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Marine Genetic Resources in Areas beyond National Jurisdiction: Do We Need to Regulate Them in a New Agreement?

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Abstract

This paper seeks to question the prevailing orthodoxy on the need for the 'package deal' on the proposed international legally-binding instrument under UNCLOS on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction to address marine genetic resources, including questions relating to access and benefit sharing. Through an examination of key documents and reports prepared over the past two decades, the first part of this paper will show that there has been little hard commercial evidence brought forward during debates at the United Nations to justify the inclusion of the marine genetic resources issue within the 'package deal'. In light of that analysis, the second part of the paper will then go on to offer some initial thoughts on the various options for regulating access and benefit sharing in relation to marine genetic resources in areas beyond national jurisdiction that have been floated during the initial phase of negotiations. In particular, the second part of this paper examines the possible elements of a draft text of an international legally binding instrument set out in the chairs non-paper considered at the 3rd session of the Preparatory Committee established by General Assembly Resolution 69/292. The paper does not seek to trace the extent to which aspects of the chairs non-paper ultimately were contained in the Prep Comm's final report to the United Nations General Assembly in late 2017. These negotiations are still ongoing and nothing definitive can be read into what was present or absent from that report. Instead, this analysis highlights which proposed elements of the international legally binding instrument would be the preferable outcome from these negotiations in light of the lack of evidence of commercial interest in marine genetic resources in areas beyond national jurisdiction.

Keywords: marine genetic resources, areas beyond national jurisdiction, international legally binding instrument

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1. Introduction

On 19 June 2015, the United Nations General assembly passed Resolution 69/292[1] which committed States to develop an international legally binding instrument under the 1982 *United Nations Convention on the Law of the Sea* (UNCLOS)[2] on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction. Critically Resolution 69/292 mandates that the international legally binding instrument must address:

> the topics identified in the package agreed in 2011, namely the conservation and sustainable use of marine biological diversity of 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, environmental impact assessments and capacity-building and the transfer of marine technology.[3]

In essence, Resolution 69/292 sets up the negotiations for an international legally binding instrument under UNCLOS on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction as a 'package deal' - that is to say, all issues are to be addressed or no issues will be addressed. This approach to the negotiation of an international legally binding instrument should come as no surprise to even the most casual observer of these debates. These issues have become increasingly intertwined in the discussions at the United Nations (UN) over the past decade and a half, especially during the work of the Ad Hoc Open-ended Informal working group to study issues relating to the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction (the Ad hoc Working Group).[4] All the issues relating to the conservation and sustainable use of biodiversity in areas beyond national jurisdiction (ABNJ) are interrelated and are best addressed as a package deal, assuming that is that each element of the package deal actually merits regulation.

This paper seeks to question the prevailing orthodoxy on the need for the 'package deal' to address the marine genetic resources (MGR) issue, including questions relating to access and benefit sharing. Through an examination of key documents and reports prepared over the past two decades, the first part of this paper will show that there has been little evidence of commercial interest brought forward during debates at the UN to justify the inclusion of the MGR issue within the 'package deal'. In light of that analysis, the second part of the paper will then go on to offer some thoughts on the various

1 UNGA Res 69/292 'Development of an international legally binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction' (19 June 2015) UN Doc A/RES/69/292.

2 United Nations Convention on the Law of the Sea (opened for signature 10 December 1982, entered in force 16 November 1994) 1833 UNTS 3 (UNCLOS).

3 UNGA Res 69/292 (n 1) para 2.

4 For a concise overview of the history of discussions on the issue see Elisa Morgera and others, 'Third session of the Preparatory Committee on Marine biological diversity beyond areas of national jurisdiction: 27 March-7 April 2017' (2017) 25(119) Earth Negotiations Bulletin-PrepCom 3.

options for regulating access and benefit sharing in relation to MGR in ABNJ currently on the negotiating table. In particular, the second part of this paper examines some aspects of the possible elements of a draft text of an international legally binding instrument set out in the chairs non-paper[5] which was considered at the 3rd session of the Preparatory Committee (Prep Comm III) established by General Assembly Resolution 69/292. The analysis in the second part of this paper will highlight which proposed elements of the international legally binding instrument would be the preferable outcome from these negotiations in light of the lack of evidence in relation to commercial interest in MGR in ABNJ. It should be noted, however, that it is not the author's intention that this final part of the paper trace the extent to which aspects of the chairs non-paper ultimately were contained in the Prep Comm's final report to the UN General Assembly[6] in late 2017. Given the negotiations for the international legally binding instrument are yet to be concluded nothing definitive can be read into what was present or absent from that report. Some of these elements may or may not ultimately be incorporated into the final international instrument. Instead, the aim of the second part of this paper is to highlight what in the author's view would be the optimal outcome on some of the key issues which have been flagged in the chairs non-paper. Whether these optimal outcomes will or will not be achieved it is too early to say.

2. 'Alternate facts' and debates on marine genetic resources

In a recent opinion piece published in *The Guardian*, cell biologist Jenny Rohn from University College London lamented:

> The recent jaw-dropping performance of Donald Trump and his cronies, firing off random statements without even bothering to check whether they are true, is not as disturbing as the fact that they seem to be getting away with it. It is no longer enough for a reputable press outlet to cry foul – the corrections are shrugged off as partisan conspiracy theorists, and the exposé no longer leads to shame, or the mending of ways. Say something loud enough and often enough, and it starts to sound true. Get away with it enough, and it becomes a viable strategy.[7]

While that commentary related to attacks on science and scientists that regrettably have come to characterize what passes for policy-making in the 'post-truth world' of the Trump Presidency, it is arguable that a similar phenomenon can also be observed in debates on MGR at the UN over the past decade and a half. That is to say, certain 'alternate facts' relating to the level and extent of com-

5 UN, 'Chair's non-paper on elements of a draft text of an international legally-binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction' (2017) <www.un.org/depts/los/biodiversity/prepcom_files/Chair_non_paper.pdf> accessed 9 May 2017 (UN Paper).

6 UNGA, 'Report of the Preparatory Committee established by General Assembly resolution 69/292: Development of an international legally binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction' (2017) UN Doc A/AC.287/2017/PC.4/2.

7 Jenny Rohn, 'Scientists can't fight 'alternate facts' alone' *The Guardian* (London, 25 January 2017) <www.theguardian.com/science/occams-corner/2017/jan/25/alternative-facts-experts-scientists-fight-alone-humanities> accessed 27 April 2017.

mercial interest in MGR in ABNJ have repeatedly been asserted loud enough and often enough that they have now come to be accepted as fact even though the supporting evidence for these claims is woefully lacking.

The 'alternate facts' that I am referring to here are repeated assertions that there is huge industry interest in the commercialization of MGR from ABNJ; that numerous products are already on the market or are very close to commercial sale; and that massive profits are already being reaped by developed country companies without any equitable sharing of these benefits with developing countries. These 'alternate facts' in turn are used to justify the need for the proposed legally binding instrument to address access and benefit sharing in relation to MGR in ABNJ.

What evidence is there to support the 'alternate facts'? In this paper three key sources will be examined: the Annual Reports of the UN Secretary-General on Oceans and the Law of the Sea (2.1); reports, documents and presentations made as part of the UN Open-ended Informal Consultative Process on Oceans and the Law of the Sea (UNICPLOS) and the Ad Hoc Working Group (2.2-2.3); and key academic and scholarly studies published over the past decade and a half (2.4).

