. With the signature of Guyana in 1990, 60 countries had by then signed the UNCLOS treaty, and by its own ratifying agreement, UNCLOS had enough signatures to then enter into force around the world, and became mandatory law, regardless of the status of remaining countries. It is this UNCLOS agreement that forms the basis of modern international ocean law.

One interesting "retroactive" feature of UNCLOS is its numerous references to "customary international law" scattered throughout its text. These statements, an example of "masterful ambiguity", have always been interpreted to be an assertion of international maritime law and admiralty law. Fostered by seafaring states, especially the British Empire, for centuries and administered by the International Maritime Organization [IMO] today, these rules have always played a significant part of seafaring trade and transportation. Nevertheless, being largely the product of European colonial powers, these laws have largely been the provenance of Western states, and so there was a question as to their relevance outside the Western world. With the ascension of the UNCLOS in 1990, however, these laws retroactively became binding everywhere.

The UNCLOS contains unprecedented new regimes and mechanisms for environmental conservation and resource management. In particular, UNCLOS §60-1,2, which establish 'Total Allowable Catch' [TAC], and also the mandate that states shall cooperate with one another to conserve resources and settle environmental issues.

Nevertheless, some (La Fayette and Arico) argue that the current regime for the High Seas creates the possibility of a "Tragedy of the Commons". After all, it places people in a situation wherein there is no real regulation over when or by whom extraction of the Ocean's resources can occur. To be fair, classical human views on the Ocean have viewed it as an inexhaustible resource, and from the stand point of ancient man this was a fair view to hold, relative to human insignificance compared to the vastness of the seas. However, modern times have changed. The Earth's current population and the capabilities of modern science allow for human consumption on a scale never seen before, and technology allows us to plum the ocean's depths in a way that can impact it in untold ways.

As such, it became apparent to most that such *lassie faire* governance of the Ocean's resources was inappropriate and must shift away from the old paradigm of "unlimited access" and enter a new age.

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A number of international and regional agreements have been adopted over the years to address questions of conservation and resource management in the world's oceans. Many of these treaties have failed to accrue signatures from all the world's nations, and especially significant contributors to these issues such as the USA, who has been ambivalent towards such agreements. Further, many of these agreements tend to be non-regulatory arrangements that suggest scientific based policies and produce voluntary mechanisms, and not binding laws or regulations. Nevertheless, these instruments play a significant role in modern international ocean law.

One example includes the 1995 UN Fish Stocks Agreement, which clarified many of the UNCLOS principles and duties for highly migratory fish, implements requirements for assessing the impacts of fishing, and to apply a precautionary approach. Another example is the 2002 WSSD agreement, which promises to accomplish a number of environmental aims by 2010-12. These include mitigating biodiversity loss; encouraging ecosystem approaches to marine management; developing networks of MPAs; and to integrate marine and coastal management into key sectors (Henkin).

While technically devised before the modern regime, another regional agreement that complements and functions largely within the framework of UNCLOS is the 'Antarctic Treaty System' [ATS]. The ATS was devised to settle the conflicting and overlapping territorial claims made over Antarctica and its adjacent waters by those countries claiming territory in Antarctica. The ATS is composed of three legal components, namely: the Antarctic Treaty [AT], the Protocol on Environmental Protection [Madrid protocol], and the Convention on the Conservation of Antarctic Marine Living Resources [CCAMLR]. In particular, these instruments contain a number of mechanisms relating to the governance of marine living resources [MLR]. While not transferable outside of the ATS as they stand, these mechanisms are nonetheless of interest in the debate over MGR in the ABNJ and could be duplicated by subsequent agreements applicable in a truly international regime (Drankier, Greibner).

Another important example is the 'United Nations Conference on Environment and Development' [UNCED], convened from June 3 to June 14 1992 in Rio De Janeiro, Brazil. Also known as 'Eco-92', 'Earth Summit' or just the 'Rio Summit', this convention produced a number of significant binding and non-binding international agreements. Agreements reached at Rio include the non-binding agreements 'Agenda 21', 'Forest Principles', and the 'Rio Declaration on Environment and Development', and the legally binding 'United Nations Framework Convention on Climate Change' [UNFCCC], and the 'Convention on Biological Diversity' [CBD]. Green Cross International was also founded in relationship to this conference. The original Rio Summit has been further supplemented by a number of other conferences, including Rio+5 (1997), Rio+10 (2002), Agenda 21 for culture (2002), and Rio+20 (2012).

While not exclusive to the seas, the UNCED and the various agreements related to it play a significant role in international ocean law. In particular, the CBD and its supplementary agreements the Nagoya Protocol, the Bonn Guidelines, and the Cartagena Protocol on Biosafety, have a great

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deal of significance in international ocean law in general, and to the issue of MGR in the ABNJ in particular. Closely related to the UNCLOS, "the CBD and UNCLOS seem to complement each other" (La Fayette) and "Virtually all States Parties to the LOSC are also Parties to CBD" (Drankier). An international treaty whose main aim is to foster conservation and sustainable development in all the world's ecosystems (not just the sea), the CBD includes governance mechanisms related to benefit sharing and capacity building, as well as mechanisms for regulating traditional knowledge and genetic resources (cf. CBD §15).

With the growing issue of conservation and sustainable use of marine biodiversity in the ABNJ, including exploitation of MGR the United Nations General Assembly [UNGA] in 2004 established the *Ad Hoc* Open-ended Working Group to Study Issues Related to the Conservation and Sustainable Use of Marine Biodiversity in Areas Beyond National Jurisdiction [the BBNJ Working Group].

December 2011 UNGA established a process to ensure that the existing legal framework under the UNCLOS effectively addresses issues relating to the conservation and sustainable use of marine biodiversity in the ABNJ. This process was initiated with A/66/L.21. In this new arrangement, the BBNJ Working is now more specifically charged with identifying gaps and ways forward, including through the implementation of existing instruments and the possible development of a multilateral agreement under the UNCLOS. The process will consider a package of interrelated issues: 1.) Marine genetic resources, including questions related to the sharing of benefits; 2.) Area-based management tools, including Marine Protected Areas [MPAs]; Environmental Impact Assessments [EIAs], and Select Ecological Areas [SEAs], 3.) Capacity-building; and Transfer of technology.

