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Benefit sharing of marine genetic resources and intellectual property protection under the BBNJ agreement

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The relationship between benefit-sharing of marine genetic resources in areas beyond national jurisdiction and the intellectual property system has been a focal issue in past negotiations of the BBNJ Agreement. The legal status of marine genetic resources in areas beyond national jurisdiction is contentious. Although the BBNJ Agreement stops short of legally defining marine genetic resources in areas beyond national jurisdiction as “common heritage of mankind,” it adopts the principle as a guiding normative framework. The protection of specific knowledge information derived from the development of marine genetic resources in areas beyond national jurisdiction through the intellectual property system is not incompatible with the principle of the common heritage of mankind, nor does it conflict with relevant provisions of UNCLOS. Intellectual property protection can be integrated with benefit-sharing, and the current focus should be on improving the benefit-sharing mechanism within the intellectual property framework. The benefit-sharing mechanism for intellectual property associated with marine genetic resources in areas beyond national jurisdiction should emphasize non-monetary forms, achievable through international treaties under WTO and WIPO platforms.

KEYWORDS

BBNJ agreement, marine genetic resources in areas beyond national jurisdiction, intellectual property, benefit-sharing, common heritage of mankind

1 Introduction

Marine Genetic Resources (MGRs)¹ can be categorized by their geographical location into those within areas under national jurisdiction and those in areas beyond national jurisdiction². Previously, The Convention on Biological Diversity (CBD) and its supplementary legal document, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (Nagoya Protocol), primarily regulated the former. Although the United Nations Convention on the Law of the Sea (UNCLOS), known as the constitution for the oceans, can regulate Marine Genetic Resources in Areas Beyond National Jurisdiction (hereinafter referred to as “MGRs

in ABNJ”), it does not address the sharing of benefits from genetic resources. The benefit-sharing of MGRs in ABNJ has thus remained a gap in international treaties. The Agreement on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction (BBNJ Agreement) has filled the gap, adopted after arduous negotiations on June 20, 2023³. As the third implementing agreement of the UNCLOS, it is of significant importance in reversing the destructive trends facing the oceans and restoring ocean health.

The relationship between the benefit-sharing of MGRs in ABNJ and the intellectual property system has been a focal issue in past negotiations of the BBNJ Agreement. MGRs in ABNJ, as a significant strategic resource, are regarded as a key driver of the “blue economy” due to their unique bioactivity and pharmaceutical potential. However, their development faces challenges such as high technical difficulty and investment risk, necessitating institutional guarantees for developers to ensure benefit returns, thereby filling the incentive gap and maintaining the stability of long-term investment. The existing intellectual property system becomes the inevitable choice. Nonetheless, there is still controversy among countries regarding the legal status of MGRs in ABNJ, and the legitimacy of privatizing specific knowledge information derived from the development of MGRs in ABNJ (hereinafter referred to as “The Specific Knowledge Information”) through the intellectual property system is questioned. To clarify the relationship between the benefit-sharing of MGRs in ABNJ and the intellectual property system, this article attempts to address the following questions: Are MGRs in ABNJ common

property or the common heritage of mankind? Is there a conflict between the use of MGRs in ABNJ and the intellectual property system? How can the benefit-sharing of MGRs in ABNJ be effectively balanced under the intellectual property regime?

2 The legal nature of MGRs in ABNJ

There is significant controversy over whether the common heritage of mankind as stipulated in Article 136 of UNCLOS can be interpreted broadly to include MGRs in ABNJ⁴. Consequently, during the negotiations of the BBNJ Agreement, the legal nature of MGRs in ABNJ became a focal point of contention. In general, developed countries tend to support the theory of common property, which stands in contrast to the principle of the common heritage of mankind favored by developing countries.