2.1 Annual Reports of the UN Secretary-General on Oceans and the Law of the Sea

A useful place to start our search for evidence supporting these 'alternate facts' is to review the annual reports of the UN Secretary-General to the UN General Assembly. While scholarly engagement with the marine genetic resources issue began in 1996 with the publication of Lyle Glowka's seminal paper on marine scientific research, genetic resources and the Area,[8] the first discussion of the issue in the UN Secretary-General's report was in 1995. The 1995 report observed:

> In the field of marine biology, new discoveries of marine creatures dwelling on or in seabed ooze, often miles deep, thriving in pitch darkness under an enormous pressure, have led experts radically to revise upwards their rough estimates of the number of species of all types of marine life from 200,000 to between 10 million and 100 million, which is the same as the range projected by the possible total number of terrestrial species. The newly recognized creatures are considered important because of their *possible commercial value* as well as because of their role in maintaining the earths ecological balance. The *potential commercial value* of the new organisms lies in their great genetic diversity. The aim is to use their exotic genes to develop new drugs, catalysts and agents that can break down wastes…[G]rowing attention is being paid to investigations on the commercial uses of exotic undersea and deep earth species. For example, a company based in San Diego, California is looking for bacterial enzyme adapted to high temperature and intense pressures that *might be industrially useful.* … Some of the microbes are already being scanned for antibiotics and agents that might help fight diseases. Japanese biologists have begun a major effort to retrieve microbes from the deep, and perhaps to make a new drugs and tools for genetic engineering.[9]

8 Lyle Glowka, 'The Deepest of Ironies: Marine Scientific Research, Genetic Resources and the Area' (1996) 12 Ocean Yearbook 154.

9 Report of the Secretary-General, 'Oceans and the law of the sea' (1995) UN Doc A/50/713, paras 240-43 (emphasis added).

Several points are worth noting about these initial observations on MGR in 1995. Firstly, the discussion refers only to 'potential' or 'possible' commercial value. One example of commercial research and development, namely an un-named San Diego based company is referred to. But this single example related to research and development and not the actual commercialization of a product. Thus, in the first UN Report to refer to the status of MGR in ABNJ there was no suggestion that possible or potential commercial value had at all been realized. The report is speaking as to something that may or may not occur in the future; activities may or may not be happening now.

The following year, 1996, the Secretary-General's report again referred to 'the scientific and commercial value of deep seabed genetic resources'[10] but did not provide any evidence as to the nature and scale of that interest. Despite this, 1996 could potentially have been the year when significant evidence on the nature and scale of commercial interest could have been forthcoming as this was the first occasion a detailed study of this issue was undertaken by a UN Body. At the second Conference of Parties (COP) to the 1992 *Convention on Biological Diversity* (CBD)[11] parties passed a resolution requesting the CBD Secretariat in consultation with the UN Office for Ocean Affairs and the Law of the Sea to undertake a study of the relationship between the CBD and UNCLOS with regard to the conservation and sustainable use of genetic resources on the deep sea-bed.[12] As the first report by a UN body on the issue, one might have hoped that as a starting point the report would review what is known about the level of scientific and commercial interest in MGR in ABNJ. But the report failed to give any real evidence on either the nature or level of either scientific or commercial interest in MGR from areas beyond national jurisdiction. In fact, in a number of parts, the report highlights the lack of evidence. Thus, in the context of its initial consideration of regulatory options the report observed:

> At the moment any consideration of these long-term considerations is hampered by a lack of information and knowledge surrounding the use of genetic resources from the deep sea-bed. Without this basic knowledge, decisions about the type of control that is to be preferred, possible or even practical cannot be made.[13]

Even more significantly later in the context of the report's description of how marine scientific research is carried out, the same report observes:

> Obviously, access to marine genetic resources, especially from the deep sea-bed poses some significant problems that limited the use of these resources by biotechnology. Currently, *there is little reliable information on the collection of these resources, and what does exist is largely unsubstantiated*.[14]

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10 Report of the Secretary-General, 'Oceans and the law of the sea' (1996) UN Doc A/51/645, para 229.

11 Convention on Biological Diversity (opened for signature 5 June 1992, entered in force 29 December 1993) 31 ILM 818 (CBD).

12 CBD, 'Conference of Parties, 2nd Meeting, Decision II/10', para 12 <www.cbd.int/decision/cop/default.shtml?id=7083> accessed 27 August 2018.

13 CBD Subsidiary Body on Scientific, Technical and Technological Advice, 'Bioprospecting of genetic resources of the deep sea-bed-Note by the Secretariat' (24 July 1996) UN Doc UNEP/CBD/SBSTTA/2/15, para 19.

14 ibid para 43 (emphasis added).

On the scale of the market for commercial use of MGR from ABNJ, and the deep sea in particular, the report goes on to conclude:

> The extent to which new, commercially useful extremophile may come from the deep sea-bed is not known. *Consequently, the economic value of this market is entirely speculative and, to date, unrealized.*[15]

Thus, the first detailed report on the issue by a UN body concluded there is little evidence of commercial uses of MGR in ABNJ. Despite these unambiguous conclusions the report unfortunately undermined these very clear conclusions by examining the level of interest in MGR in coastal waters (i.e. in areas within national jurisdiction) conflating that with the potential for ABNJ. It is in this context that we first start to see vast figures being quoted relating to biotechnology with little precision or verification. For example, in commenting on the market for enzymes a figure of at least $600 million is quoted.[16] No evidence is provided in that context as to the source of those enzymes. Were they from the terrestrial environment or from a marine source? Useful enzymes have been sourced for biotechnology from both the terrestrial and marine environments and predominately from within areas of national jurisdiction. Subsequent discussion in the paper goes on to discuss the Taq DNA polymerase as an example of a commercially valuable enzyme, even though this was sourced from a terrestrial geyser in Yellowstone National Park. Perhaps more critically, the source cited for this figure is not the peer-reviewed scientific or economics literature, not a potentially reliable source such as the OCED, the World Bank or some other reliable industry indicator. Rather the source for the subsequently off quoted figure is a newspaper article published in the *New York Times*, albeit an article written by a Pulitzer Prize winner.[17] Subsequent discussion on deep-sea hydrothermal vents in the report also cites articles from other publications such as the *Financial Times* and the *Nikkei Weekly*. While I am not criticizing the author of the *New York Times* article cited (and I acknowledge the other newspapers cited are also credible factual and accurate news sources), basing major international reports like this on newspaper articles over peer-reviewed scientific or economics literature is sloppy research methodology, to say the least, and should not play any part in contributions to major policy debates like the MGR issue.

Unfortunately, subsequent reports are also scant on any detail to support the case for regulation. From 1997 until 2003 there is little useful or additional information on the nature and scale of commercial interest in MGR sourced from ABNJ contained in the Reports of the UN Secretary-General on oceans and the law of the sea. One example of an unnamed enzyme sourced from a hydrothermal vent is mentioned in the 1999 Secretary-General's Report, but no information is provided as to

15 ibid para 65 (emphasis added).

16 ibid para 53.

17 The source of this figure cited in the bibliography of the report is William Broad, 'Strange oases in sea depths offer map to riches' *New York Times* (New York, 16 November 1993). See Subsidiary Body on Scientific, Technical and Technological Advice (n 13) para 17.

whether that was sourced from within or beyond national jurisdiction. [18] Discussion on MGR, to the extent there is any, relates to MGR sourced from areas within national jurisdiction.[19]

The 2003 Secretary-General's Report sheds no further light on the nature and scale of commercial interest in MGR in ABNJ, although it does refer expressly to the report prepared in 2003 for the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) of the CBD on the relationship between the CBD and UNCLOS with regard to the conservation and sustainable use of genetic resources on the deep seabed.[20] This rather pedestrian report examines the perceived lacuna in the law and then goes on to set out options for possible regulation of MGR in ABNJ. Like the reports that have come before, it lacks any evidence on the nature and scale of commercial interest in MGR in ABNJ. Curiously, this report does, however, suggest how bioprospecting in ABNJ is carried out observing:

> The exploitation of deep seabed genetic resources implies a succession of value-adding activities, from exploration through laboratory analysis to the eventual commercialization. The initial steps of exploration, sampling and analysis in the chain of those activities and processes is referred to as bioprospecting. Some of those activities are carried out *in situ* while others, such as analysis and testing, which refer to the notion of use, are carried out in laboratories, i.e. in *ex situ* conditions.[21]

The 2004 Report on Oceans and the Law of the Sea by the UN Secretary-General also failed to provide any further information on the nature and scale of commercial interest although the increasingly familiar unsubstantiated refrain of a 'vast reserve of economically, scientifically and environmentally valuable compounds, materials and organisms'[22] is repeated yet again in the 2004 Report. The report also only speaks of possible rather than actual documented uses when it observes:

> Bacteria from seeps contain novel genes that *may be useful* to the biotechnology industry. For example, applications such as the treatment of oil pollution (bioremediation) *may be* of particular interest. *Seepages may be used* as a prospecting tool for the petroleum industry and may also become subject to direct exploitation in the future if high-grade mineral-laden fluids expelled from the deep seabed can be tapped.[23]

The report also includes detailed examination of potential differences between marine scientific research and bioprospecting (a very relevant issue at the core of the MGR issue),[24] but no specifics are provided of actual scientific research projects or bioprospecting activities.