Different types of waters in the UNCLOS

The UNCLOS divides the world's oceans into a number of different 'waters' or 'zones'. Some of these divisions are drawn from pre-existing legal regimes, while others are novel to UNCLOS. In all cases, these different regional divisions of the sea found in UNCLOS represent distinctively anthropogenic or 'man-made' divisions of the world's oceans and seas, and not necessarily natural ones. These different divisions of the ocean are as follows:

- **Baseline [BL]:** The dividing point between the territorial sea and the rest of the landward state (including internal waters). The definition of a state's baseline can be found in UNCLOS §5-7. UNCLOS §5 states that a state's baseline is the low-water line along its coast, with UNCLOS §6-7 clarifying this definition relative to interruptions in a coast due to indentures, fringing reefs, or other features (the so-called "Straight Baseline").
- **Internal Waters [IW]:** UNCLOS §8 discusses internal waters. These are all waters landward of the baseline, which are effectively not part of 'the sea' for legal purposes. State's may create any laws they wish relative to these waters, and they lack even 'innocent passage' rights. Estuaries and rivers are invariably a part of this zone.
- **Archipelagic Waters [AW]:** UNCLOS § 47-48, 49, 51 create a unique regime, "archipelagic baselines" and "archipelagic waters". States whose territories are principally archipelagos are allowed to draw special, internal baselines which contain the waters within their

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archipelago; essentially treating the waters internal to the archipelago as "land" for the purposes of determining the other zones provided by UNCLOS. These "Archipelagic Waters" resemble internal waters in many ways, but are distinct from them.

- **Territorial Sea [TS]:** The first 12 nautical miles [nm] outward from a state's baseline form its "territorial sea", though less than 12 nm may be claimed, as per UNCLOS §3. A state's sovereignty extends fully into this region, although laws governing this region are bound by certain precedents and international laws, including "right of innocent passage" for friendly foreign vessels.
- **Exclusive Economic Zone [EEZ]:** The zone immediately adjacent to the TS not exceeding 200 nm as per UNCLOS §55-57. States have certain sovereign rights in this area, including exclusive rights to any and all resources contained therein. However, it is not part of a nation-state's territory as such. States' also gain rights over the airspace of this region.
- **Contiguous Zone [CZ]:** The "traffic zone" of a state's waters not exceeding 24 nm, which overlaps with a state's TS and parts of its EEZ (UNCLOS §33). States enjoy certain rights regarding the traffic of ships in this region.
- **Exclusive Economic Zone, Supra-Adjacent Waters [EEZ-SAW]:** The remainder of the EEZ not also part of the CZ.
- **Continental Shelf [CS]:** This difficult to define region is discussed in detail in UNCLOS §76-77, 82. The submarine seabed, subsoil, and substratum up to 200 nm irrespective of the actual continental margin, and even further than this if certain criteria are met, is the legal "continental shelf". If conditions are met, than more than 200 nm may be claimed, as long as no more than 350 nm from the baseline or 100 nm from the 2,500 meter isobath is claimed. In this region, states have exclusive rights in drilling and mining within 200 nm. For continental shelves extended beyond this, these exclusive rights are still maintained, but states must pay a subsidy to the International seabed Authority [ISA] just as they would for exploitation of the Area.
- **The High Seas [HS]:** Waters not included in any of the other categories and are therefore completely beyond the sovereignty and jurisdiction of any state, are the HS. These truly international waters are governed by the "Freedom of the High Seas" regime, as mentioned in UNCLOS §86-87 but actually going back to the 16th century Dutch jurist Hugo Grotius and later ancient thinkers. The "five classical freedoms of the High Seas" are: 1.) freedom of navigation, 2.) freedom of over flight, 3.) freedom to construct artificial islands and other structures, 4.) freedom of fishing, and 5.) freedom to lay submarine pipelines and cables. Part VII of the UNCLOS deals the most with the High Seas.
- **'The Area':** As mentioned in UNCLOS § 1-1, 133 "the Area is the seabed and ocean floor, and the subsoil thereof, beyond the areas of national jurisdiction". Broadly, Part XI of UNCLOS, and more specifically UNCLOS §136, designates that the Area and its resources are the "common heritage of mankind". This unique regime means that exploitation of the Area requires payment and benefit sharing on the part of states exploiting this region; these proceeds are used to help in capacity building for less advanced economies. This is managed and maintained by the "International Seabed Authority" [ISA] also known as "the Authority" (UNCLOS § 136).

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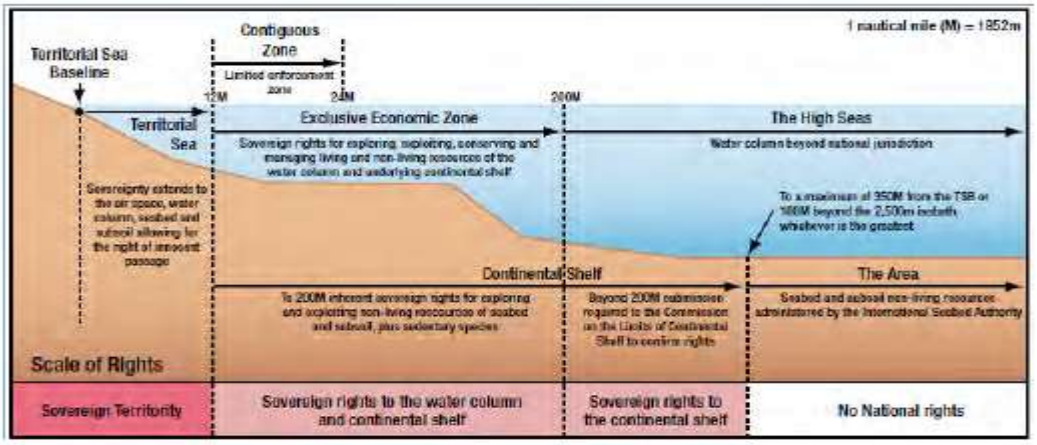

Figure 2: UNCLOS Nautical Divisions

What is 'The Area Beyond National Jurisdiction' [ABNJ]?

The acronym ABNJ stands for "Area Beyond National Jurisdiction". This term is used to mean any area of the sea not within the jurisdiction or sovereign territory of any given state. Under the modern UNCLOS, this refers collectively to the regimes of the "High Seas" [HS] and "The Area" taken together. Specifically, the HS refers to the pelagic water column outside of national jurisdiction (UNCLOS §86-87), and The Area "means the sea-bed and ocean floor and subsoil thereof beyond the limits of national jurisdiction" (UNCLOS 1-1).

The regimes of the UNCLOS, as with past regimes, treat these areas of the sea as beyond the governance of any one nation. Classically, humankind regarded these areas as an inexhaustible and "open-access" resource, and modern regimes reflect this. This makes the establishment of mechanisms for conservation and sustainable development in this region difficult.

Figure 3: The ABNJ

While the 'The Area' and the HS are both seen as being outside of national jurisdiction, they are nonetheless not identical. The UNCLOS and subsequent instruments provide for different regulatory regimes concerning these areas.

Specifically, the HS is governed by the "Freedom of the High Seas" regime as defined in Part VII of UNCLOS, but ultimately derived from Hugo Grotius's *Mare Liberum*, 1609. The HS are free to all nations but belonging to none. UNCLOS §87 grants "five freedoms" to the HS, namely: (a) Freedom of navigation, (b) Freedom of overflight, (c) Freedom to lay submarine cables and pipelines, (d) Freedom to construct artificial islands and similar structures, and (e) Freedom of fishing. While

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delineating these five freedoms specifically, the text of the UNCLOS includes the phrase *Inter Alia*, meaning that these five do not represent the limits of one's rights in the HS (Drankier). The HS is therefore governed by a relatively free, open-access regime.