2.1 The core of international law dispute: common property vs. common heritage of mankind

2.1.1 The historical origins and limitations of the theory of common property

The concept of “common property” originates from ancient Roman law and is strongly characterized by natural law attributes. Its main feature is that it can be freely used by anyone and, theoretically, will not be exhausted. The Justinian Code regarded the ocean as common property, explicitly stating that it could not be privatized, and established the original institutional framework of “open use and development for benefit.” However, with the advancement of navigation technology and the Age of Discovery, maritime nations like the United Kingdom put forward claims of maritime sovereignty, leading to a prolonged struggle with the Dutch-led maritime openness faction, eventually forming two core theoretical systems. Dutch scholar Grotius inherited the theory of common property and explicitly proposed the idea of “freedom of the seas” in his 1609 work “*Mare Liberum*.” In contrast, British scholar Selden published “*Mare Clausum*” in 1635, providing legal support for national maritime sovereignty, advocating for the distribution of maritime rights through actual control (Thornton, 2006). After two centuries of practical examination, the international community eventually reached a compromise: dividing the seas into national territorial waters and international high seas. The high seas regime directly inherits the Roman law concept of “common property,” establishing six major principles of freedom, including freedom of navigation and fishing, forming the cornerstone of modern international maritime law.

1 Article 1 of the BBNJ Agreement defines “marine genetic resources” as any material of marine plant, animal, microbial or other origin containing functional units of heredity of actual or potential value.

2 According to the UNCLOS, the maritime area extending 12 nautical miles from the territorial sea baseline constitutes a country's territorial sea, over which the coastal state enjoys full sovereignty. Beyond the outer limits of the territorial sea, a coastal state may, in accordance with the provisions of the Convention, claim a 200-nautical-mile exclusive economic zone and a naturally extending continental shelf, exercising specific jurisdiction such as resource exploration, development, and environmental protection in these areas. The vast ocean space beyond these national jurisdictional areas (including the territorial sea, exclusive economic zone, continental shelf, and other legally defined jurisdictional areas) is divided into the high seas and the international seabed area. According to Articles 87 and 137 of the UNCLOS, neither of these maritime areas may be claimed by any state for sovereignty or exclusive rights, thereby collectively constituting the “areas beyond national jurisdiction.” Based on this, Article 1, paragraph 2 of the BBNJ Agreement defines “areas beyond national jurisdiction” as the high seas, along with the seabed, ocean floor, and subsoil located beyond the limits of national jurisdiction.

3 The BBNJ Agreement is available for signature from September 20, 2023, to September 20, 2025, and will come into effect once it is ratified by 60 signatory countries following their national procedures. As of May 14, 2025, 115 countries worldwide have signed the agreement, and 21 countries have formally ratified it. Currently, some countries are speeding up their ratification processes to hasten the agreement's entry into force.

4 Article 136 of the UNCLOS designates the “Area” (referring to the seabed, ocean floor, and subsoil beyond the limits of national jurisdiction) and its resources as the common heritage of mankind. However, Article 133 defines “resources” as all solid, liquid, or gaseous mineral resources in situ in the “Area,” including polymetallic nodules, but excludes marine genetic resources within the “Area.”

Rooted in the theory of common property, the principle of freedom of the high seas was historically premised on the belief that marine resources were inexhaustible and would never be depleted. However, this premise seems difficult to sustain in modern society. With the advancement of human technology, the utilization of ocean resources has become increasingly aggressive, and unrestrained use of “common property” can easily lead to the “tragedy of the commons⁵.” The excessive exploitation of marine resources by various countries has led to a growing number of marine environmental issues, triggering ecological crises and posing the risk of depleting these resources. Limited by its historical context, the principle of freedom of the high seas, struggles to provide significant guidance on modern high seas issues. Therefore, the current concept of “freedom of the high seas” under the guidance of the UNCLOS has become a relative freedom. Its exercise is subject to the conditions stipulated by this convention and other international law rules, and it must consider the interests of other countries exercising their freedom of the high seas (UNCLOS, 1982, Art 87). Additionally, Article 86 of the UNCLOS limits the scope of “freedom of the high seas” to “all parts of the sea not included in the exclusive economic zone, in the territorial sea or in the internal waters of a State, or in the archipelagic waters of an archipelagic State,” emphasizing “areas of the sea.” However, there is debate over whether areas such as the “deep seabed,” where MGRs are typically located, fall within this scope (Scovazzi, 2013). Consequently, many developing countries advocate that the seabed, subsoil, and their resources in the high seas be regarded as the common heritage of all humankind, with no nation or individual having the right to claim them as their own. Instead, countries should collaboratively develop and utilize these resources based on the principle of equality. These propositions gradually evolved into the principle of the common heritage of mankind.

