

# ANTARCTICA AND ABNJ IN THE ANTHROPOCENE: CHALLENGES TO THE SUSTAINABLE MANAGEMENT OF MARINE GENETIC RESOURCES<sup>1</sup>?

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ANA FLÁVIA BARROS-PLATIAU<sup>2</sup>  
LEANDRA REGINA GONÇALVES<sup>3</sup>

## Introduction

One of the biggest challenges in contemporary global environmental governance is the future of marine ecosystems, which are under immense pressure. Increasing waste disposal, pollution, climate-related acidification, and overfishing are examples of human activities threatening marine species and habitats (UN ENVIRONMENT, 2019; HALPERN et al., 2019). Because oceans are connected all over the planet, Antarctica and marine areas beyond national jurisdiction (ABNJ) suffer from both intensification of activities and poor coastal management (POPOVA et al., 2019).

Considering the impact of humankind in the world, it can be argued that we are in the Anthropocene epoch (CRUTZEN, 2006; FRANCHINI et al., 2017; ZALASIEWICZ et al., 2017, 2019; DOLMAN, 2019). In this context, the main objective of this research was, from the very beginning, to provide a contribution to the ongoing debate about the global governance of the oceans. Although there are many multilateral and regional agreements oriented to control the mounting pressure on the environment, we still observe a high rate of degradation of the marine environment, both within and beyond areas of national jurisdiction, raising questions about the effectiveness of the regulatory framework in place (BODANSKY, 2013; MCCAULEY et al., 2015; UN ENVIRONMENT, 2019).

Although there is still debate over the start of the period of large-scale human effects on our planet, a growing majority of scientists agree that some facts are irreversible, such as the dramatic diminution of wild species (DIRZO et al., 2014) and the significantly increasing cumulative impact in the oceans mainly related to climate change, but also from fishing, land-based pollution and shipping (HALPERN et al., 2019). This means that not only is humankind the main driver of the evolution and survival of species, but also that it can destroy an entire population of species, recombine genes of living beings,

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2. International Relations Professor at Universidade de Brasília – anabarros@unb.br. ORCID <https://orcid.org/0000-0002-8804-0378>.

3. Researcher at Oceanographic Institute of University of São Paulo – leandra.goncalves@usp.br Grant FAPESP Process 2018/00462-8. ORCID <https://orcid.org/0000-0003-1182-418X>.

create living modified organisms, and change ecosystem functioning (DIRZO et al., 2014; DOLMAN, 2019).

Due to unprecedented global interconnectedness, research about how to assess the ecosystem services and to maintain them in the future is necessary. Also, how to develop robust international agreements that consider “biodiversity at the core of strong social–ecological interdependencies across the planet, which affect people’s wellbeing in many ways” (BALVANERA et al., 2017). In this context, marine genetic resources are a unique source of value to future generations, and yet able to provide different ecosystem services (DIAZ et al., 2015).

Human societies and globally interrelated economies rely on ecosystems services and support (MILLENNIUM ECOSYSTEM ASSESSMENT, 2005; HOLTHUS, 2018; UN ENVIRONMENT, 2019), and in order to guarantee its maintenance it becomes necessary to discuss: how does the Anthropocene bring new challenges to the sustainable management of marine genetic resources? This paper explores international relations and legal and environmental science literature through the lens of interdisciplinary research, to shed light on the multilateral negotiations in Antarctica and the marine biodiversity in areas beyond national jurisdiction (ABNJ), in order to better regulate their sustainable management.

The debate about the status of marine genetic resources has been positioned within different international forums and legal instruments, for instance, the United Nations Convention on the Law of the Sea (UNCLOS); the 1992 Convention on Biological Diversity (CBD); the International Seabed Authority (ISA); the United Nations Informal Consultative Process on Oceans and the Law of the Sea (UNICPLOS); the Antarctic Treaty Meetings; the annual debates of the United Nations General Assembly on Oceans and the Law of the Sea. More recently, the United Nations General Assembly (UNGA) created 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 (LEARY et al., 2009; TILLER et al., 2019). Under the UN auspices, intergovernmental conferences aim to draft an international legal binding instrument by 2020.