"The Area" is governed by a unique regime referred to as the "Common Heritage of Mankind" as per UNCLOS §136. This never before seen legal arrangement basically argues that resources garnered from this region of the sea belong to all mankind equally (UNCLOS §137), and cannot be exploited by any one state alone with out recompense to humanity in general (UNCLOS §144). This "recompense" essentially takes the form of a transfer of technology to other, usually developing states, managed by the "International Seabed Authority" [ISA] (UNCLOS §144) or "the Authority". This highly restrictive regime contrasts with the open-access HS regime.

The intent here was to prevent a "capacity gap" from developing between developing nations reliant on resource and mineral exportation to developed nations from forming. The ISA and its ABS mechanism essentially act as remuneration to countries whose economies would loose if wide-scale exploitation of "The Area" were to commence, or who would be incapable of such exploitation.
As Churchill and Lowe paraphrase, the story surrounding the regime of "The Area" begins with the 1873 *Challenger* expedition. This trawling ship, sent out to study whatever materials it could dredge up from the sea-floor, made many fascinating discoveries. Among these was the discovery of nodules of metal buried in the ocean substratum. These unique objects, known as "polymetallic manganese nodules" or just "polymetallic nodules" are mango-sized nuggets of high grade metals scattered across the sea floor. These objects, and how they form, are not well understood, however it is thought that they form through a process of accretion of molecular metals in the pelagic sea. While varying in composition, those from the Clarion-Clipperton fracture zone in the north Pacific are on average 26% manganese, 7% iron, 1.3% nickel, 1.1% copper, and 0.27% cobalt (Churchill and Lowe). These particular nodules are the most commercially viable specimens for harvesting.

In the 1960s-1970s discussions on the possibility of actually mining these materials became feasible (Churchill, Drankier). To quote Drankier: "The exploration of the mineral resources of the Area and the development of technologies for their exploitation attracted much attention during the 1960s and 1970s". A number of important issues were raised at this time, for one only a handful of economically advanced states were even capable of mining the Area in the first place. How mining of the sea-bed fit in to the framework of contemporaneous legal regimes was another important issue. Three possibilities were theorized: 1.) that due to the increase in capacity to perform such mining, that the 'Continental Shelf' (CS) of coastal states would be pushed further out indefinitely; 2.) that the sea-bed and its resources were a part of the HS, and so could be mined under the 'Freedom of the High Seas'; and 3.) that the Area was *res nullius*. Most industrialized nations favored the second interpretation. In 1974, a US company named Deep Sea Ventures, [DSV] Inc. appealed to the US State Department [USSD] for exclusive mining rights in the Area around a region they discovered to be rich in nodules and which they meant to mine. The USSD replied that it could not recognize such an arrangement, but that DSV, Inc. was free to mine under the "High Seas" regime. Many

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other nations reiterated this interpretation.

Nevertheless, at the UN many other countries did not agree with the course of events as they were unfolding. In 1967, Dr. Avid Pardo approached the UNGA and asked that a treaty should be drawn up declaring reservation for exclusively peaceful purposes in mining the Area. Further debate ensued around the Area, resulting in UNGA resolutions 2574 and 2749. These resolutions contain much of the intent of the modern regime governing the Area under UNCLOS. The G77 and many Islamic countries tried to argue that these resolutions were binding, but in fact UNGA resolutions are not binding laws. Eventually, the debate culminated in the UNCLOS III convention, and its Part XI component which forms the basis of the modern regime governing 'the Area'. The USA, which disagreed with the regime of the Area, signed but did not ratify the convention.

This was the birth of the "Common Heritage of Mankind" regime and the ISA. Given that the settlement of this issue revolved around the mining of the seabed for *minerals*, the resultant articles in the UNCLOS defines "resources" in relationship to the Area as "mineral resources *in situ*" (UNCLOS §133). It also mentions the resources shall include (i) gaseous or liquid materials at or beneath the surface, (ii) solid substances at or below three meters of the surface, (iii) solid substances more than three meters below the surface, and (iv) metal bearing brine at or below the surface (UNCLOS §133). However, the UNCLOS is laconic as to the status of living resources located at or near the Area, and to the definition of its boundary relative to the pelagic column of water surrounding it (Vierros, Drankier, Greibner).

What are Marine Genetic Resources [MGR]?

The term "genetic resources" [GR], including "marine genetic resources" [MGR] lack a concise definition (Greibner, Drankier). As Greiber puts it: "Defining what genetic resources are concretely has been a difficult exercise practiced by a large number of experts from international organizations, countries and nongovernmental organizations over the last 20 years." (Greibner). The CBD §2 offers three important points relevant to the definition of GR:

- *'Biological resources includes genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity.'*
- *'Genetic material means any material of plant, animal, microbial or other origin containing functional units of heredity.'*
- *'Genetic resources means genetic material of actual or potential values.'*

Put more generally, GR is one sub-set of 'living resources' [LR], but unlike food or other LR, GR being "genetic" is by definition connected directly to the process of inheritance or to the materials relating to inheritance (such as DNA or RNA), and as a "resource" has either 'real' or 'potential' economic value (Drankier). Vierros offers the simple definition of "materials harvested from organisms". Enzymes taken from sea anemones, biological processes replicated from undersea microbes, and genes harvested from Arctic fish are all examples of MGR (Leary).

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Potential scientific value of MGR in the ABNJ

Exploration and exploitation of the deep seabed has been a dream of mankind for centuries. As mentioned above, in 1873, the *Challenger* became one of the first truly scientific vessels in history, when it was commissioned to trawl the bottom of the sea simply to see what the trawl would fetch. Bizarre organisms of all kinds, as well as metallic nodules composed primarily of manganese were some of their discoveries.

Nevertheless, the technological capacity to actually probe the depths of the sea in a meaningful way is a novelty of the modern age. Beginning especially in the 1970s, and continuing until today, exploration of the seabed by scientists has uncovered unique organisms never encountered or imagined before (Churchill, Leary). Scientists once believed that the depths of the sea were abiotic due to the fact that dissolved oxygen and sunlight penetration decrease with depth (Leary). After a certain depth, it was though that life would not be feasible. The *Challenger's* early discoveries challenged this view, but it was the many submarine missions of the 20th century that finally shattered it (Leary, Greibner).

Scientists know today that the bottom of the ocean is teaming with life, every bit as much so as the gentler waters further above them or even the rainforests. Greibner notes that "Some of the marine organisms survive under extreme temperature and high hydrostatic pressure, thus presenting interesting metabolic, physiological and taxonomic characteristics. The discovery of creatures perfectly adapted to extreme conditions, including eternal darkness, has awakened first of all enormous scientific interest in how life emerged on Earth and how it flourishes in such extreme environments".

Strange fish with jagged and alien features, single-celled organisms as large as a baseball, beings that live in total darkness or which even produce their own light, giant starfish, worms that live within frozen methane, and twenty-storey long jellyfish are only some of the bizarre and alien beings that live far beneath us in their own world in the depths of the abyss. Most exciting of all is the discovery of rare archea that survive entirely without the sun. These microbes do not rely on photosynthesis, but on a "sister process", called *chemosynthesis* to metabolize energy using geothermal energy instead of sunlight (Leary).