2.1.2 The justification for the principle of the common heritage of mankind

The justification for the principle of the common heritage of mankind can be explained from the perspective of global public interest. The scientific, medical, and ecological value of biological genetic resources is universal, inherently possessing a global public attribute. Their development and utilization transcend national borders and address the common needs of human survival and development. Given the advantages of developed countries in technology and capital, if seabed resources are regarded as “common property” and countries are allowed to freely exploit and benefit individually, it would further widen the gap in benefits obtained from globally public resources between developed and developing countries. Furthermore, the principle of Intergenerational Equity offers theoretical support for the principle of the common heritage of mankind (Garcia, 2021). Intergenerational equity, as a part of international environmental law, emphasizes

humanity’s responsibility to protect Earth’s resources to ensure the survival and development of future generations. Biological genetic resources, such as genes and species diversity, are products of natural evolution. Their value lies not only in contemporary scientific, medical, or economic applications but also in maintaining the long-term stability of ecosystems. For instance, the genes of certain endangered species may become crucial in addressing future food crises or diseases. If current generations monopolize or destroy these resources, it would directly threaten the survival and development rights of future generations. The development of genetic resources often involves “intergenerational externalities”—where the current generation reaps the benefits while ecological costs are transferred to future generations, such as the loss of biodiversity. Therefore, the current generation has an obligation to preserve natural resources and the living environment for future generations, avoiding short-sighted exploitation that harms their interests. The principle of the common heritage of mankind advocates that biological genetic resources should be collectively owned by all of humanity. Its purpose is to prevent the disorderly and excessive exploitation that can easily occur under the Theory of Common Property. The underlying logical foundation is the principle of intergenerational equity, which emphasizes the sustainable use and equitable distribution of resources. The principle of intergenerational equity provides an ethical and legal foundation for the principle of the common heritage of mankind.

Global public interest demands universal benefit, and intergenerational equity requires resource utilization to align with sustainable development. Both point towards an institutional design of “joint management and shared benefits.” Based on this, Malta submitted a proposal to the United Nations General Assembly in 1967, explicitly advocating that the seabed and its resources should be considered the common heritage of mankind and should be developed cooperatively by the international community through an effective international regime (Thambisetty, 2021). This proposal received widespread support from developing countries. During the Third United Nations Conference on the Law of the Sea from 1973 to 1982, Western developed countries attempted to extend the “common property” theory to the international seabed area but faced fierce opposition from developing countries, including the Group of 77. Due to severe North-South divisions, the conference ultimately adopted the UNCLOS by voting rather than by consensus. Article 136 of the convention stipulates that the “Area⁶ and its resources are the common heritage of mankind. The principle of the common heritage of mankind is embodied in this landmark document.

2.2 Divergences and coordination among countries during the negotiation of the BBNJ agreement

Based on the aforementioned theoretical viewpoints, the drafts submitted by various delegations during the negotiation of the BBNJ

5 Refer to Hardin, G. (1968) for the foundational literature on the “tragedy of the commons” theory in Science, 162(3859), 1243–1248. This paper uses the allegory of the “public pasture” to illustrate how the absence of exclusive property rights leads to the overuse and eventual depletion of common resources.

6 Article 1 of the UNCLOS defines the “Area” as the seabed, ocean floor, and subsoil beyond the limits of national jurisdiction.

Agreement reflect three types of positions: First, under the principle of freedom of the high seas, MGRs in ABNJ are considered common property, emphasizing the freedom to utilize and privatize them. Second, according to the principle of the common heritage of mankind, MGRs in ABNJ are regarded as the common property of humanity, highlighting the need to strengthen management of their use and implement benefit-sharing. Third, from a pragmatic perspective aimed at advancing the negotiation process, it is argued that disagreements over the legal status of MGRs in ABNJ should not obstruct the establishment of legal frameworks, emphasizing the importance of reaching a consensus on benefit-sharing mechanisms.