From a broader global biodiversity management agenda to the marine genetic resources, there are several sets of technology-related challenges, such as the carbon and nitrogen cycles. In addition to the biosphere challenges concerning the interconnection between atmosphere, water and land (ROCKSTROM et al., 2009), and the linkages between social and natural systems, three key institutional challenges were found in our research. The first one is the place of humankind in the interface of socio-ecological systems. The rights and duties of all humans, not only in relation to the other living species and their ecosystems, but also in relation to future generations and least developed countries, are put into perspective with the fourth industrial revolution as described by Schwab (2017). The second is the poor quality of the multilateral responses produced so far, in terms of a double macro-trend of fragmentation and privatization, and despite the scientific community warnings. Put bluntly, technology brings new threats and opportunities faster than institutions can adapt to them. The third is the UN 2030 Agenda as a collective action initiative (KAMAU et al., 2018; KANIE &

BIERMANN, 2017) to pave the roadmap for ocean governance, notably with SDGs 13, 14 and 15 taken as a whole<sup>4</sup>.

### **Challenge 1: The socio-ecological complex system of Antarctic and ABNJ**

Although humans only represent 0,01% of living beings, they are responsible for the loss of most of them. For instance, it is estimated that around 50% of plants and 83% of mammals have disappeared due to human activities, while livestock has been increasing. Accordingly, bacteria represent circa 13%, whereas life in the oceans represent only an estimated 1% of all biomass. Therefore, the impacts of a minority species are extremely disproportionate over the centuries (BAR-ON et al., 2018). However, life in a significant part of the oceans is still unexplored, such as the mesopelagic (also known as the twilight zone). Consequently, species may disappear due to human activities before they are even known to scientists.

In spite of recent technological breakthroughs and future possibilities, these impacts have been rather dangerous in the last decades and the biosphere is more and more depleted (SCHRAMSKI et al., 2015; STEFFEN et al., 2004; UN ENVIRONMENT, 2019). In the case of marine biodiversity, the concept of “defaunation,” that is, human-caused animal loss in the oceans (MCCAULEY et al., 2015), is rather alarming. Therefore, humankind must frame new sustainable management challenges and navigate them (BERKES et al., 2003) to go beyond panaceas (OSTROM, 2007).

The Antarctica region and the ABNJ are both large-scale ecosystems that are considered here as a socio-ecological system, also called human–environment systems over time. Berkes and Folke (1998) coined the term social–ecological system to emphasize the integrated concept of humans-in-nature and to stress that there is no established limit between social and ecological systems.

In this context, the Antarctica and the areas beyond national jurisdiction, however different, are rather interesting cases due to the intensification of human activities in both areas. Furthermore, technological developments will bring new possibilities of exploration and exploitation of natural resources as time goes by. In different terms, they are two cases with growing interests in many areas, but mainly those involving access to marine genetic resources; where to achieve transformations towards a more sustainable development pathway is one of the key challenges for ocean governance.

LEARY et al., (2009) reviewed scientific documents and searched international patent databases to conclude that the increasing number of scientific publications and patents on marine genetic resources were directly related to commercial interests. Therefore, it is important to further clarify the perspectives of the scientific community on marine genetic resources, as well as the development of new international arrangements to assure compliance with environmental impacts assessments and the sharing of benefits, as well as the non-economic values.

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4. They comprise climate change, life underwater and life on earth. The five axes of action are people, planet, peace, prosperity and partnership with the aim of leaving no one behind.

The challenge of managing marine genetic resources is not only due to the impacts exploration may cause to genetic diversity (HAUSER et al., 2002), or because they may have undesirable consequences for renewable marine resources (KENCHINTON et al., 2003). It is broader than that since humankind must find its way to disentangle panarchy (GUNDERSON & HOLLING 2009) around the issue of sustainable management of common marine resources.