Using the Earth's heat around thermal vents, rather than the Sun's light, as the foundation of their existence means that these beings technically form a separate ecosystem and biosphere entirely apart from our own. These archea, in turn, form symbiotic relations with other creatures, such as tube worms, which are in turn hunted by *in situ* predators such as giant, carnivorous slugs. These creatures must have evolved from the same stock as our own life, and migrated to these areas at some point in the distant past, adapting to life without the sun. Nevertheless, their existence raises questions about the development of life, and has even led to speculation about life on other worlds. The possibility of life on Jupiter's moon Europa, with its sub-surface oceans beneath its icy cover is one possibility raised by the existence of these *extremophiles*, since it is theorized that Europa may

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have volcanoes similar to IO (Leary).

Greibner provides a list of some of the unique ecosystems seen in the ABNJ of both scientific and commercial interest:

- Seamounts are isolated mountains or mountain chains beneath the surface of the sea, generally formed over upwelling plumes and in island arc convergent settings. They are often highly productive ecosystems that can support high biodiversity and special biological communities with high levels of endemic species.
- Cold-water corals are widely distributed. To date, most of them have been discovered on the edges of the continental shelf or on seamounts where they build biodiversity hotspots in the open ocean.
- Hydrothermal vents occur along all active mid ocean ridges and back-arc spreading centres. They were the first ecosystem on Earth found to be independent from the sun as an original source of energy, relying instead on chemosynthesis. While biodiversity is generally low at vent sites, endemism is high.
- While species diversity in the pelagic habitats is generally lower than in the benthic environment, the pelagic ecosystem is far from uniform in terms of productivity with distinct hot spots.
- Sponge reefs are formed by glass sponges with three-dimensional silica skeletons, and are built in a manner similar to coral reefs, by new generations growing on previous ones. They can be found on the soft mud bottom of the deep sea where they provide habitat for many species.
- Cold seeps are deep soft-bottom areas where oil or gases seep out of the sediments. They are known to support relatively high diversity with a high rate of endemism.

Figure 4: Unique Ecosystems in the ABNJ, adapted from Greibner.

Nevertheless, in their study "*Marine Genetic Resources: A review of scientific and commercial interest*", David Leary, *et. al.* point out that "So far debate on the status of scientific knowledge in relation to marine genetic resources has been relatively superficial" and "…there has been relatively limited consideration by policy makers of the nature and extent of scientific research on marine genetic resources and very little consideration of scientists' perspectives on the issue".
In the same study mentioned above, Leary gauges the growing interest in MGR by the scientific community by analyzing the number of scientific journals published over the years referring to MGR. The results of his study are summarized below:

Year	Number of journals	Number of marine natural products described in the articles
1999	36	30
2000	85	143
2001–2002	175	97
2003–2004	163	150

Figure 5: Publications referring to MGR, adapted from Leary.

Marine scientific research is discussed in Part XIII of UNCLOS and is classically allowed to be

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carried out freely with out hindrance or fee when done for peaceful purposes. When done in the jurisdiction of another state, such activity requires permission from the state, as well as mutual sharing of all findings, and the right of the state to place its own personnel aboard the vessel performing the research Part XIII UNCLOS). When done in the ABNJ, whether in the Area, or in the High Seas, such activities are completely permissible and may be done freely and with out impost.

Commercial value of MGR in the ABNJ

The cornucopia of organisms inhabiting the sea floor offer unprecedented new genetic resources for extraction. As Vierros *et. al.* note: "deep and open oceans represent the largest reservoir of genetic resources (material derived from organisms), including some of major interest for commercial and industrial applications, including, for example, cancer-curing medicines."

Greibner offers a list of potential non-monetary benefits from MGR.

- Sharing of research and development results;
- Collaboration and cooperation in, and contribution to scientific research and development programmes, particularly biotechnological research activities;
- Participation in product development;
- Collaboration and cooperation in and contribution to education and training;
- Admittance to ex situ facilities of genetic resources and to databases;
- Transfer of knowledge and technology under fair and most favourable terms, in particular, knowledge and technology that make use of genetic resources, including biotechnology, or that are relevant to the conservation and sustainable utilization of biological diversity;
- Strengthening capacities for technology transfer;
- Institutional capacity-building;
- Access to scientific information relevant to conservation and sustainable use of biological diversity, including biological inventories and taxonomic studies;
- Research directed towards priority needs, such as health and livelihood security;
- Institutional and professional relationships that can arise from collaborative activities;
- Joint ownership of relevant intellectual property rights.

Figure 6: list of potential nonmonetary benefits from MGR, adapted from Greibner.

In their study, "*Marine Genetic Resources: A review of scientific and commercial interest*" Leary *et. al.* attempt to analyze the growing commercialization of MGR by analyzing patents. While acknowledging that patents offer a limited scope for studying commercial value, Leary nevertheless points out that patents can offer a glimpse at the growing demand and marketability of a product. In any case, patent information is one of the few relatively complete sets of corporate data available for analyses, due the lucrative and highly sensitive nature of MGR.

The results of Leary's study are summarized below:

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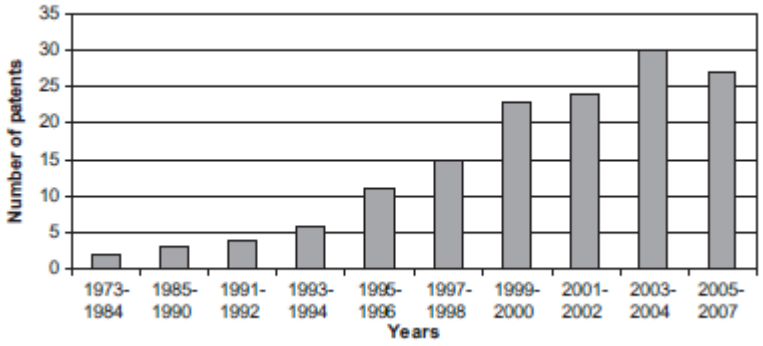

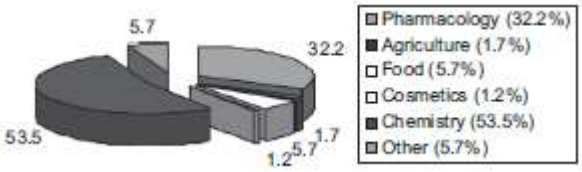

Industry	Total estimated value of world market	Selected product annual sales value
Pharmaceutical industry	$643 billion in 2006	• $50 m and $100 m for herpes remedy from sea sponge (2005) • $1 billion cancer fighting agents from marine sources (2005) • $23 million for AIDS drug Retrovir (2005) • $237 million for herpes treatment Zovirax (2006)
Enzyme market	• Minimum of $50 billion a year for enzymes • 1 billion per year for the DNA extraction market	• Estimated $150 million per year for Valley Ultra Thin (from deep sea hydrothermal vent source) • Estimated $20-30 million for Luminase (from geyser)
Cosmetics industry	• Total $231 billion in 2005 • $38.3 billion globally in 2005 for skin care products	Not available

Figure 7: Patents relating to MGR and the ABNJ, adapted from Leary.