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18 Report of the Secretary-General, 'Oceans and the law of the sea' (1999) UN Doc A/54/429, para 534.

19 See e.g. Report of the Secretary-General, 'Oceans and the law of the sea' (1998) UN Doc A/53/456, para 438.

20 See CBD Subsidiary Body on Scientific, Technical and Technological Advice, 'Marine and Coastal Biodiversity: Review, further elaboration and refinement of the programme of work. Study of the relationship between the Convention on Biological Diversity and the United Nations Convention on the Law of the Sea with regard to the conservation and sustainable use of genetic resources on the deep seabed (decision II/10 of the Conference of the Parties to the Convention on Biological Diversity-Note by the Executive Secretary' (22 February 2003) UN Doc UNEP/CBD/SBSTTA/8/INF/3/Rev. 1.

21 ibid para 79.

22 Report of the Secretary-General, 'Oceans and the law of the sea' (2004) UN Doc A/59/62, para 233.

23 ibid para 243 (emphasis added).

24 ibid para 260-62.

By the time of the publication of the 2004 UN Secretary-General's report on Oceans and the Law of the Sea is published the hyperbole of the report begins to imply a veritable gold rush is underway in the deep sea in ABNJ. Thus the 2004 Report observes:

> During the past decade the research efforts of scientists, biotechnology and pharmaceutical companies have increasingly shifted from the shallow-water to deep-water ecosystems, including hydrothermal vents, seamounts, canyons and trenches, cold-water corals and sponges, given the unique nature of the organisms found in these ecosystems…As scientific and commercial interest *grows fast,* so do the related impacts arising from frequent visits and repeat sampling, which, if carried out in an unsustainable manner, may include reducing or driving to extinction the endemic biodiversity of these ecosystems …
>
> For example, *there is increasing interest from scientists, biotechnology and pharmaceutical companies* in screening hydrothermal vents, seamounts and cold-water habitats and their associated fauna for species which produce potentially beneficial substances and genes.[25]

No evidence is put forward in the 2004 Report for the 'fast' growth in scientific and commercial interest. In fact, the 2004 Report incorrectly cites as its authority for this assertion a 2004 Report published by UNEP with contributions from a range of leading scientists.[26] That report in fact does not argue there has been 'fast' growth in scientific and commercial interest instead it merely notes that '[d]uring the past decade the research efforts of scientists, biotechnology and pharmaceutical companies have increasingly shifted from shallow-water to deep-water ecosystems, including cold-water corals and sponges. The search for beneficial substances and genes offers a new field of economic importance.'[27] That is to say that interest has moved from one part of the ocean to another. No insight is offered into the scale or value of these endeavours and certainly there is no evidence offered that the growth is 'fast'.

However, by 2004 the push for the international community to address issues relating to the conservation and sustainable use of biodiversity in ABNJ had gained momentum. In 2004 in Resolution 59/24 the UN General Assembly agreed to establish the Ad Hoc Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction:

> (a) To survey the past and present activities of the United Nations and other relevant international organizations with regard to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction;

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25 Report of the Secretary-General, 'Oceans and the law of the sea' (2004) UN Doc A/59/62/Add.1, para 60 (emphasis added).

26 André Freiwald and others, *Cold-water Coral Reefs. UNEP-WCMC* (Cambridge 2004).

27 ibid 41.

> (b) To examine the scientific, technical, economic, legal, environmental, socio-economic and other aspects of these issues;
>
> (c) To identify key issues and questions where more detailed background studies would facilitate consideration by States of these issues;
>
> (d) To indicate, where appropriate, possible options and approaches to promote international co-operation and coordination for the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction.[28]

An addendum to the 2005 Report of the UN Secretary-General on oceans and the law of the sea was prepared in response to *Resolution 59/24* to assist the Ad Hoc Working Group established by the General Assembly.[29] Despite detailed examination of how scientific research is carried out in ABNJ and in the deep-sea in particular,[30] the report's examination of the nature and extent of commercial interest in marine genetic resources in ABNJ was very superficial. Significantly the 2005 report again repeats the mistakes of earlier reports by using figures relating to the growth of biotechnology more broadly without any real linkage to the actual figures for biotechnology developed from ABNJ, while also equating biotechnology potential with actual commercialization. Thus, the report observes:

> The biotechnology sector is one of the most dynamic research areas with increasing prospects for growth and profitability … Deep sea organisms, in particular, are interesting because of their ability to adapt to extreme environments. Knowledge of their adaptation process provokes questions as to the mechanisms they use and *possible* commercial applications. Many have been sampled with an eye to their biotechnology *potential*.[31]

The report then goes on to provide examples of academic research institutions such as the Extremobiosphere Research Centre of the Japan Agency for Marine-Earth Science and Technology in Japan and the Marine Bioproducts Engineering Centre in the USA engaged in research which has potential commercial applications.[32] Yet no evidence is provided that any of that research has actually led to the commercialization of a product.

The report then goes on to throw around a range of figures relating to natural products research, marine-sourced natural products more generally and the biotechnology industry more broadly, none of which relate specifically to MGR from ABNJ. Thus, the report states:

> Potential applications from marine-sourced material include pharmaceuticals, fine chemicals, enzymes, agri-chemicals, cryoprotectants, bioremediators, cosmaceuticals and nutraceuticals. A study of small-molecule new chemicals introduced globally as drugs between 1981 and 2002 showed that 61 per cent can be traced to, or were inspired by, natural products. This figure rose to 80 per cent in

28 UNGA Res 59/24 (17 November 2004) UN Doc A/RES/59/24.

29 Report of the Secretary-General, 'Oceans and the law of the sea' (2005) UN Doc A/60/63/Add.1.

30 See especially ibid 5-20.

31 ibid paras 77-79 (emphasis added).

32 See ibid paras 83-86.

> 2002-2003. Compounds from natural products are considered to be more agreeable to consumers and two thirds of the anti-cancer drugs, for example, are derived from both terrestrial and marine natural products. Marine plants, animals and microorganisms produce many unique biochemicals with great potential in treating diseases such as cancer and inflammatory disorders and may prove effective against HIV/AIDS. Marine-sourced material (for example, from sea water/sediment) has a higher chance of being successful commercially because of its mega-diversity.
>
> Although natural molecules are used by a variety of industries, they are mostly known for their application in the health sector. Biotechnology could lead to more preventive medicine based, inter alia, on genetics and targeted diagnostics. There are also a considerable number of new drugs that are the result of biotechnology, including anti-cancerous and anti-inflammatory agents. In addition, biotechnology may bring solutions to illnesses such as obesity, diabetes or neurological ailments. The role of biotechnology in the health-care industry is increasing and more and more partnerships are being created between biotechnology and pharmaceutical companies. From 22 in 1993, companies using biotechnology for the health sector now number 190, of which 13 have over $1 billion in sales each per year. In the United States, the approval of new drugs increased by 25 per cent in 2003, with some 300 biotechnology products based on natural compounds.[33]

Here we again see the trend towards conflating the significant economic value of the biotechnology sector as a whole with the as yet unrealized and unsubstantiated potential of biotechnology-derived from the marine environment from ABNJ.