## Challenge 2: Currently inadequate institutional responses

Over the decades, institutional responses to the sustainable management of living resources have been inadequate. Not only have fish stocks and marine ecosystem been increasingly threatened (FAO, 2014; MCCAULEY et al., 2015; RAYFUSE, 2015), but also flawed international regulation proved inadequate to command and control navigation, exploitation and bioprospecting activities in the high seas (BLASIAK & YAGI, 2016; AL-ABDULRAZZAK et al., 2017). Likewise, multilateral regulation of access to genetic resources and benefit sharing have been slow and insufficient (BLASIAK & YAGI, 2016; BROGGIATO et al., 2018). One of the main reasons is that international environmental law is not very effective, including ocean protection (BIGAGLI, 2016). Furthermore, the Convention on Biological Diversity (CBD), signed in the 1992 UN Conference on Environment and Development (or Rio Summit), does not apply to the ABNJ nor the Antarctica, in spite of the fact that Article 5 states that countries shall cooperate “in areas beyond national jurisdiction and other matters of mutual interest.”

The reason is that the Convention only applies to sovereign spaces in the case of components of biological diversity, despite the fact that, regarding processes and activities, the Convention also applies beyond the limits of national jurisdiction (Article 4). Therefore, the 2010 Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity does not apply to either. Nevertheless, it is not fully effective yet because relevant countries did not ratify it, such as the United States, Australia and Brazil<sup>5</sup>. Likewise, the Strategic Plan for Biodiversity (Aichi Biodiversity Targets from 2010 to 2020) was adopted in 2010, but overall achievements are still poor (ADENLE, 2012).

Consequently, the Antarctica and the ABNJ still lack clear multilateral regulation on access to genetic resources and benefit-sharing. The Antarctic continent has been regulated by the Antarctic Treaty since 1959 (ATS), residing in the background of the bipolar world order. Thus, in 1976, the Parties to the treaty agreed to a moratorium on all mining activities. It was decided that the Antarctic would be a common heritage of mankind, with three main features. One was that territorial claims over the continent would be frozen until 2048, when a review of the treaty may be requested. As a result, some countries have claimed sovereignty over the continent<sup>6</sup>, but they cannot appropriate

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5. They are considered megadiverse countries, that is, among the richest in terms of living diversity in the Planet. There are only 119 ratifications as of July 2019, including China and India. Available at: [www.cbd.int/abs/nagoya-protocol/signatories](http://www.cbd.int/abs/nagoya-protocol/signatories). Accessed on 14 July 2019.

6. Argentina, Australia, Chile, France, Norway, New Zealand and the United Kingdom.

it by force or their authorized presence in scientific facilities. The second is the prohibition of military activities in the continent, although the army can take part in activities in the region, as is the case in Brazil (with the Brazilian Antarctic Program, the Navy is responsible for the logistical support and the Ministry of Science and Technology for the coordination of the Brazilian research program). The third, and most relevant for this paper, is the key role of scientific research in the ATS. To enhance the regulation of human activities in the continent, negotiations were launched concerning biological and mineral resources with two different commissions to prepare the following conventions: one for the Conservation of Antarctic Marine Living Resources (CCAMLR), and one on the Regulation of Antarctic Mineral Resource Activities (CRAMRA). But the latter never entered into force.