In their research, Leary *et. al.* identified 135 patents issued from 1973-2007 for new and unique discoveries and inventions relating to MGR harvested from the ABNJ. For the purposes of their study, Leary *et. al.* divided these patents into six categories: "Pharmacology", "Agriculture", "Food", "Cosmetics", "Chemistry", and "Other". Leary *et. al.* also lists the patents by year of issue, indicating a steady pattern of growth, and then go on to discuss the monetary earnings made by each industry from their patented technology.

Capacity Gap – a vicious circle?

In their research, Leary *et. al.* note that there are "at least 14 biotechnology and other companies actively involved in patenting" and "a brief search of European and US Patent databases revealed that at least 37 patents have been granted with respect to products derived from deep sea genetic resources". Leary further notes "These companies were predominately North American and European-based companies including some of the world's largest biotechnology companies. Six of these companies already market products derived from deep sea genetic resources sourced both with in and beyond national jurisdiction". Vierros seems to reiterate this when he notes: "A survey of patents associated with marine genes shows that they originate from only a handful of countries (the top three being the United States, Germany and Japan) that have access to the required technologies."

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These figures seem to suggest that there exists the potential for a capacity gap to develop in mining and bioprospecting in the deep sea-bed. As Vierros goes on to say: "Remote and difficult to access, to reach the deep seas requires a very significant input of financial resources and, often, sophisticated technology. Only affluent developed countries are able to mount expeditions with the sophisticated research vessels, instrumentation, submersibles and remotely operated vehicles that are required to explore these areas."
Like a Giraffe eating fruit from a tree too tall for other animals to reach, the already tall giraffe gains nutrients and grows ever stronger, while other smaller animals loose out entirely – this is what some argue current legal regimes create in the ABNJ; a vicious circle, a capacity gap. As Vierros puts it:

The capacity imbalance and the increasing privatisation of what is seen as a common resource have resulted in many developing countries seeking to address the issue within the UN.
The implication is that, if they are covered by the common heritage of mankind principle, then some form of benefit-sharing should take place between those countries that are collecting and commercializing genetic resources from the deep seabed beyond national jurisdiction and those that do not have the means to do so. Most developing countries, particularly the G-77 and China, support the common heritage principle, while many developed countries argue that the products derived from marine genetic resources, such as pharmaceuticals, already benefit all countries and further regulation is not desirable.

In response to such concerns, from 31 May to 3 June, 2011 the '*Ad Hoc* Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction' [BBNJ Working Group] proposed to the UNGA to initiate a process to address these, and other concerns, and find a possible way forward in resolving the current legal canard in relation to bioprospecting in the ABNJ (Drankier, Greibner, Vierros).
In part, this recommendation reads (as reproduced by Greibner): *'...*

1. A process be initiated, by the General Assembly, with a view to ensuring that the legal framework for the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction effectively addresses those issues by identifying gaps and ways forward, including through the implementation of existing instruments and the possible development of a multilateral agreement under the United Nations Convention on the Law of the Sea;
2. This process would address the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction, in particular, together and as a whole, marine genetic resources, including questions on the sharing of benefits, measures such as area-based management tools, including marine protected areas, and environmental impact assessments, capacity-building and the transfer of marine technology;
3. This process would take place:
[…]
ii) In a format of intercessional workshops, aimed at improving understanding of the issues and clarifying key questions as an input to the work of the Working Group;…'

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This recommendation eventually lead the UNGA to draft A/66/L.21 (Vierros), which will initiate a consultative process for resolving the lacuna in modern international law relating to bioprospecting of MGR in the ABNJ.

Legal Lacuna – MGR in the ABNJ

Current legal regimes were not written with 'MGR' in mind. The prolific existence of biota in the ABNJ at the astounding magnitude we know exist today was not known or anticipated at the time that most of the legal mechanisms we live under today were written (Drankier, Churchill). The five most important international legal instruments relevant to the issue of MGR are as follows (Greibner):

- The United Nations Convention on the Law of the Sea [UNCLOS];
- The Convention on Biodiversity [CBD], and the two subsequent instruments: the Cartagena Protocol on Biosafety and the Nagoya protocol;
- The three components of Antarctic Treaty System [ATS], which includes the original Antarctic Treaty, the Protocol on Environmental Protection [Madrid protocol], and the Convention on the Conservation of Antarctic Marine Living Resources [CCAMLR];
- Modern intellectual property rights [IPR] regimes, such as the Budapest Treaty, WTO regulations, TRIPS, and WIPO regulations among others; and
- While not related to the Law of the Sea as such, the United Nations Food and Agriculture Organization [FAO]'s International Treaty on Plant Genetic Resources for Food and Agriculture [ITPGRFA], also known as the 'seed treaty' or 'FAO Treaty'.

None of the above instruments even make mention of MGR. The term '*Marine Genetic Resources*' does not even appear in the text of the UNCLOS, the most important of these five instruments (Greibner, Cole). The other instruments discuss either GR or LR in a more general sense, not necessarily in relationship to the Ocean; or else MGR in a more localized area. The CBD and modern IPR regimes would be examples of the former, while the ATS would be an example of the ladder case (Greibner, Drankier, Cole).

The ITPGRFA has absolutely no connection to the sea and its legal regimes, however it is still of great significance due to its analogous regime governing plant genetic resources in agriculture (Greibner, Drankier, Cole). In particular, its multilateral benefit sharing program [MLS] of land based plant genetic resources is of great interest in the legal debate surrounding MGR in the ABNJ (Drankier).

MGR reveals a "legal lacuna" within these treaties – treaties which our entire modern, international regime of ocean governance rests upon. Nevertheless, it is precisely within these legal instruments that we must search for a means to fill this gap. A possible way forward in the governance of MGR can only be achieved through analysis and investigation into these regimes, with emphasis on their strengths, weaknesses, current status in relation to MGR, and how to instigate incorporation of MGR into these regimes (Drankier, Greibner).

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Current Legal Frameworks

As Greibner notes: "So far, marine genetic resources in ABNJ are not regulated through a specific legal instrument at the international level. However, different international instruments exist which are related to the marine environment and its biodiversity, as well as to access to genetic resources and related benefit sharing (ABS). These legal instruments include the United Nations Convention on the Law of the Sea (UNCLOS), the Convention on Biological Diversity (CBD) and its Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (Nagoya Protocol), the Antarctic Treaty System (ATS), comprising the Antarctic Treaty, its Protocol on Environmental Protection (Madrid Protocol) and the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), as well as international instruments related to intellectual property rights."