Developed countries such as the United States, Japan, and South Korea support the principle of freedom of the high seas. For example, the U.S. representative believes that access to MGRs in ABNJ should remain open and unobstructed, and that discussions on the ownership and legal status of these MGRs are unnecessary (IISD/ENB @ BBNJ IGC-3, 2019). The Group of 77 and China, along with other developing countries, assert that the principle of the common heritage of mankind must become the new foundation for managing MGRs in ABNJ. They argue that this principle should be central to the BBNJ Agreement, providing a legal basis for the protection and sustainable use of biodiversity, including access to and fair and equitable sharing of benefits from the utilization of MGRs in ABNJ (IISD/ENB @ BBNJ IGC-3, 2019). Additionally, the European Union and some of its member states seek an alternative approach to resolving the legal status issue of MGRs in ABNJ, believing that the progress of negotiations should not depend on determining the legal attributes of these MGRs (IISD/ENB @ BBNJ IGC-2, 2019).

The final adopted BBNJ Agreement achieved a compromise and balance by stipulating both the principle of the common heritage of mankind and alongside the principle of freedom of the high seas within the principle clauses [BBNJ, 2023, Art 7 (2), (3)]. It merely designates “common heritage of mankind as a principle without emphasizing that MGRs in ABNJ belong to this heritage. However, the institutional designs in the BBNJ Agreement related to benefit-sharing, capacity building, and technology transfer clearly embody the principle of the common heritage of mankind. Based on the specific content of these provisions, the principle of the common heritage of mankind can also be interpreted as placing limitations on the principle of freedom of the high seas⁷. This interpretation aligns with the international legislative trend of increasing restrictions on the principle of freedom of the high seas.

Incorporating the principle of the common heritage of mankind into the text of the BBNJ Agreement is not only a result of international consensus and institutional compromise but also a jurisprudential necessity for achieving the value objectives of the

BBNJ Agreement. As international law theory evolves, the principle of the common heritage of mankind has been endowed with richer contemporary meanings: it not only addresses intra-generational equity in the distribution of current benefits but also extends the concept of inter-generational equity to the interests of future generations and incorporates the integrity of ecosystems into a higher dimension of equity consideration. This aligns jurisprudentially with the core objective established by the BBNJ Agreement—the protection and sustainable use of marine biodiversity (BBNJ, 2023, Art 2)—forming a conjugate relationship in their value core.

3 The adaption between the principle of the common heritage of mankind and the intellectual property system

Despite significant challenges in incorporating MGRs in ABNJ into “common heritage of mankind” through a broad interpretation of Article 136 of the UNCLOS, and the fact that the BBNJ Agreement ultimately adopted does not directly define MGRs in ABNJ as “common heritage of mankind,” the idea continues to play a guiding role in relevant international treaties in the form of a principle. For example, Article 14, paragraph 1 of the BBNJ Agreement clearly establishes benefit-sharing as a general obligation under international law, stating that benefits arising from activities related to MGRs in ABNJ and their digital sequence information “shall be shared in a fair and equitable manner according to this Part and contribute to the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction.” The core concept of the common heritage of mankind principle emphasizes that resources and the benefits derived from them should benefit all humanity. In contrast, the intellectual property system stresses that the results of innovation are privately owned, granting individuals exclusive rights of use. Therefore, under the principle of the common heritage of mankind, can The Specific Knowledge Information be privatized through the intellectual property system?

3.1 Interpretation of the relevant provisions in the UNCLOS

The BBNJ Agreement does not explicitly clarify whether rights can be claimed over The Specific Knowledge Information. Since the BBNJ Agreement is intended to implement the UNCLOS, all provisions within it must comply with the rights and obligations outlined by UNCLOS [BBNJ, 2023, Art 5 (1)]. Therefore, it is essential to examine the relevant provisions of UNCLOS. Article 241 of UNCLOS states that “Marine scientific research activities shall not constitute the legal basis for any claim to any part of the marine environment or its resources.” This article addresses marine scientific research activities, and it clearly includes the development and utilization of MGRs in ABNJ.