Shortly after that legal setback, the Protocol on Environmental Protection to the Antarctic Treaty (Madrid Protocol) was signed in 1991. It designated Antarctica as “a natural reserve devoted to peace and science” (article 2)<sup>7</sup>. Since the negotiation to regulate mining activities failed, this environmental Protocol prohibited them. In 2016, the mining ban was reaffirmed in the 39th Antarctic Treaty Consultative Meeting (ATCM) and in the 2016 Santiago Declaration. As the region is roughly well protected from human activities related to mining<sup>8</sup>, it can be said that the regime was a half-success. However, concerning the sustainable use of biodiversity and the regulation of bioprospecting, there are still significant gaps in the regime, as was shown in the 2019 ATCM, in Prague. Issues currently under discussion range from tools such as marine protected areas to more detailed obligations to share scientific research results. The Protocol does not regulate access to marine genetic resources and benefit-sharing, although there is relevant progress in related issues, such as the 2017 Scientific Committee on Antarctic Research (SCAR) Code of Conduct<sup>9</sup>. In the 2018 ATCM meeting in Buenos Aires and in the 2019 ATCM in Prague, the issue of bioprospecting was barely raised, and it was not discussed.

Activities in the area beyond national jurisdiction are also regulated in two different regimes, one for mining under the UNCLOS provisions and the one aforementioned, under negotiation. It is called the BBNJ international legally binding instrument (ILBI), after the UN General Assembly resolution A/RES/72/249. But, contrary to the Antarctic experience, mining is rather well regulated while the biodiversity regime is not. In 1994, the International Seabed Authority was created under the United Nations Convention on the Law of the Sea (UNCLOS) to deal with mining contracts. There are currently 29 exploration contracts with Brazil signing its first contract in 2015<sup>10</sup>.

In fact, the sustainable use and conservation of biodiversity beyond national jurisdiction was already discussed during the 1992 Rio Summit. Twenty years later, delegates reaffirmed the need to protect marine biodiversity in the high seas during the

7. It entered into force seven years later. Available at: <https://ats.aq/e/ep.htm>. Accessed on 14 July 2019.

8. The Convention on the Regulation of Antarctic Mineral Resources Activities was rejected, but there is no authorized mining activity in the Antarctica region. The 1991 Madrid Protocol prohibited mining activities, except for scientific research (article 7). Thus, article 25.5 states that this prohibition shall only be modified if there is a legal binding regime adopted.

9. SCAR's Code of Conduct for the Exploration and Research of Subglacial Aquatic Environments. ATCM Final Report, Beijing 2017. Available at: [https://www.ats.aq/devAS/info\\_finalrep.aspx?lang=e&menu=2](https://www.ats.aq/devAS/info_finalrep.aspx?lang=e&menu=2). Accessed on 14 July 2019.

10. Available at: <https://www.isa.org/jm/deep-seabed-minerals-contractors>. Accessed on 14 July 2019.

Rio+20 Summit. However, negotiations are very tough and there is no legal instrument yet. The preliminary details and three main features are now set: one is that it will be a binding legal instrument; the second is that it will not threaten preexistent agreements and institutions, notably those related to the fisheries and mining sector. Finally, ongoing negotiations have four pillars: *Marine Genetic Resources*; *Area-Based Management Tools*; *Environmental Impact Assessments*; *Capacity Building and Technology Transfer*.

## A double macro-trend of fragmentation and privatization

Fragmentation (KOTZE, 2008) and privatization are two macro-trends in the process of global environmental governance (BARROS-PLATIAU & BARROS, 2017). As a result, marine genetic resources' regulation also follows those trends, although it is not only an environmental agenda due to commercial interests and intellectual property rights involved.

The macro-trend of institutional fragmentation dates back to the end of World War II. In that context, new multilateral institutions were created under the UN auspices, such as the International Maritime Organization (IMO), the UNCLOS International Seabed Authority (ISA), Food and Agriculture Organization (FAO), United Nations Development Program (UNDP), United Nations Education, Scientific and Cultural Organization (UNESCO), the World Meteorological Organization (WMO) and United Nations Environment (UNE), to mention just a few. Although they were designed to function as a UN system, they have different agendas and institutional cultures. Furthermore, different negotiating processes led to a plethora of multilateral agreements related to sectoral activities such as navigation and greenhouse gases mitigation (IMO); mining (ISA); fisheries (FAO), the International Commission for the Conservation of Atlantic Tunas (ICCAT) and Regional fisheries management Organizations RFMOs); sustainable development goals (UNDP) and so forth. As a consequence, the challenge for the ATCM and BBNJ negotiations is to adopt innovative provisions that may lead to harmonization of rights and obligations related to MGR exploration and exploitation. Unfortunately, both cases have not shown significant progress in reducing legal and diplomatic fragmentation up to now (BROGGIATO et al., 2018).