Each of these regimes offers their own unique combination of strengths and weaknesses, and each one could potentially be used to establish a regime relating to MGR. The question really becomes 1.) how could MGR be made part of the regime, 2.) who stands to benefit or loose from incorporating MGR into a given regime, and 3.) concurrent to the second question, which regimes are most politically, socially, and economically feasible? A review of each legal regime and will follow:

Regime:	**Common Heritage of Mankind**	**Freedom of the High Seas**	**CBD Regime**	**ATS**	**IPR Regimes**	**MLS Regime**
Instruments:	UNCLOS (Part XI)	UNCLOS (Part VII)	CBD, Cartagena Protocol, Nagoya Protocol	Antarctic Treaty, Madrid Protocol, CCAMLR	National IPR, WTO, TRIPS, WIPO	ITPGRFA, FAO
Regulatory Authority:	ISA	None	COP,		WTO, WIPO, States	FAO, SMTA

Figure 8: Legal Regimes regarding the ABNJ

UNCLOS - 'Common Heritage' vs. 'Open Access'

Under the UNCLOS, two very different regimes co-exist in the ABNJ. Concerning the "the Area", UNCLOS establish the unique "Common Heritage of Mankind" regime (Part XI), whereas the HS are governed under the "Freedom of the High Seas" (Part VII) regime, as was explained above (Cole, Drankier, Greibner). There is a gap in the UNCLOS concerning MGR, because at the time the UNCLOS was drafted, these resources were not being marketed or explored (Greibner, Drankier), the term "marine genetic resources" does not even appear in the text of the UNCLOS. Also, the UNCLOS does not offer an explicit boundary between "the Area" and the HS (Drankier, Cole, Greibner). Hence, the debate isn't really over what regulations exist, but which family of

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regulations apply.

UNCLOS § 1-1, 133 "the Area is the seabed and ocean floor, and the subsoil thereof, beyond the areas of national jurisdiction". Broadly, Part XI of UNCLOS, and more specifically UNCLOS §136, designates that the Area and its resources are the "common heritage of mankind". This unique regime means that exploitation of the Area requires payment and benefit sharing on the part of states exploiting this region; these proceeds are used to help in capacity building for less advanced economies. This is managed and maintained by the "International Seabed Authority" [ISA] also known as "the Authority" (UNCLOS § 136). Two schools of thought exist concerning how MGR should be classified:

- Some argue, that because MGR organisms live on or near the seafloor, they should be classified as part of "The Area", and therefore governed under the "Common Heritage of Mankind" regime.
- Others argue, that because MGR organisms are organisms, and therefore not a characteristic of the seabed as such, they should be treated just as pelagic fish would.

Either case holds interesting implications. If treated as part of "The Area", technology withdrawn from MGR would have to be shared in some public way, via the ISA's ABS system, and could not be privatized or would be very limited in its privatization. If not treated as part of "The Area", but rather as pelagic organisms, then MGR technology would be private property as much as fish caught on the high seas are.

This in turn depends upon how one defines the boundary between the Area and the HS. The text of the UNCLOS is laconic on the delineation between the two regions. Drankier paraphrases the conundrum succinctly: " Article 1 of the LOSC states that the "Area" means the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction. The terms "seabed", "ocean floor" and "subsoil" are not defined in the LOSC. The meaning of the term seabed is particularly relevant to define the limit of the Area in relation to the superjacent water column. Does the seabed only refer to solid materials that make up the bed of the sea, or does it also include solids, water or other liquids or gasses in contact with those materials? For instance, are the waters, flowing from a hydrothermal vent and the materials it contains, part of the Area or the superjacent water column? Another example is provided by so-called brine pools, which are small lakes on the seafloor with a distinct surface and shoreline. These pools are bodies of water that have a salinity three to five times greater than the surrounding ocean, such that the dense brine does not easily mix with overlying seawater. Are these pools part of the Area or the water column?"

Does "the Area" include *only* the "earth" or "soil" of the substratum *strictu sensu*, or is it broader than this? UNCLOS §1 defines the Area very precisely to mean the "seabed", though what "seabed" refers to exactly is not clear. UNCLOS §135 also notes that the regime of the area shall not prejudice the waters superjacent to it. UNCLOS §256, 257 discuss marine scientific research in the Area and HS, respectively, distinguishing but not delineating the two. In all three cases we encounter what seems to be a case for the Area being defined specifically as the substratum apart

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from the water, but this is not clear. In any case Drankier and Greibner both seem to disagree on this point.

UNCLOS §133 defines "resources" in the Area to mean "(a)…mineral resources *in situ*. When recovered from the Area, such resources shall be regarded as minerals. (b) Resources shall include: (i) Liquid or gaseous substances at or beneath the surface… (ii) Solid substances occurring on the surface or at depths of less than three meters below the surface, including ploymetallic nodules; (iii) Solid substances at depths of more than three meters below the surface; (iv) Metal-bearing brine at or beneath the surface." The emphasis placed on soil and mineral resources in or under the substratum again seems to hint at *strictu sensu* interpretation of 'the Area'.

Drankier disagrees, however, with a *strictu sensu* interpretation noting: "Two criteria would seem to be relevant for establishing whether features are part of the seabed or the superjacent waters. One is their location in relation to the seabed, the other whether or not they can be clearly distinguished from the surrounding waters…Article 133 of the LOSC supports the conclusion that the definition of the upper limit of the Area should not be based on a restrictive interpretation of the term "seabed". Article 133 of the LOSC refers to *all* solid, liquid or gaseous mineral resources "*in* the Area *at* or beneath the seabed". However Greibner argues that UNCLOS §133, in fact excludes MGR as it specifically defines mineral resources as being "resources" relative to the Area: "As a consequence, the ABS regime under Part XI of the UNCLOS does not directly apply to marine genetic resources in ABNJ." In any case, the inclusion or exclusion of MGR from the Area hinges on whether "genetic" resources can be described as *in situ* to it.

Similar disputes relate to the HS. UNCLOS §86 states that the HS is "all parts of the sea that are not included in the exclusive economic zone, in the territorial sea or in the international waters of a State, or in the archipelagic waters". UNCLOS §87 lists the five freedoms of the HS, which all states enjoy, nevertheless these rights are not absolute, as Greibner points out. Fishing for example is regulated by UNCLOS §116-120, and in any case such states must pay due interest to the rights of other states (UNCLOS §87). UNCLOS §88 states that activities on the HS must be carried out peacefully.

The debate as to whether bioprospecting of MGR can be considered an activity covered under the "Freedom of the High Seas" hinges on three main points (Greibner): 1.) whether or not bioprospecting as an activity can be covered under the "Freedom of the High Seas", 2.) whether or not it is seen as being "peaceful" and "beneficial to all", and 3.) whether or not it could be considered "scientific research". Drankier and Cole seem to consider it a given that MGR is part of the HS regime.