The initial question to consider is whether the “claim to rights” mentioned in this article encompasses intellectual property claims

⁷ According to Article 31 of the Vienna Convention on the Law of Treaties, the purpose and objectives of a treaty may be considered when interpreting it. One of the objectives of the BBNJ Agreement is to promote the equitable and sustainable use of resources in areas beyond national jurisdiction, which allows for some interpretative flexibility in reflecting the principle of the common heritage of mankind. However, it is important to emphasize that any interpretation in line with Article 31 of the Vienna Convention on the Law of Treaties should not overlook the differing opinions of countries during the negotiation process.

over The Specific Knowledge Information referred to earlier. This requires interpreting Article 241. The drafting history of this article shows that the original text was derived from the content related to the third principle recorded in a working document submitted by the Canadian delegation to the Third United Nations Conference on the Law of the Sea in 1972 (Tanaka, 2016). The third principle stated, “Marine scientific research activities themselves do not constitute the legal basis for claiming development rights or any other rights in areas beyond national jurisdiction.” (United Nations, 1972, A/AC.138/SC.III/L.18) It is evident that the rights obtained from marine scientific research activities initially excluded at least commercialization rights such as development rights. However, during the drafting of Article 241, most countries favored a broader restriction on the rights granted by marine scientific research activities, and the final text of Article 241 adopted the more abstract term “claim to rights.” Therefore, it is more logical to broadly interpret the “assertion of rights” restricted by the current Article 241 (Jørem and Tvedt, 2014).

However, even with a broad interpretation, this does not necessarily exclude intellectual property rights over The Specific Knowledge Information. A literal interpretation of this article suggests that what is excluded is the assertion of rights over “resources,” which typically refer to tangible objects and do not include “information” as intangible objects. The object of intellectual property is “information” as an intangible object, whose value is not attached to tangible resources but relies on the new “information” obtained through the development of resources. Clearly, the assertion of intellectual property rights pertains to the “information” generated during the utilization of MGRs, rather than the “resources” themselves. It does not grant the intellectual property holder any ownership rights over the resources (Heafey, 2014). The text of the BBNJ Agreement only emphasizes that no rights may be claimed over MGRs obtained *in situ* from areas beyond national jurisdiction⁸, and does not deny the assertion of rights over the aforementioned The Specific Knowledge Information, which aligns with the provisions of Article 241 of UNCLOS.

3.2 Compatibility of the protection of MGRs in ABNJ with intellectual property systems

Unlike traditional marine resources, such as fish catches that generate economic benefits directly through market transactions, the core value of MGRs in ABNJ is not directly realized through market transactions. Instead, it is embodied in the entire process of development activities targeting these resources. These resources require professional technical methods, such as gene sequencing and bioengineering, and must undergo systematic technological

research, development, and industrial application to be transformed into products with practical application value, such as biomedicine and industrial enzyme preparations. Only through development activities can the immense potential value of MGRs in ABNJ be unearthed. However, these resources are often located in deep-sea areas, where development is technically challenging and investment risks are high. The existing incentive mechanisms in market economic activities that motivate developers to engage in development activities are insufficient when faced with high difficulty and high-risk obstacles. To encourage the development and utilization of these resources, it is necessary to establish exclusive rights to the transformation of intellectual achievements at the legal level, providing developers with an institutional arrangement for predictable benefit distribution (Heafey, 2014). Since the efficiency of value transformation of MGRs in ABNJ fundamentally depends on human capacity to decode genetic information and the level of investment in technological research and development, it can be said that the process of realizing the value of MGRs in ABNJ essentially reflects the core driving role of human intellectual activity. The development and utilization of MGRs in ABNJ inevitably extend into the field of intellectual property, where intellectual achievements are the focus. Therefore, rather than creating an entirely new rights system, employing the relatively mature intellectual property systems within national and international legal frameworks is the best choice.

Although some viewpoints suggest that intellectual property mechanisms, such as patent protection, may reinforce the monopolistic control of private entities over the research and commercialization of genetic resources, this tendency towards privatization structurally conflicts with the principle of the common heritage of mankind advocated by the BBNJ Agreement (Thambisetty, 2021). However, a closer examination of the objectives of the intellectual property system and its specific design reveals that such concerns may be overstated. Intellectual property differs from property rights in that it is, to some extent, merely a limited monopoly over “information.” The purpose of the intellectual property system is to incentivize researchers to continuously create valuable information, thereby enabling the public to access and use this information, ultimately aiming to enhance social welfare (Lemley, 2005). In this sense, the objectives of the intellectual property system are consistent with the core values embodied in the principle of the common heritage of mankind. For this reason, intellectual property rights are usually time-limited, ensuring that valuable information eventually returns to the public domain; even during the validity period of intellectual property, there are various restrictions to maintain a dynamic balance between public and private interests. Additionally, from the perspective of specific institutional design, the content of property rights is also limited by the costs associated with the property rights system (Posner, 2014). To reduce the cost of information dissemination, the law mandates the delineation of unprotected areas to preserve the public domain. For instance, scientific discoveries are excluded from the scope of patent rights, which has become an internationally accepted rule. This design is essentially a compromise due to the high costs of defining and protecting such resources.