Privatization is another macro-trend in global governance (GREEN, 2013; KHANNA, 2016; LE PRESTRE, 2018). It means that the private sector is not only richer and stronger in the world stage, but also that some companies are global players (CHEN & JOHNSON, 2017) when it comes to sustainable use of marine living resources. For instance, the ISA adopted the Nautilus Inc. pattern of environmental impact assessment (COLLINS et al., 2013). Consequently, in terms of regulation of MGR exploration and exploitation, these companies may have significant influence in the negotiating process. Furthermore, sovereign countries and public agencies are not necessarily the biggest funding sources of research and industrial use of biotechnology, except for a few countries like China, Russia and Brazil. The German giant BASF, for example, accounts for 47% of all marine sequences included in gene patents, while all the other companies in the world combined have 37% and universities combined with partners have approximately 12%.

Furthermore, the traditional and key feature is a context of *de facto* monopole, given that only 10 countries (and companies headquartered there) have 98% of all marine sequences included in gene patents (BLASIAK et al., 2018).

### Challenge 3: Implementing the UN 2030 Agenda and SDG 14

After assessing the management of MGR from the background of a socio-ecological complex system and the limits of institutional responses, this section focuses on the 2030 Agenda framework. More specifically, it seeks to address the question of if and how the Agenda 2030 deals with the MGR issue. The two main questions are: how to make sure that exploration, that is, scientific research, will lead to sustainable management of marine resources instead of commercial overexploitation (MYERS & WORM, 2003), as was the case with fisheries? The second one asks what are the options for bioprospecting and regulating access to MGR considering that the lines between public and private research are blurred and that giant companies are involved? In other words, how to assure benefit sharing for the sake of humankind if the CBD and the Nagoya Protocol do not properly apply and if 165 countries do not have relevant patent sequences (BLASIAK et al., 2018)?

The United Nations 2030 Agenda was launched in 2015 as a continued United Nations' effort after the Millennium Agenda (from 2000 to 2015). It has 17 sustainable development goals (SDGs) and 169 specific targets (UN, 2015). But, differently from the Millennium Agenda, the 2030 Agenda has a specific SDG goal related to life below water, that is SDG 14. The reason for that is because the ocean is recognized as "the cornerstone of our life support system" (EARLE, 2014) and, as it is recognized by the UN, more than three billion people depend on marine biodiversity (UN, 2015).

Out of the ten targets in SDG 14, four of them are set to 2020, concerning the sustainable management of coastal and marine ecosystems and the reduction of illegal, unreported and unregulated fishing (IUU), as well as the World Trade Organization's sluggish negotiations on subsidies. Although they will probably not be met by all countries, it is important to highlight its urgency. Two of them are related to marine pollution and ocean acidification, another two mention market-related issues, and one recalls the UNCLOS importance. Finally, only target 14a. sets the goal to:

*"Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries"* (UN, 2015).

Even though the target above does not mention bioprospecting nor access to the MGRs, it establishes the criteria and guidelines, that according to UNESCO/IOC are: *"The guiding principle of the CGTMT is that the Transfer of Marine Technology must always be conducted on fair and reasonable terms and conditions and should enable all parties concerned to benefit on an equitable basis from developments in marine science related activities, particularly those aiming at stimulating the social and economic contexts in developing countries."* (IOC, 2005). However, those are vague and not legally binding provisions. As a consequence,

SDG 14 is clearly insufficient to tackle the challenge of regulating access to MGR and effectively promoting both: the sustainable use of marine resources and a benefit-sharing mechanism. In this vein, the 2030 Agenda may fail to influence future BBNJ negotiations in the UN headquarters. If that is so, bioprospecting and scientific research may lead to new commercial interests, mostly in the pharmaceutical and nutraceutical fields, given the companies engaged.