Greibner however points out in his research that one might argue the case that bioprospecting is not covered, since it "not explicitly mentioned by Article 87 UNCLOS, it could be argued that such activities do not fall under the high seas regime. Indeed, the freedoms listed focus more on

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"traditional" kinds of marine activities. Fishing, for example, differs substantially from the "typical" bioprospecting, as it aims at catching large quantities of given living resources to produce the maximum yield from the species. In contrast, bio-prospectors usually have a different aim, namely securing material of plant, animal, microbial or other origin containing functional units of heredity of actual or potential value. For this they are more interested in the quality and difference of the harvested species than in their maximum yield." However, because, UNCLOS §87 includes the term, "*inter alia"* when listing the five freedoms a case may be argued that bioprospecting is covered by the "Freedom of the High Seas" even if it isn't fishing or scientific research.

Nevertheless, Greibner also argues that bioprospecting can be argued to be covered under the HS, as it resembles fishing in its execution, if not its purpose. After all, bioprospectors still use most of the same tools that fisheries employee, even if their aims are different. Also, one could consider bioprospecting on the HS to be covered as "scientific research", since companies are harvesting marine organisms for study, it is only afterwards that they sell technology *based on* the research. Another important point in the debate is the fact that trawl fishers, who scrape the ocean floor for fish, are not considered to be taking from 'the Area' (Drankier). Also, because, UNCLOS §87 includes the term, "*inter alia"* when listing the five freedoms a case may be argued that bioprospecting is covered by the "Freedom of the High Seas" even if it isn't fishing or scientific research.

CBD:

The 'Convention on Biological Diversity' [CBD] is one of a number of instruments initiated at the UNCED or 'Rio Summit' held in 1992 in Rio De Janeiro, Brazil (Henkin, Cole, CBD Preamble). CBD §1 states that the CBD's three main objectives are:

- The conservation of biological diversity.
- The sustainable use of its components.
- The fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

An international treaty whose main aim is to foster conservation and sustainable development in all the world's ecosystems (not just the sea), the CBD includes governance mechanisms related to benefit sharing and capacity building, as well as mechanisms for regulating traditional knowledge (TK) and genetic resources (GR). In a broader sense, the CBD regime incorporates the original CBD treaty and is further supplemented by a number of other agreements, including the 'Nagoya Protocol', the 'Bonn Agreement', and the 'Cartagena Protocol on Biosafety' (Cole, Henkin, Drankier, Greibner). The CBD's benefit sharing program finds it fullest expression in CBD §15, as paraphrased by Greibner:

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- Article 15.1 CBD recognizes the sovereign right of states over their genetic resources, including the right of states to regulate and to control the use of their genetic resources. Accordingly, genetic resources are not perceived as common heritage of humankind and cannot be treated per se as freely accessible.[43]
- The authority of a government to determine access to genetic resources is qualified by Article 15.2 CBD which requires the CBD contracting Parties to endeavour to create conditions which facilitate access to their genetic resources for environmentally sound uses, and do not impose restrictions that run counter to the objectives of the CBD.
- According to Article 15.5 CBD, access to genetic resources is subject to the prior informed consent (PIC) of the Party providing the genetic resources, unless otherwise determined by that Party. Where granted, access is further conditioned on reaching mutually agreed terms (MAT) between the Party providing genetic resources and a potential user (Article 15.4 CBD).
- Article 15.7 CBD requires each contracting Party – whether developed or developing – to take legislative, administrative or policy measures whose goal is the fair and equitable sharing of benefits with the contracting Party providing genetic resources. While the CBD does not provide a definition of the term *'benefits'*, these can, amongst others, include research and development results (Article 15.7), commercial or other benefits derived from utilizing the genetic resources provided (Article 15.7), access to and transfer of technology using the genetic resources (Article 16.3), participation in all types of scientific research based on genetic resources (Article 15.6), specifically in biotechnological research (Article 19.1), or priority access to the results and benefits arising from biotechnological use of the genetic resources (Article 19.2).

Figure 9: Greibner's paraphrase of the CBD

In regard to the Law of the Sea, La Fayette points out that "the CBD and UNCLOS seem to complement each other" with many of the mechanisms mentioned in UNCLOS finding fuller expression in the CBD. Greibner also notes that CBD §22 and UNCLOS §311 create a legal interlock between the two treaties. Drankier further points out that "the negotiations on the CBD were completed in 1992, which is a decade after the conclusion of the LOSC. The CBD came into force in December 1993, almost a year before the entry into force of the LOSC. Virtually all States Parties to the LOSC are also Parties to CBD. The United States are neither party to the LOSC nor to the CBD." Hence, while not a treaty with regards to the ocean per se, the CBD nonetheless is meant to be applied to the ocean as much as to other environments.

The CBD offers a number of strong benefits in relation to multi-lateral sharing arrangements for traditional knowledge (TK) and genetic resources (GR) – in fact, regulating multi-lateral benefit sharing of GR is the CBD's primary function (CBD §1(3)). Since this was its primary purpose, it would seem appropriate to establish some type of MLS based on its regime; also, its governance approaches, such as sustainable development, were also written with circumstances such as that surrounding MGR in the ABNJ in mind (CBD §2, 6, 8, 10, Drankier). The CBD's MLS system is already well established in many national jurisdictions (Drankier), and includes measures to ensure equity, including 'prior informed consent' [PIC] and 'mutually agreed terms' [MAT] (Nagoya §3, 4, 5; Bonn §I, CBD §15(4), 15(5), 15(7). CBD §16 requires mutual cooperation and respect towards

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property rights by all parties.
However, CBD §4(a), 4(b) indicate that the CBD's rules and regulations regarding GR and LR only apply to such resources within a state's jurisdiction. This means that either the CBD doesn't apply in the ABNJ at all, or would only apply to processes and acts carried out by a state in the ABNJ, which leaves private enterprises in an ambiguous state (Greibner, Drankier). This is the CBD's biggest weakness in relation to MGR in the ABNJ (Drankier).

Opponents also have the right to block attempts at using the MAT and PIC mechanisms, and further current patent regulations with regard to TRIPS does not require disclosure of point of origin or location of harvested materials, potentially robbing potential beneficiaries of the MLS (Drankier). Also, many important nation-states, particularly the USA, are not party to the CBD. (Greibner)
In general, as Drankier and Greibner both note, the CBD is vague in some places, overly bureaucratic in others, and is aimed at private use with in state jurisdiction. Changes would need to be made in order to make things applicable to the ABNJ.

Antarctic Treaty System [ATS]
The Antarctic Treaty System [ATS] is a legal arrangement that grew out of conflicting territorial claims in Antarctica amongst states claiming territory there (henkin). This regime is presently composed of a number of instruments, three of these are of concern surrounding MGR and benefit sharing in the ABNJ (Drankier, Greibner):

- The Antarctic Treaty [AT]. 1959
- Protocol on Environmental Protection (Madrid Protocol); 1991
- The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) 1980
- the Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA), (not yet in force)

The ATS includes a comprehensive multi-lateral benefit sharing [MLS]. As the ATS is a regional scheme, it cannot be instituted elsewhere; however its mechanisms are of interest to MGR discussion.