Later in the 2005 report, this trend is more evident in the report's attempted analysis of the commercial value of bioprospecting in ABNJ. Thus, the report observes:

> … In order to provide an idea of the commercial value of bioprospecting beyond national jurisdiction, the broader context of the biotechnology sector needs to be considered … As reported by the United Nations University (UNU) Institute of Advanced Studies, according to the Ernst & Young global biotechnology market overview in 2004, the global biotechnology industry (not limited to marine biotechnology) supported almost 200,000 employees worldwide and generated revenues of up to $46.6 billion in 2003. In connection with marine biotechnology, a 1996 study estimated that the worldwide sales of products related to marine biotechnology were expected to reach $100 billion by the year 2000. Profits from a compound derived from a sea sponge to treat herpes were estimated to be worth $50 million to $100 million annually and estimates of the value of anti-cancer agents from marine organisms are up to $1 billion a year. However, it is not clear how many, if any, of these products use biological resources from areas beyond national jurisdiction. The UNU study demonstrates that, on the basis of an analysis of patent databases, bioprospecting for deep seabed genetic resources is taking place and related commercial applications are being marketed. Furthermore, there are some patents involving genetic resources from the deep seabed where it is unclear whether practical applications for their use have been developed or not. Bioprospecting activities may therefore create a market for genetic resources.

33 ibid paras 88-89.

> … Bioprospecting, including the development and commercialization of products derived from genetic resources in areas beyond national jurisdiction involves very high costs … and it is estimated that it may take approximately 15 years to produce results. Furthermore, only 1 to 2 per cent of preclinical candidates actually become clinically produced. Estimates for the costs of research and development to develop a new drug (not necessarily one related to marine biotechnology) presently range between $231 and $500 million to $800 million and $1.7 billion. Due to the high costs involved, patenting is presently the main avenue for securing economic benefit as a return for investment. The protection of inventions is granted for a limited period, generally 20 years.
>
> … In the case of land-based bioprospecting, pharmaceutical companies have been willing to pay substantial sums for access to the regions where there is extensive inter-species competition and have made deals with host countries that involve giving them a royalty on the products that might eventually be based on this prospecting. In some cases, the terms of agreement for bioprospecting includes the allocation of a fixed sum of money, to be used for conservation measures, in exchange for the right to receive samples from bioprospecting. The UNU study highlights, however, that it appears that the extension of patentability of biological and genetic material has not been based on sufficient economic analysis and that the positive benefits expected from patent protection with regard to trade, foreign direct investment and technology transfer have not been evidenced.[34]

Conflating the biotechnology potential of marine biodiversity in areas beyond national jurisdiction with the actual experience of other existing sectors of the biotechnology industry is in part what has fuelled the expectations of a veritable new deep-sea gold rush [sic].

This confusion between the biotechnology industry overall and the theoretical potential of MGR from the deep sea in ABNJ is not confined to the UN Secretary-General's Report. For example, at its 11th meeting held in 2005, the SBSTTA of the CBD considered a report on the *Status and trends of, and threats to, deep seabed genetic resources beyond national jurisdiction, and identification of technical options for their conservation and sustainable use.*[35] This report spoke of the 'high potential for biotechnology' from biodiversity associated with deep-sea hydrothermal vents without any authority for this assertion. More problematically without citing any verifiable authority, this report observed:

> Deep seabed resources hold enormous potential for many different types of commercial applications, including in the health sector, for industrial processes or bioremediation. A brief search of selected Patent Office Databases revealed that compounds from deep seabed organisms have been used as basis for potent cancer fighting drugs, commercial skin protection products providing higher resistance to ultraviolet and heat exposure, and for preventing skin inflammation, detoxification agents for snake venom, anti-viral compounds, anti-allergy agents and anti-coagulant agents, as well as industrial applications for reducing viscosity.[36]

34 ibid paras 107-09.

35 CBD Subsidiary Body on scientific, Technical and Technological Advice, 'Status and trends of, and threats to, deep seabed genetic resources beyond national jurisdiction, and identification of technical options for their conservation and sustainable use' (22 July 2005) UN Doc UNEP/CBD/SBSTTA/11/11.

36 ibid para 21.

In the absence of a citation for this patent database search, it is difficult to verify these assertions. However, the author of this paper has undertaken searches of the patent database and has been unable to reproduce the purported results. It is possible here that there is again confusion between the genetic resources of the deep sea and genetic resources sourced from marine biodiversity in shallow waters, often within national jurisdiction. This possibility is supported by the SBSTTA Report's comments that:

> Assessing the type and level of current uses of genetic resources from the deep seabed proves relatively difficult for several reasons. First, patents do not necessarily provide detailed information about practical applications, though they do indicate potential uses. Moreover, information regarding the origin of the samples used is not always included in patent descriptions. However, the commercial importance of marine genetic resources is demonstrated by the fact that all major pharmaceutical firms have marine biology departments. The high cost of marine scientific research, and the slim odds of success (only one to two percent of pre-clinical candidates become commercially produced) is offset by the potential profits. Estimates put worldwide sales of all marine biotechnology-related products at US $100 billion for the year 2000.[37]

How is it that the SBSTTA report authors admit patents often do not include information on the origin of samples, and yet assert that specific biota sampled from the deep sea was the basis for the alleged inventions? One might have expected that if this was correct the specific patents might have been cited. What is more likely is that specific patents attributable to MGR from shallower waters have been confused with deep sea MGR. But in the absence of citations for the specific patents, this cannot be verified.

With the exception of material produced by the Ad Hoc Working Group (to be considered below), the following decade of reports[38] by the UN Secretary-General on oceans in Law of the Sea actually contained very little useful information on the nature and style of commercial interest in MGR from ABNJ. In fact, the 2007 report explicitly acknowledges that there was very little data available as diplomats and policymakers began the Ad Hoc Working Group process. The 2007 report drawing on a joint United Nations University (UNU) and UNESCO Study co-authored by the author of the present paper (discussed below) noted:

There appears to be no evidence, however, that any commercial entity has mounted its own dive to the deep sea to collect samples for the purposes of research and development. Commercial interest in sample extraction from the deep sea would be limited to funding research dives by national scientific

37 ibid para 22.

38 Citation for the little data available in these reports is as follows: Report of the Secretary-General, 'Oceans and the law of the sea' (2008) UN Doc A/63/63, para 280; Report of the Secretary-General, 'Oceans and the law of the sea' (2009) UN Doc A/64/66, para 87; Report of the Secretary-General, 'Oceans and the law of the sea' (2009) UN Doc A/64/66/Add. 2, paras 104-108; Report of the Secretary-General, 'Oceans and the law of the sea' (2011) UN Doc A/66/70/Add.2, para 167; Report of the Secretary-General, 'Oceans and the law of the sea' (2012) UN Doc A/67/79/Add.1, para 167; Report of the Secretary-General, 'Oceans and the law of the sea' (2014) UN Doc A/69/71/Add.1, para 79.

research organizations or academic institutions and/or collaboration in laboratory research. Biotechnology companies would also rely on samples deposited in national culture collection.

> … To date, research and product development related to marine genetic resources has centred mainly on the development of novel enzymes for use in a range of industrial and manufacturing processes, including chemical and industrial processes involving high temperatures. A number of commercially viable enzymes have been developed from hydrothermal vent microbes. DNA polymerases, some of which have been isolated from several hydrothermal vent species, are also of interest for use in life sciences research, diagnostics, pharmaceutical and therapeutic applications. Microbial exopolysaccharides isolated from hydrothermal vents are under evaluation for therapeutic uses, principally in the areas of tissue regeneration and cardiovascular diseases. Research on hydrothermal vent microbes has also led to the development of ingredients for cosmetics, including anti-ageing creams. Research also suggests that heat-loving microbes from hydrothermal vents may be suitable for use in novel biotechnological processes including oil, coal and wastegas desulphurization, as well as in the treatment of industrial effluents and the development of new mining techniques such as biomining and bioleaching.
>
> Patent applications provide a good indication of the types of interests in marine genetic resources. Based on a search of 135 patents, a report by UNU indicates that the chemistry and pharmacology sectors have the highest number of patents filed in relation to marine genetic resources in the period 1973 to date, indicating a strong interest from those sectors. It has also been observed that medical innovation continues to drive the growth of the biotechnology industry in general. However, the contribution of marine genetic resources beyond areas of national jurisdiction to such growth is not clear.[39]

Thus, it is clear that even as the Ad Hoc Working Group was underway there was still significant uncertainty as to the nature and scale of commercial interest in MGR from ABNJ. Indeed, the need for further details and study on the nature and scale of commercial interest in MGR from ABNJ is explicitly acknowledged in the 2007 report which went on further to observe:

> Assessing the actual or potential total economic value of marine genetic resources beyond areas of national jurisdiction can assist decision-making by providing indications of the expected economic and societal benefits of such resources, as well as providing supporting arguments for the possible need for conservation and sustainable use measures.
>
> … quantifying the level of the interest in marine genetic resources from areas beyond national jurisdiction is difficult owing to scattered and limited quantified information specifically related to those resources. Some information is also not publicly available owing to its commercially sensitive nature. Any quantification therefore remains anecdotal, speculative and is based on analogies with the biotechnology sector. Strengthening the information base with specific data related to those interests is therefore important.[40]

39 Report of the Secretary-General, 'Oceans and the law of the sea' (2007) UN Doc A/62/66/Add.2, paras 202-04 (emphasis added).