Since the 2030 Agenda's motto is "leave no one behind," it is paramount that the private sector, notably the companies, be involved in the whole process (HOLTHUS, 2018). They were not so engaged in the agenda-setting, although the Global Compact was launched in 2005 and has more than 13,000 members<sup>11</sup>. Now is the time to invite them to the negotiating table as the intermediaries, as Abbott et al. (2016) put in their "orchestration"<sup>12</sup> model. Private companies are the best positioned to calculate the costs and benefits of bioprospecting. They are able to finance innovative research and to Co-operate with the public sector. Concerning benefit-sharing, they have the bulk of patents related to MGR. Finally, considering their respective roles as global players, if they do not comply with multilateral agreements, laws will not be effective. In a nutshell, the 2030 Agenda focuses on targets for the interest of mankind, but executive authorities need to focus more on funding sources and the key implementing actors, especially in the private sector.

## Conclusion

Marine resources depletion is becoming more serious while scientific research and human awareness improve with the fourth technological revolution. It is no paradox, but rather a fact that institutional responses to shape collective action in the sense of sustainable use and conservation of biodiversity are still inadequate and insufficient. Antarctica and the ABNJ are two cases of ongoing tough negotiations inside and outside the United Nations, with comparable challenges in which public and private interests are intertwined.

A first challenge concerns the socio-ecological complex system and the fact that terrestrial biodiversity within national jurisdiction is already threatened. This could be the future trend for marine life if global ocean governance continues to be unsustainable. Humans are the dominant species and the first responsible for behavior change. Human activities such as harvesting, fishing, mining, exploitation, pollution and greenhouse gas emissions lead to the degradation of ecosystems and consequently affect the ocean's health.

The second challenge consists of the institutional responses to the sustainability global agenda. Antarctica and the ABNJ have two different negotiating dynamics and outcomes, but mining and bioprospecting were two activities selected because they reflect the opposition of commercial interests to environmental obligations. In spite of the fact that both cases are ecologically linked to the ocean and to each other,

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11. Available at: <https://www.unglobalcompact.org/> Accessed on 14 July 2019.

12. Their OIT model stands for: organization, intermediaries and targets. They state that organizations may delegate tasks for intermediaries so that they can contribute to the execution of projects.

the CDB is not properly applied. Two mega-trends contribute to understanding why: fragmentation and privatization. Fragmentation is a result of political and commercial interests predominating over environmental protection. There are myriad international organizations and treaties that make ocean governance much less harmonious and Syn-nergistic than it could and should be. Thus, both Antarctica and the ABNJ ongoing negotiations offer precious opportunities to harmonize sustainable use and conservation of marine biodiversity obligations. Privatization is the unavoidable consequence of private companies investing in technological innovation and becoming global players in ocean governance. Consequently, their participation in the rule-making processes is necessary so that the environmental, social and economic pillars of development are taken into consideration.

The third challenge is prospective, given that the institutional multilateral responses to the sustainable management of biodiversity and marine genetic resources are insufficient. The UN 2030 has 17 sustainable development goals that are somehow connected to the oceans' health and wealth. More specifically, SDGs 13 (climate), 14 (life below water) and 15 (life on land) also constitute a global institutional effort to improve the sustainable use and conservation of living resources for the sake of humanity. So, it is a matter of promoting public/private scientific research in balance with environmental and social responsibilities. Additionally, regulating access to marine genetic resources and benefit-sharing obligations in accordance with the CBD and the Nagoya Protocol is necessary to encourage innovation with fairness to present and future generations. Moreover, the best way to assure compliance with international law is to have all stakeholders onboard. Multilateral negotiations should include the private sector in different ways, so that negotiations are less normative and much more pragmatic. Finally, future research concerning ocean stewardship and access to genetic resources in Antarctica and ABNJ is necessary to solve self-created problems.