⁸ Article 11(5) of the BBNJ Agreement stipulates that “Collection in situ of marine genetic resources of areas beyond national jurisdiction shall not constitute the legal basis for any claim to any part of the marine environment or its resources.”

In recent years, the boundary between inventions and discoveries has become increasingly blurred, with many countries gradually allowing material inventions to obtain patent protection through legislation or judicial precedents. The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) reflects this tendency, as it excludes only “(non-microbial) plants and animals” from patent eligibility, and material inventions involving genetic resources are generally regarded as included within the scope of patentable subject matter [TRIPS, 1994, Art 27.3(b)]. However, a closer analysis of specific cases reveals that the granting of patents for material inventions has not deviated from the institutional framework reserved for the public domain as mentioned above. Patent recognition for common types of marine genetic resources, such as natural products, microorganisms, and gene fragments, continues to emphasize that biological materials must undergo technical modification to be eligible for protection (Diamond v. Chakrabarty, 1980). The legal basis for granting biotechnology patents lies in human technological intervention that enables naturally occurring biological entities to exhibit functions they do not possess in their unaltered state, rather than in the mere discovery of the inherent value of the material itself (Chiarolla, 2014).

It is clear that the current intellectual property system’s limited monopoly over “information” does not structurally conflict with the principle of the common heritage of mankind. Under this principle, protecting specific knowledge and information through the intellectual property system is appropriate, and the independent value of intellectual property should be respected. However, it is important to note that the purpose of the intellectual property system is to focus on the future increase in the overall welfare of human society. If the value orientation of the intellectual property system is considered in isolation, completely ignoring the justice of current resource distribution, the goal of global governance of MGRs in ABNJ is likely to be missed. Implementing a benefit-sharing mechanism is necessary to counteract the inequities arising from the limitations of the intellectual property system in the development and use of MGRs in ABNJ. As a result, the current discourse should prioritize finding an appropriate balance between intellectual property rights and benefit-sharing arrangements.

4 Balancing benefit-sharing within the intellectual property system

The BBNJ Agreement provides an important legal basis and institutional foundation for benefit-sharing⁹. The development and refinement of a systematic benefit-sharing system for MGRs in

ABNJ may still need to progress under the framework of subsequent negotiations for the implementation of the BBNJ Agreement. However, given that the Agreement’s entry into force will take time and its benefit-sharing implementation mechanism remains subject to further negotiation, incorporating considerations of benefit-sharing into the existing international intellectual property treaty system is currently a feasible and effective path. This is particularly critical for efforts aimed at balancing intellectual property objectives with benefit-sharing goals. Mandatory monetary benefit-sharing often leads to sovereignty disputes and compliance issues due to its significant intervention in the interests of intellectual property holders. In contrast, non-monetary benefit-sharing demonstrates greater legal and institutional feasibility and flexibility, better addresses the core concerns of developing countries, and exerts a more structurally significant long-term impact.

4.1 Focusing on utilization-oriented non-monetary benefit-sharing

In the current benefit-sharing mechanisms for genetic resources, benefits are categorized into two types: monetary and non-monetary (CBD, 1992, Art 19; ITPGRFA, 2001, Art 13). The former pertains to market returns from the commercialization of genetic resource developments through intellectual property, while the latter involves the positive externalities from using these developments. An effective benefit-sharing system is generally believed to need to address both monetary and non-monetary aspects. However, during the BBNJ Agreement negotiations, countries differed on whether monetary benefits should be part of the benefit-sharing system for MGRs in ABNJ (Jaspars and Brown, 2020). Ultimately, the BBNJ Agreement only established a general obligation for sharing monetary benefits [BBNJ, 2023, Art 14(1)], with the specific sharing model to be determined in future negotiations¹⁰.