40 ibid paras 209 and 217.

Although the Report then goes on to attempt to provide some basic indicators of commercial interest through discussion of limited patent data.[41] At this point, the 2007 report refers to a report by UNEP which mentions 37 examples of patents issued for products based on deep-sea organisms.[42] But as my original research from which this data is drawn highlights, it is not clear if all of these patents relate to MGR sourced from ABNJ.[43]

The above discussion has highlighted the paucity of evidence on the nature and scale of commercial interest in MGR in ABNJ contained in the reports of the UN Secretary-General. Before considering the available data from the literature outside the UN system it is useful to briefly consider the extent to which this issue was considered during UNICPLOS and the work of the Ad Hoc Working Group.

2.2 UNICPLOS discussions

MGR were considered at the eighth meeting of UNICPLOS from 25 to 29 June 2007. A total of 21 Panel presentations were made during this meeting relating to the MGR question. While a wide range of issues relating to MGR were canvassed during these meetings no presentations touched on the key issue of the nature and scale of commercial interest in MGR from ABNJ. There were presentations on the role of MGR in biotechnology more generally,[44] presentations on commercial aspects of biotechnology development from marine sources,[45] and experiences of MGR commercialization and regulation within areas of national jurisdiction.[46] But none of the presentations offered any further insight as to the nature and scale of commercial interest in MGR from ABNJ.

2.3 The Ad Hoc Working Group

From 2005 to 2015, issues related to MGR were also considered as part of the Ad Hoc Working Group. While much of the debate during this process focused on the legal status of MGR in ABNJ there was in fact little hard data brought forward on the nature and level of commercial interest in MGR from ABNJ. A significant part of the discussions was devoted to the controversial issues of the

41 For the record it should be noted that the UNEP report cited is not the original source of this data. The original data of 37 patents is drawn from research conducted by the current author as part of his PhD. See David Leary, 'More than just bugs and bioprospecting in the abyss. Designing an international legal regime for the sustainable management of deep-sea hydrothermal vents beyond national jurisdiction' (DPhil Thesis, Macquarie University, 2005). This data is also set out in a revised version of that thesis published as David Leary, *International Law and the Genetic Resources of the Deep Sea* (Martinus Nijhoff 2007).

42 Report of the Secretary-General, 'Oceans and the law of the sea' (2007) UN Doc A/62/66/Add.2, para 220.

43 See 2007 Report of the Secretary-General (n 39).

44 These included presentations by Marc Slattery, 'Marine Genetic Resources: Experiences in Commercialization' (26 June 2007) <www.un.org/Depts/los/consultative_process/8thmeetingpanel.htm> accessed 27 August 2018.

45 For example, Geoff Burton, 'Commercialisation: Not Plain Sailing; and Simon Munt, From Marine Expeditions to New Drugs in Oncology' (26 June 2007) <www.un.org/Depts/los/consultative_process/8thmeetingpanel.htm> accessed 27 August 2018. Other presentations can be accessed at the same web address.

46 For example, Marcia Creary, 'Jamaica's marine genetic resources: challenges and opportunities' and John Hooper, 'Maximizing benefits from "biodiscovery": A Coastal State resource providers perspective' (26 June 2007) <www.un.org/Depts/los/consultative_process/8thmeetingpanel.htm> accessed 27 August 2018.

purported common heritage status of MGR in ABNJ, rather than the more important threshold issue of whether there was in fact any commercial interest in MGR from ABNJ in the first place. It is worth noting that on numerous occasions during this process many countries called for further detailed information on and study of this issue. For example, the first report of the Ad Hoc process to the UN General Assembly in 2006 observed the need for a range of studies including:

> … [e]conomic aspects of various activities, including …exploitation of deep seabed genetic resources … [and] … Nature and level of interests in marine biological diversity beyond areas of national jurisdiction, in particular commercial interest in genetic resources from the deep sea.[47]

Crucially in 2008 several delegations suggested further research was needed on 'the level of activity actually occurring in respect of [MGR] in [ABNJ] and the costs and risks involved.[48] Again in 2012 some delegations 'were of the view that clarification was required as to the extent to which bioprospecting was currently taking place and…its consequences… for commercial and non-commercial aspects.'[49] While the 2012 meeting did result in the convening of an intersessional workshop on MGR, in 2013 there was little new information that came from that workshop. In fact, what information that did emerge suggested that (as was already well established) most commercial interest in MGR relates to MGR within areas of national jurisdiction. Significantly, the intersessional workshop also highlighted it was almost impossible to determine from patents where a source organism came from, ABNJ or areas within national jurisdiction. As the report on the intersessional workshops observed:

> It was remarked that the lack of available information in patent documents on the exact geographical origin of marine genetic resources used in the development of an invention posed challenges. *It was often impossible to establish which patents related to inventions based on marine genetic resources of areas beyond national jurisdiction. However, a panellist observed that since most research was taking place in coastal areas of tropical countries, it could be inferred that compounds used in patented inventions also came from those areas.* It was noted that efforts were under way to better identify the location and environment of sampled resources. *A panellist also indicated that it was too early to determine whether areas within national jurisdiction or those beyond national jurisdiction would yield more promising compounds from a commercial point of view.*[50]

47 UNGA, 'Report of 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' (2006) UN Doc A/61/65, Annex II paras (i) and (l).

48 UNGA, 'Report of 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' (2008) UN Doc A/63/79, para 34.

49 UNGA, 'Report of 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' (2012) UN Doc A/67/95, para 18.

50 UNGA, '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, Intersessional workshops aimed at improving understanding of the issues and clarifying key questions as an input to the work of the Working Group in accordance with the terms of reference annexed to General Assembly resolution 67/78. Summary of proceedings prepared by the Co-Chairs of the Working Group' (2013) UN Doc A/AC.276/6, para 15 (emphasis added).

Despite the number of calls for more detailed studies on the nature and scale of commercial interest there appears to be no evidence that such studies were ever formally carried out as part of any of the UN processes considering the issue. The following discussion now turns to consider the limited number of studies that have been carried out outside these processes.

2.4 Published studies on nature and scale of commercial interest in MGR in ABNJ

While there have been a plethora of publications[51] dissecting the legal and policy issues relating to the MGR issue (many of which include some citations to isolated examples of biotechnology developed from MGR in ABNJ), there have in fact only been a handful of studies that have attempted to delineate the actual nature and scale of commercial interest in MGR from ABNJ.

One of the initial studies to attempt this was my own PhD thesis completed in 2005,[52] which was subsequently revised and published as a monograph in 2007.[53] That study focused primarily on bioprospecting associated with deep-sea hydrothermal vent ecosystems and identified 14 companies that were then involved in research and or product development in relation to hydrothermal vent biota as well as several examples of products already on the market.[54] The study also presented evidence of 37 patents that had been granted in relation to deep-sea genetic resources from a range of sources including deep-sea hydrothermal vents and the ocean floor of the Mariana Trench.[55] While this was arguably the first study to flesh out any detail on the nature and level of commercial interest on deep sea genetic resources, as the study highlighted it was very difficult to work out whether MGR of interest were sourced from ABNJ or within areas of national jurisdiction.