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# ANTARCTICA AND ABNJ IN THE ANTHROPOCENE: CHALLENGES TO THE SUSTAINABLE MANAGEMENT OF MARINE GENETIC RESOURCES?

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ANA FLÁVIA BARROS-PLATIAU  
LEANDRA REGINA GONÇALVES

## ANTARCTICA AND ABNJ IN THE ANTHROPOCENE: CHALLENGES TO THE SUSTAINABLE MANAGEMENT OF MARINE GENETIC RESOURCES?

**Abstract:** The Anthropocene epoch brings new technology-related challenges for the sustainable management of biodiversity, including the access to marine genetic resources. Although separated in two multilateral agendas, Antarctica and the area beyond national jurisdiction are comparable cases, since the regulation of bioprospecting activities has been under negotiation for decades, inside and outside the UN. From an interdisciplinary approach in international relations, legal and environmental science literature, three challenges are discussed: the socio-ecological complex system, the institutional responses and the UN 2030 Agenda (sustainable development goals). The main finding is that the UN 2030 Agenda needs to include companies (global players) in order to improve the effectiveness of the future regulations.

**Keywords:** marine genetic resources, Antarctica, ABNJ, BBNJ.

## ANTÁRTICA E ÁREAS ALÉM DA JURISDIÇÃO NACIONAL NO ANTHROPOCENO: DESAFIOS PARA A GESTÃO SUSTENTÁVEL DOS RECURSOS MARINHOS GENÉTICOS?

**Resumo:** A época do Antropoceno traz novos desafios relacionados à tecnologia para o manejo sustentável da biodiversidade, incluindo o acesso a recursos genéticos marinhos. Embora separados em duas agendas multilaterais, a Antártica e as áreas fora da jurisdição nacional são casos comparáveis, uma vez que a regulação das atividades de bioprospecção está em negociação há décadas, dentro e fora da ONU. A partir de uma abordagem interdisciplinar nas relações internacionais, literatura de ciências jurídicas e ambientais, três desafios são discutidos: o sistema complexo socioecológico, as respostas institucionais e a Agenda 2030 da ONU (Objetivos de Desenvolvimento Sustentável). A principal conclusão é que a Agenda 2030 precisa envolver o setor privado nas negociações para aprimorar a eficácia das regulamentações futuras.

**Palavras-chave:** recursos marinhos genéticos, Antártica, AAJN, BAJN.

## ANTÁRTIDA Y ZONAS FUERA DE LA JURISDICCIÓN NACIONAL EN EL ANTROPOCENO: ¿DESAFÍOS PARA EL MANEJO SOSTENIBLE DE LOS RECURSOS GENÉTICOS MARINOS?

**Resumen:** La época del Antropoceno plantea nuevos retos tecnológicos para la gestión sustentable de la biodiversidad, incluyendo el acceso a los recursos genéticos marinos. Aunque separados en dos agendas multilaterales, la Antártida y el área fuera de la jurisdicción nacional son casos comparables, ya que la regulación de las actividades de bioprospección ha estado bajo negociación durante décadas, dentro y fuera de la ONU. Desde un enfoque interdisciplinario en las relaciones internacionales, la literatura jurídica y de ciencias ambientales, se discuten tres desafíos: el complejo sistema socio-ecológico, las respuestas institucionales y la Agenda 2030 de la ONU (objetivos de desarrollo sostenible). La principal conclusión es que las Naciones Unidas 2030 Agenda deben incluir a los actores globales para mejorar la eficacia de las futuras regulaciones.

**Palabras claves:** recursos genéticos marinos, Antártida, ZFJN, BFJN

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