The push for monetary benefit-sharing highlights the redistribution of commercial profits derived from intellectual property, reflecting the idea of equitable economic benefit distribution. While this focus on economic returns is important, an overemphasis on resource-based benefit-sharing risks overshadowing the deeper ethical and normative values embedded in the principle of the common heritage of mankind (Kiss, 1985). In practice, however, the persistent global challenges in establishing effective benefit-sharing mechanisms for MGRs in ABNJ illustrate the difficulty of achieving common welfare solely through equal economic distribution (Noyes, 2011). This difficulty

⁹ Driven by the collective efforts of developing countries, several substantive outcomes reflecting these countries’ benefit-sharing claims have been incorporated into Part II of the BBNJ Agreement, titled “Marine Genetic Resources, Including the Fair and Equitable Sharing of Benefits”. Not only does this part include the expression “fair and equitable” in its title, but it also incorporates Digital Sequence Information (DSI) into the benefit-sharing system, establishes a BBNJ Standard Batch Identifier mechanism, and sets up the benefit-sharing committee to enhance system implementation.

¹⁰ From April 14 to 25, 2025, during the First Session of the Preparatory Commission for the Entry into Force of the BBNJ Agreement (Prep Com 1) held in New York, USA, countries engaged in in-depth discussions on the purpose, funding sources, and approval procedures of “special funds” such as the Special Fund and the Global Environment Facility (GEF). This will aid in utilizing these funds to support the implementation of benefit-sharing from MGRs.

arises because this approach exceeds the current commercialization stage of MGRs in ABNJ and lacks legal support for obtaining monetary compensation. Specifically, the commercial scale of MGRs in ABNJ is currently limited, and it is uncertain whether it can be effectively converted into economic returns that provide incentives. Additionally, developers or investors incur significant economic costs for MGRs development activities beyond national jurisdiction, while other beneficiaries in the benefit-sharing system are numerous and uncertain, unable to share the associated research and investment risks. In this context, an overemphasis on promoting monetary benefit-sharing could significantly discourage developers from engaging in marine scientific research, thereby reducing the production of The Specific Knowledge Information. Furthermore, unlike genetic resources within national jurisdictions, which are controlled by the country of origin, access to MGRs in ABNJ is not controlled by any specific entity. Since current laws do not recognize MGRs in ABNJ as “common heritage of mankind,” there are no physical or legal barriers to accessing them. Without a factual basis for the country of origin to provide genetic resource materials as consideration, the legitimacy of monetary benefit-sharing for specific knowledge and information still requires further justification.

In contrast to direct monetary benefit-sharing, non-monetary benefit-sharing highlights the public nature of the knowledge and information derived from genetic resources, emphasizing the fair use of development outcomes by relevant beneficiaries. However, when developing countries engage in non-monetary benefit-sharing, their ability to access and acquire MGRs in ABNJ is objectively constrained. This is because these MGRs in ABNJ are mostly located on the deep-sea floor, and their development and utilization depend on advanced deep-sea exploration and operational capabilities, as well as financial support. Due to economic and technological constraints, it is practically difficult for developing countries to realize their rights to MGRs in ABNJ. The entities primarily engaged in the development of these resources are developed countries and their affiliated corporations, which possess strong economic and technological capacities and thus unilaterally control the benefits derived from MGRs in ABNJ. In addition, developing countries face restrictions from the intellectual property rights of rights holders regarding the use of the outcomes of MGRs in ABNJ. Although the BBNJ Agreement explicitly outlines seven forms of non-monetary benefit-sharing¹¹—each indirectly aiming to ensure that developing countries can access and utilize knowledge and information protected by intellectual property rights—this objective

is often undermined by the strong exclusive rights enjoyed by rights holders. When intellectual property owners exercise their exclusive rights through measures such as injunctions, the public nature of such knowledge is easily overshadowed by its privatization. This tension becomes especially acute when the exclusivity of intellectual property rights is abused, such as the imposition of trade barriers or refusals to license, which further restrict developing countries’ ability to benefit from MGRs in ABNJ. For example, in the pharmaceutical sector, which currently holds significant application value, the development of MGRs in ABNJ is primarily used for researching and developing antiviral and anti-AIDS drugs. Although this is closely tied to public health security in various countries, the use of these development results is governed by intellectual property rights. Unauthorized use without the rights holder’s permission is prohibited, preventing many developing countries from fully benefiting from the non-monetary benefit-sharing offered by MGRs in ABNJ.