Also, in 2005, a report published by the UNU-Institute of Advanced Studies[56] set out some data demonstrating that bioprospecting for deep seabed genetic resources was occurring and gave some examples of commercial applications being marketed. While much of the discussion contained in the report dealt with legal and policy issues, useful data was presented on patents and several commercial examples, such as that of Diversa Corporation and New England Biolabs Inc (also discussed in my own studies mentioned above).[57] As detailed and informative as that study was, it must be acknowledged that the few examples it provides shed very little light on the full extent of the nature and scale of interest in MGR from ABNJ.

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51 Much of the early literature was reviewed in David Leary, 'Moving the Genetic Resources Debate Forward: Some reflections' (2012) 27 The International Journal of Marine and Coastal Law 435.

52 Leary, 'More than just bugs and bioprospecting in the abyss' (n 41).

53 Leary, *International Law and the Genetic Resources of the Deep Sea* (n 41).

54 See ibid 155-81 and app 1, 271-77.

55 See ibid app 2, 278-86.

56 See Salvatore Arico and Charlotte Salpin, 'Bioprospecting of Genetic Resources in the Deep Seabed: Scientific, Legal and Policy Aspects' (UNU-IAS Report, 2005) <www.cbd.int/financial/bensharing/g-absseabed.pdf> accessed 27 August 2017.

57 ibid 15-21.

Shortly after this, while based at the UNU in Japan I was invited to join work being conducted by my colleagues at UNU and UNESCO on the ABNJ MGR issue and contributed to a study[58] that was submitted to the eighth meeting of UNICPLOS in 2007. The report was subsequently revised and key findings on the nature and scale of commercial and scientific interest in MGR were published in a now widely cited article in the peer-reviewed literature.[59]

The report set out to examine the level and nature of scientific and commercial interest in MGR, including in ABNJ. The report was based on a comprehensive examination of published scientific literature, searches of international patent databases, interviews with scientists, and a review of literature and websites published by biotechnology companies.[60] Significantly, in 2007, drawing on the studies discussed above, in that report we observed:

> There is no substantiated evidence that any company has mounted its own dive to the deep sea to collect samples for the purposes of research and development in relation to biotechnology derived from deep sea genetic resources. The involvement of commercial interests in sample extraction from the deep sea is limited to funding research dives by national scientific research organizations or academic institutions and or research collaboration in laboratories once samples have been collected. Commercial interests also rely on samples provided by national culture collections where samples are often deposited by research institutions. Samples of deep sea microbes are available for a nominal fee from several type culture collections and some are even offered for sale over the internet.
>
> Actual isolation, characterization and culture of biological samples (predominately microbial samples) extracted from the deep sea occur either in laboratories operated by public research institutions such as universities, or in laboratories funded by commercial interests. On some occasions research has been carried out as part of major collaborative research projects across several research institutions. Where biotechnology research is funded by the public sector, generally speaking such results will be published in the scientific literature. However, where the research is funded by the private sector these results are generally kept confidential and are ordinarily not disclosed until after patent applications have been filed.[61]

Although not acknowledged as such, these conclusions were the source of the assertions made in the UN Secretary-General's Report in 2007 discussed earlier in this paper.

While the report was quite detailed (including detailed examination of the main areas of research interest for MGR and extensive MGR patent data) the information on both scientific and commercial interest in MGR largely referred to marine biotechnology research in shallow waters and within

58 See Marjo Vierros and others, 'An Update on Marine Genetic Resources: Scientific Research, Commercial Uses and a Database on Marine Bioprospecting' (UN Informal Consultative Process on Oceans and the Law of the Sea, Eight Meeting, 25-29 June 2007) <https://pdfs.semanticscholar.org/e743/926b0e2e4a13a4779084668dea11299047e4.pdf> accessed 27 August 2018.

59 See David Leary and others, 'Marine Genetic Resources: A Review of Scientific and Commercial Interest' (2009) 33 Marine Policy 183.

60 Vierros and others (n 58) 6.

61 ibid.

national jurisdiction.[62] Although it should be noted the report also contained some new information on commercial interest such as examples of enzymes from MGR in ABNJ.[63]

Our report did conclude that the evidence demonstrates 'the potential of marine genetic resources is substantial'[64] and also noted 'the steady increase in the number of scientific publications and patents on marine genetic resources observed demonstrates that this area is of growing importance to both the scientific community and to those involved in bioprospecting.'[65] But for the most part here we were talking more generally about MGR from areas within national jurisdiction. Significantly, in our conclusions we also noted 'the need to increase the information base on marine genetic resources.' [66]

A very interesting study on biological diversity in the patent system[67] published in 2013 presented further novel (but brief) information on the extent of patents granted in relation to deep-sea biodiversity. This study noted:

> Using the Chemosynthetic Ecosystem Science (ChEssBase) database of 1,085 marine organisms with additional research we identified an initial 128 deep sea and hydrothermal species in the patent data…Patent activity is led by extremophiles such as *Thermus thermophilus*, *Methanocaldococcus jannaschii*, *Thermococcus litoralis*, *Aeropyrum pernix*, *Archaeoglobus fulgidus* and *Pyrococcus horikoshii*. Other species include the giant tube worm *Riftia pachyptila* for a novel fusion protein and *Beryx splendens* (the Splendid alfonsino fish) for foodstuffs and medicines. *Anoplopoma fimbria* is involved in the development of vaccines for fish and *Bythograea thermydron* (the vent crab) for a new nucleic acid useful in therapeutic insertions of DNA. *Microstomus pacificus* (Pacific dover sole) is involved in a claimed new treatment for bone disorders.[68]

But significantly this study also went on to note:

> These examples illustrate the diversity of potential applications arising from marine organisms and extremophiles but raise concerns about benefit-sharing and the environmental impacts of research in these environments … *We would emphasize that further research is required to provide a more comprehensive picture of patent activity involving organisms from these environments and the impacts of research.*[69]

62 Note the report does make this clear. See ibid 8.

63 ibid 27-28

64 ibid 55.

65 ibid.

66 ibid.

67 See Paul Oldham, Stephen Hall and Oscar Forero, 'Biological Diversity in the patent System' (2013) 8(11) PLoSOne 1.

68 ibid 9.

69 ibid (emphasis added).

Despite years of discussion on the MGR issue, it was not until 2014 that a very detailed study was finally produced.[70] This study commissioned by the United Kingdom Department for Environment, Food and Rural Affairs is by far the most comprehensive study on the nature and extent of scientific and commercial interest in MGR form ABNJ published to date. Based on a comprehensive review of scientific literature, extensive analysis of patent data based on a methodology of patent landscaping, a range of commercial sources and a Delphi study surveying key expert in the field, this study contains a wealth of information relevant to the debates on the MGR issue. A detailed examination of the data contained in the 241 pages of that report is not possible in this paper. However, it is worth noting the five key findings of that report were as follows:

> 1. *There is growing interest in marine genetic resources in general but research mainly takes place inside national jurisdictions*. This is demonstrated through mapping of deep-sea research locations from the scientific literature. Research in ABNJ is concentrated in a limited number of locations such as the East Pacific Rise and Mid-Atlantic Ridge;
>
> 2. *Marine organisms from ABNJ that appear in patents often occur elsewhere*. Patents are an indicator of commercial research and development. *Many deep-sea marine organisms from ABNJ that appear in patent documents also occur inside national jurisdictions and terrestrial aquatic environments.* There are very limited references to actual field collections of organisms from ABNJ. It is likely that patent applicants mainly obtain marine genetic material or data from commercial sources, public collections or databases;
>
> 3. *Marine natural product research mainly concentrates on marine invertebrates from inside national jurisdictions.* Marine natural product research focuses on marine invertebrates, such as sponges and tunicates, but displays growing interest in microorganisms. *Interest in organisms from ABNJ is best described as emergent;*
>
> 4. *Marketed products are mainly derived from organisms inside national jurisdiction with limited exceptions*. The exceptions are mainly enzymes from extremophiles and oils from Antarctic krill for nutraceutical products;
>
> 5. *Widely quoted market estimates for marine genetic resources lack methodological transparency and should not be relied upon in the absence of peer review*.[71]

It is disappointing that the conclusions of this report have not been widely debated in policy or academic circles.