AT §II requires that contracting parties agree to freedom of scientific investigation, and AT §VII.5 requires that parties notify one another of any and all expeditions. The ATS has an Electronic Information Exchange System [EIES], which by the Antarctic Treaty Consecutive Meeting [ATCM] §10 requires its use to declare when specimens are being collected, and Madrid Protocol Annex II §3, Annex V §7 could be interpreted to require a permit for such activities. All such research must also adhere to the principles for environmental conservation outlined in CCAMLR §II.3, IX.2, though these restrictions do not apply to all organisms (Drankier).

In terms of intellectual property rights [IPR], though some debate it, the ATS does not recognize patentability in the Antarctic (Drankier, Greibner). Scientific knowledge gained from Antarctica must be shared, via AT §III.1(c), reiterated in CRAMRA §16. This benefit-sharing regime requires free exchange of information, and generally frowns upon commercialization. An ATCM Working

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Paper notes "patent may result in excluding others from freely using" (Drankier, Greibner). The new CRAMRA will contain new mechanisms for monetary regulations, however many of these seem ad hoc (Drankier).

ITPGRFA:

In his paper, "*Access and Benefit Sharing in Relation to Marine Genetic Resources from Areas Beyond National Jurisdiction - A Possible Way Forward*" Thomas Greibner argues the unique case of using the United Nations Food and Agriculture Organization [FAO]'s 'International Treaty on Plant Genetic Resources for Food and Agriculture' [ITPGRFA], also known as the 'FAO treaty' or 'Seed Treaty', as a model to develop a wholly new regime.

The ITPGRFA was devised to help farming communities gain through an MLS of TK and GR (ITPGRFA §1). The ITPGRFA sets up a multi-lateral benefit sharing [MLS] regime known as the 'Standard Material Transfer Agreement' [SMTA] (ITPGRFA §12, Greibner). Under this unique regime, the ITPGRFA sets up a world wide network of "GR Banks" called 'International Agricultural Research Centers' [IARCs] which farmers as well as researchers may access (Greibner). Individuals and groups can pay into the SMTA in cash or in kind (Greibner, ITPGRFA §13), and can withdraw materials from its system, which currently contains over 64 unique genetic entries (Greibner).

The ITPGRFA is not without its critics, however. Payment into the SMTA by those who withdraw is not well enforced, and the monetary contributions to its oversight are non-compulsory, leaving it constantly short of funds (Greibner). Also, there is a question as to the effect of patentability, as it would seem to curtail patentability (Greibner). One idea would be to make the MGR counterpart to the ITPGRFA SMTA system less transparent, to ensure sharing but also to defend patent holder rights (Greibner).

Intellectual Property Rights [IPR] - WTO, WIPO, and TRIPS:

Greibner notes the paradox surrounding 'intellectual property rights' [IPR] and 'marine genetic resources' [MGR] "…the granting of intellectual property rights for inventions using marine genetic resources has the potential to limit the future utilization of such resources…However, IPRs can also be part of the solution, as they provide a legal and commercial framework to generate benefits from the use of genetic resources." Karl Marx once said that "wealth should remain with those who produce it", but what does "production" mean? Does the scientist or the inventor not "produce" with their mind just as the worker produces with his hands? And if so, would it not be hypocritical to say that they cannot keep their wealth, too? This is why we have intellectual property rights [IPRs],such as patents – to keep wealth with those who produce it.

However, what happens if the wealth they mean to produce was something that actually came from somebody else? Or which is so crucial to society that it would be detrimental to vest it in one person's interest? Or what if a "economic gap" exists between two groups of people in relation, and

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one more advanced economy has the wealth to invest in innovation, whereas the other does not – and then, once they have made money from their invention, they have more means to invest in yet more, creating a vicious circle? Hence the conundrum of IPRs.

Two important agencies in the world today regarding IPRs are the 'World Intellectual Property Organization' [WIPO] and the 'World Trade Organization' [WTO].

- WIPO – established in 1967, WIPO is one of 17 special UN agencies. Currently, WIPO has 185 member nations under its purview and administers 24 treaties relating to IPRs [Drankier].
- WTO – established in 1995, WTO maintains commercial codes and trade agreements between member states, facilitating leveled, balanced trade. The 'Trade-Related Agreement on Intellectual Property Rights" [TRIPS] is the WTO's most important agreement related to IPRs [Drankier, Greibner].

Some of the rules and regulations administered by these organizations create friction with MLS regimes. For example, Greibner notes that the WIPO "Paris Convention for the Protection of Industrial Property" in particular creates some interference with MGR access benefit sharing [ABS]. However, the WIPO 'Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore' [IGC] was created in 2000 to deal with the situation.

Basically, it can be thought of that there are two kinds of IPR protections, "defensive protections" and "positive protection". They're means and ultimate aims are the same, but in what direction they operate is different. A protection that would stop a scientist from appropriating traditional knowledge [TK] taken from an indigenous people and presenting it as his or her own is "defensive", whereas a rule that protects an inventor who came up with a legitimately unique idea and wanting royalties for it, is an "positive protection" [Greibner]. ABS/MLS can be thought of as one form of "defensive protection" in this conception.

Current IPR regimes create some friction in a number of ways with MLS and sustainable use of MGR (Drankier). Marine micro-organisms, as well as unique techniques or processes derived from them or other life, are potentially patentable [though not DNA its self] (Drankier). Under the current regime, both products and processes are patentable (Drankier).

Also, although TRIPS, WTO, and WIPO are international regimes that maintain standards across international jurisdiction, ultimately the right to issue a patent is the sovereign act of a state, and national laws in different countries conflict and contradict each other (Drankier). Only a country can issue a patent, this has a dynamic effect on international law(Drankier). Usually, the state conducting research or innovation in the ABNJ grants the patent according to nascent national laws (Drankier).

UNCLOS §241 provides that marine scientific research activities can not constitute the legal basis of a claim to any part of the ABNJ, however patent law does allow patentability of material from the

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ABNJ – granting exclusive rights to states (or private citizens from them) (Drankier). Out of the 153 member states of the WTO, 120 of them are party to UNCLOS (Drankier). What effect TRIPS will have on other treaties, such as the ITPGRFA, is unknown (Drankier).

Currently, patent laws require full disclosure of a discovery (i.e. a description thorough enough that an expert can reproduce it) in order to earn a patent (Drankier). However, the WTO is contemplating an amendment to the TRIPS to remove the disclosure requirement (Drankier).

CONCLUSION

Much work still needs to be done by the international community regarding marine genetic resources in the area beyond national jurisdiction. While currently, no regime exists regarding MGR in the ABNJ, MGR could be transferred into a number of possible regimes. A new annex to the UNCLOS, or a ruling on the part of either the ITLOS, the ICJ, or the Security Council could place MGR in either the ABNJ or the HS. A new annex to the CBD could be created to transfer its authority to the ABNJ, or perhaps a new treaty could be written up that would create an analogous regime in the ABNJ. Still, other option would include creating a new treaty that imitates the ATS or the ITPGRFA. Yet another possibility would even be to maintain the status quo. Many options exist, but it will take action to implement them. The world will just have to wait and see.

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