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70 See Paul Oldham and others, *Valuing the Deep: Marine Genetic Resources in Areas Beyond National Jurisdiction*. (Defra Contract MB0128 Final Report, DEFRA 2014).

71 ibid 12-13 (emphasis added).

2.5 Conclusion: Does the evidence support the need for MGR to be addressed in the proposed instrument?

In a paper delivered at the Law of the Sea Institute Conference in 2011, Kim Juniper and I argued:

> Examples of actual commercialisation of deep-sea genetic resources, and especially those deep-sea areas beyond national jurisdiction are largely anecdotal and the evidence is at best patchy. While some commercial products have been developed from deep-sea organisms, the actual proportion coming from areas beyond national jurisdiction is as yet un-substantiated. In analysing what information is available it is very important to distinguish between hard proof of products on the market or in the development phase, and speculation about their theoretical potential. The academic literature and policy debates are littered with enthusiastic statements about possibilities, but there is in fact very little hard proof in the way of products on the market … based on our review of the limited available data, we see little evidence of systematic commercial scale development of the genetic resources of the deep sea. Instead we see a debate where limited evidence is being confused and conflated with the more prolific evidence of commercialisation of marine biodiversity from shallower waters. This is primarily occurring within areas of national jurisdiction such as the territorial sea and the EEZ. Compounding this are rather grand or broad sweeping statements in the academic and policy literature as to the theoretical potential of marine biodiversity. It may sit uncomfortably with many now engaged in the debate on this topic, but there is currently very little evidence of the proverbial 'pot of gold' said to be waiting to be discovered in the biodiversity of the deep sea. There may well be a few specks of gold, but as yet no hard or substantiated evidence of great riches. It appears the rhetorical or political debate does not match the hard data.[72]

The review of the evidence presented during debates on the issue of MGR in ABNJ at the UN over the past decade and a half presented in the current paper only go to re-enforce that our conclusions made nearly seven years ago remain valid today.

Of course, these conclusions in some respects only echo the cautionary question raised on this issue from the very beginning. Some 21 years ago now Lyle Glowka, the father of the MGR in ABNJ debate argued that an examination of the nature and scale of commercial interest in MGR and its relationship with marine scientific research was a vital first step. He argued what was needed was an examination of:

> the entire spectrum of activities involving the Area's genetic resources. This could illuminate the distinctions and interfaces between marine scientific research, commercial investigative activities, and biotechnological research and development. It might also illuminate which activities are critical to adding value to the Area's genetic resources, while potentially demonstrating the present and future usefulness of the Area's genetic resources. Such an examination could add to the transparency of

72 David Leary and Kim Juniper, 'Addressing the Marine Genetic Resources Issue: Is the debate heading in the wrong direction' in Clive Schofield, Seokwoo Lee and Moon-Sang Kwon (eds), *The Limits of National Jurisdiction* (Martinus Nijhoff 2014) 769-85.

> future intergovernmental discussions. In addition, three questions might be posed. By determining (1) whether benefits can realistically accrue to humanity as a whole from the Area's genetic resources and (2) whether the LOS Convention's marine scientific research provisions, the LOS Convention's cooperation provisions, and those of the CBD adequately-ensure such benefits, governments may be able to conclude (3) whether new international measures are needed to ensure the fair and equitable utilization of the Area's genetic resources.
>
> Answering the first question will certainly require an examination of the current and possible future economic benefits that are or could be derived from the Area's genetic resources. The examination might also determine what in-kind benefits derive from greater formal international cooperation and collaboration. These might include greater knowledge of the Area's biological diversity, risk minimization, sharing expertise and expenses, hard and soft technology transfer between partners, and greater private-sector involvement and investment.[73]

It seems the international community has ignored the first of the three questions posed by Glowka and have instead jumped straight to negotiating the new international measures suggested by the third of Glowka's questions. Given that political reality, it is now useful to consider some elements of what might be an optimal outcome from these negotiations.

3. Optimal outcomes on the MGR issue: Prep-Comm III – Chairs non-paper and draft negotiating text

In light of the lack of evidence justifying MGR issues being dealt with in the proposed international legally binding instrument, the final part of this paper offers some brief thoughts on optimal outcomes from the current negotiations on the MGR issue based on some elements outlined in the Chairs non-paper for PrepComm III as a starting point for analysis. Whether the optimal outcomes will be achieved is still too early to judge.

Drawing on submissions from parties to the negotiations and civil society (but not reproducing those submissions verbatim) the Chairs non-paper provided a clustering of proposed elements and ideas in a suggested structure which proved useful as a reference document to assist delegations in their consideration of issues discussed at PrepComm III.[74] Some 112 pages in length, it is fair to say that the non-paper covers all of the key and complex issues that need to be addressed in the negotiations. While the content of the non-paper is without prejudice to the positions of delegations to the negotiations, the paper did an excellent job of capturing the diverse negotiating positions of all parties to the negotiations. Its scope is not just confined to the MGR issues and canvasses all the key issues up for negotiation under the proposed 'package deal' covering, inter alia the MGR issue, area-based management tools such as marine protected areas, environmental impact assessment,

73 Glowka (n 8).

74 UN Paper (n 5) 1.

capacity building and marine technology, institutional arrangements, exchange of information or clearing-house mechanisms, financial resources and funding mechanisms, monitoring, compliance and enforcement, settlement of disputes, obligations of non-parties, and a review mechanism.

It is not possible to canvass all issues dealt with in the non-paper in this short article. However, for present purposes, (although the following discussion is necessarily selective) I think it useful to focus on the following matters: Definitional issues (3.1); Guiding principles and approaches (3.2); Sharing of benefits from the utilization of MGR (3.3).

3.1 Definitional issues

The non-paper reflects three key approaches to definitional issues or use of key terms. One approach is that the definitions contained in the proposed instrument should be consistent with those contained in UNCLOS. A second approach is for the definitions, where possible, to be consistent with UNCLOS, the *UN Fish Stocks Agreement*, the CBD, the *Nagoya Protocol* and other relevant instruments, adjusted for the marine biodiversity of ABNJ. A third approach is that the instrument contains its own separately defined terms specifically excluding trade in commodities.

Given the MGR issue is a major element up for negotiation, an optimal outcome would be for parties to the negotiations to adopt the second of these approaches. The CBD and the Nagoya Protocol are key existing international treaties relating to biodiversity, biotechnology, bioprospecting and the whole question of access and benefit sharing. It would be an unfortunate manifestation of the fragmentation of international environmental law if key definitions and concepts applying within areas of national jurisdiction were to be departed from in ABNJ.

A further argument in favour of this approach is the now very dated terminology used in UNCLOS (for example, concepts like maximum sustainable yield) and the fact that many of the concepts and technologies associated with genetic resources, bioprospecting and biotechnology were largely unknown when UNCLOS was negotiated.

Of course, there are many challenges ahead in reconciling those approaches, not the least of which will be the approach to key and problematic concepts like defining MGR, what constitutes utilization of MGR and definition or lack thereof of key concepts such as bioprospecting, and marine scientific research, as well as the extent to what extent derivatives are to be addressed. Many of these issues, of course, have already been debated at length in the political and scholarly debates[75] over the past decade and a half and no doubt significant challenges still lie ahead in trying to reach common agreed positions on these concepts.

Another major issue that has so far been given little attention relates to the increasing reliance on digitized gene sequences in biotechnology research and development. While the existing access and benefit-sharing regime under the CBD and the *Nagoya Protocol* have traditionally focused on access

75 See for example discussion in Arico and Salpin (n 56).

to the samples of genetic resources, in modern biotechnology it is increasingly access to digitized gene sequence of organisms that is far more valuable. There are as yet very significant and real questions that remain unanswered as to whether digitized gene sequences of organisms uploaded to DNA databases fall within existing access and benefit-sharing regimes.

A related and also emerging issue for international and domestic legal systems is the implications of the birth of the next generation of biotechnology known as synthetic biology.[76] Synthetic biology holds significant implications for access and benefit-sharing regimes. Where a naturally occurring organism has been genetically manipulated into a totally novel organism (i.e. a new organism not a modified organism) which country has sovereign rights in relation to the new organism: (1) the country where the original naturally occurring organism was first sourced; (2) the country where the research lab that developed the new organism is based; or (3) some other (such as where the DNA database server located). If the naturally occurring organism is sourced from ABNJ similar questions arise. In that regard it is worth noting that at its 2016 Conference of Parties (COP), parties to the CBD, inter alia, established a process to further consider the implications of digital sequence information on genetic resources (a key element of synthetic biology methodologies), including establishing an ad hoc expert group to examine the issue more closely.[77]

Given recent developments in relation to digital sequence data and synthetic biology, it will be very important for any instrument relating to ABNJ to be consistent with whatever emerges during the course of work on the issue at the CBD. It is an issue that any instrument relating to ABNJ must address or it will run the risk of becoming redundant in light of new developments in biotechnology.[78]

3.2 Guiding principles and approaches

I have previously questioned the futility of parties to these negotiations entering into debate in favour or against the applicability of the common heritage of mankind to MGR from ABNJ.[79] As it was during the negotiations relating to the Part XI regime under UNCLOS, the pro and anti 'common heritage of mankind' ('CHM) advocates hold deeply entrenched positions. Much of the non-paper, like much of the debates during UNICPLOS and the Ad Hoc Working Group process, is devoted to debates relating to the relevance of the CHM to MGR in ABNJ.

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76 For a detailed exploration of some of the implications of for international environmental law and domestic environmental law see David Leary, 'The Synthetic Biology Revolution: Mapping a Future Research Agenda' (2015) 34(1) The University of Tasmania Law Review 110. On this issue see also the ground-breaking research published in Paul Oldham, Stephen Hall and Geoff Burton, 'Synthetic Biology: Mapping the Scientific Landscape (2012) 7(4) PLoS One 1.

77 'Decision adopted by the Conference of the Parties to the Convention on Biological Diversity (XIII/17- Digital Sequence Information on genetic resources)' Conference of the Parties to the Convention on Biological Diversity (2016) UN Doc CBD/COP/DEC/XIII/17.

78 On this issue see also Leary and Juniper (n 72) 777-80.

79 This aspect is discussed extensively in Leary, 'International Law and the Genetic Resources of the Deep Sea' (n 41) 353-69.

This issue alone has the potential to derail negotiations and I would hope all parties at some stage see sense and focus on the 'real' issues up for negotiation. As I have previously noted:

> Entering into the debate on the application of the [CHM] is, I would argue, a futile exercise-for the simple reason that, whether or not these resources are regarded or subsequently designated as the [CHM], that still does not address the core issue…We still have to develop a specific regime tailored to the unique circumstances of the way in which [MGR in ABNJ] are commercially exploited.[80]

Having said that, I am not optimistic of a sudden outbreak of pragmatism during the current negotiations.

3.3 Sharing of benefits from the utilization of MGR

Given the very clear lack of information on the extent and nature of commercial interest in MGR from ABNJ, I would argue there are at least two key aspects of benefit sharing that need to be considered closely.

The first aspect is the need for a very wide conceptualization of benefit sharing. It must encompass both monetary and non-monetary benefits which I note is the position adopted by the G77 and China (amongst others).[81] This is consistent with the approaches elsewhere such as under the CBD and Nagoya Protocol. But more importantly, given the commercial potential of MGR from ABNJ is largely still speculative and unrealized this would mean non-monetary benefits could still flow long before monetary benefits are realized (if they ever are).

In that regard, I think the approach of the European Union (EU) marks a worthwhile starting point. In the non-paper the EU position on that issue is summarized as follows:

> UNCLOS provisions related to marine scientific research already foresee different forms of non-monetary benefit-sharing, such as:
>
> promoting international cooperation in marine scientific research (article 242 UNCLOS);
>
> making knowledge resulting from marine scientific research available by publication and dissemination (article 244 para. 1 UNCLOS);
>
> promoting data and information flow and the transfer of knowledge (article 244 para. 2 UNCLOS).
>
> In this regard the new UNCLOS implementing agreement could provide for a framework to specify, coordinate, promote and monitor the implementation, with respect to marine genetic resources from areas beyond national jurisdiction, of the above mentioned benefit-sharing provisions to make the best use of the available diverse non-monetary benefit-sharing activities. Such an approach could

80 ibid 366.

81 See UN Paper (n 5) 28.

> be further strengthened and integrated with capacity-building activities that could be based on Part XIV UNCLOS, as well as with activities to enhance, facilitate and stimulate the sharing of material, information and knowledge. In particular, it could be useful to draw upon such provisions of Part XIV UNCLOS as articles 266 ('promotion of the development and transfer of marine technology') and 269 (establishment of, inter alia, programmes of technical cooperation, seminars, conferences, promote the exchange of scientists).[82]

Likewise, Australia and Norway have advocated incorporation of non-monetary benefits along the lines of the Nagoya Protocol.[83] The IUCN has similarly suggested non-monetary benefits might include:

> access to samples, data and knowledge, including the publication and sharing of scientific knowledge;
>
> collaboration and international cooperation in scientific research;
>
> capacity building and technology transfer including scientific training and access to resources, research infrastructure and technology; and
>
> other socio-economic benefits (e.g. research directed to priority needs such as health and security.[84]

These and similar proposals are sensible and practical benefits that could flow long before any monetary benefits could ever accrue.

The second issue that merits very careful consideration is the extent to which any future regime will rely on the potential monetary benefits from MGR from ABNJ to fund its operation. There are a range of different proposals on this aspect that are reflected in the non-paper. These include proposals such as those linking monetary benefit sharing to funding of specific programs for certain classes of states such as Small Island Developing States (SIDS) as advocated by the Alliance of Small Island States (AOSIS)[85] or funding for specific projects to support the conservation and sustainable use of biodiversity such as proposed by WWF.[86]

These and similar proposals relating to sharing monetary benefits from commercialization of MGR from ABNJ all assume there are monetary benefits to be shared. But as is clear from analysis elsewhere in this paper the true nature and scale of commercial exploitation of MGR from ABNJ is unclear. It would be pointless for States to negotiate a very detailed program of works or implementing structures if the funding for such was dependent on such monetary benefits which fail to materialise. Any new mechanisms would be a hollow shell if they depended on monetary benefits from exploitation of MGR from ABNJ that never materialized or was significantly less than many parties to the negotiations currently assume (without any real evidence base to justify such assumptions).

82 ibid.

83 ibid 29.

84 ibid 29-30.

85 ibid 31.

86 ibid.

4. Conclusion

It may still be several years yet for the current ABNJ negotiations to be concluded, assuming we can reach a common understanding on many of the very difficult issues that need to be thrashed out. Regardless of the future course of the current negotiations, we should not lose sight of the fact that despite the vast attention that has been given to the MGR issue, it is only one part of the current negotiations. I would argue in fact it is the least important part. The oceans and marine biodiversity are under threat more than ever before. The well-reported decline in the health of the oceans and the rapid alarming loss of marine biodiversity require urgent and strong responses by the international community across many domains. The conservation and sustainable use of marine biological diversity of ABNJ, measures such as area-based management tools, including marine protected areas, environmental impact assessments and capacity-building and the transfer of marine technology are key to addressing these challenges. Regardless of the uncertainty surrounding MGR from ABNJ diplomats and policymakers involved in the current negotiations must not lose sight of the fact that these issues, and not MGR in ABNJ, are the 'main game'.

Whether real or illusory the benefits of MGR from ABNJ cannot be allowed to distract the international community from providing for a sustainable future for the oceans which the future of humanity is so closely tied to. As this paper has argued, there is still great uncertainty as to the level of commercial interest in MGR from ABNJ and the actual (as opposed to potential) benefits it may bring. It would be a sad day for international law if we built the ABNJ regime on the premise that vast new wealth will come from MGR from ABNJ or if any of the other elements of the ABNJ were too reliant on benefits from MGR from ABNJ and no wealth materialized.

In the current climate, it is, of course, a very unorthodox approach to raise these very difficult questions. But as an advocate for conservation and the marine environment, and as a vocal critic of the perverse and pervasive trend to 'alternate facts' and 'fake news' I do think this is an important debate we need to have, even at this late stage in the ABNJ negotiations.