One of the core aspects of non-monetary benefits is promoting the utilization of The Specific Knowledge Information, but the exclusivity of intellectual property rights may conflict with this goal¹². By limiting the exclusivity of intellectual property rights related to MGRs in ABNJ (restricting the right holder’s ability to exercise the right to stop infringement, but not denying the right to claim damages), it is ensured that in specific fields involving public interest, such as public health governance and the treatment of major diseases, this specific knowledge and information can at least be utilized. This represents a current practical concern and fundamental need for developing countries regarding benefit-sharing. Therefore, given current realities, focusing on Utilization-Oriented Non-Monetary Benefit-Sharing more effectively addresses the substantive demands of developing countries for the equitable utilization of outcomes from strategic biological resource development, compared to the traditional monetary compensation model. It is particularly important to note that focusing on non-monetary benefit-sharing does not imply excluding or marginalizing explorations in monetary benefit-sharing. The emphasis on non-monetary benefit-sharing arises from its practical and immediate potential as a more feasible and implementable mechanism in the short term, especially given the current lack of commercial scale and institutional uncertainty surrounding monetary benefit-sharing of MGRs in ABNJ. Therefore, the focus on non-monetary benefit-sharing is merely a pragmatic and complementary approach, not a substitute for monetary benefit-sharing.

11 Article 14, Paragraph 2 of the BBNJ Agreement employs a semi-open legislative model, clearly enumerating seven forms of non-monetary benefit-sharing: (1) access to samples and sample collections, (2) access to digital sequence information, (3) open access to findable, accessible, interoperable and reusable scientific data, (4) provision of information with identifiers in a publicly searchable and accessible format, (5) transfer of marine technology, (6) capacity-building, (7) Increased technical and scientific cooperation. Additionally, it includes a catch-all provision for other forms of non-monetary benefit-sharing as recommended by the Access and Benefit-sharing Committee.

12 The concept of “property-protected activity” has been introduced by scholars, emphasizing that the governance of MGRs in ABNJ should not be confined to the traditional model of object ownership. Instead, it is important to recognize the “property rights of activities,” whereby the freedom of scientific research is conceptualized as an activity protected by property rights. This framework grants researchers and developers a priority right to utilize the resources, provided that the overall value of the resources is not compromised. See [Thambisetty, \(2025\)](#) The unfree commons: freedom of marine scientific research and the status of genetic resources beyond national jurisdiction, *Modern Law Review*, 88(2), 300–332.

4.2 Restricting the exclusivity of rights through international intellectual property treaties

If the focus is placed on benefit-sharing related to non-monetary benefits, aimed at addressing the exclusivity issues of intellectual property as a key barrier, improvements can feasibly be made within the framework of existing international intellectual property treaties, as this approach only involves adjusting the current intellectual property system from the perspective of restricting intellectual property rights.

Intellectual property is inherently exclusive, no one may use the knowledge controlled by intellectual property rights without the rights holder's permission. However, as previously noted, certain knowledge has public attributes, and the exclusivity of intellectual property on such knowledge should be limited. Even where infringement is found, it is essential to safeguard the ability of developing countries to use The Specific Knowledge Information; however, this should not be understood as absolving the infringer of liability for damages. Recent international judicial practices, whether in common law or civil law countries, show a tendency to limit injunctive relief when the exercise of intellectual property rights conflicts with public interest (Contreras and Husovec, 2022). This also offers a practical foundation for limiting the exclusivity of intellectual property in international treaties.

Within the WTO framework, although the TRIPS Agreement allows member states to stipulate limited exceptions to the exclusive rights granted by patents¹³ (TRIPS, 1994, Art 30), this opt-in legislative model cannot impose a universal obligation on countries to allow relevant beneficiaries to use The Specific Knowledge Information. To ensure that relevant beneficiaries can legitimately use The Specific Knowledge Information, future efforts may be undertaken within the WTO framework to promote amendments to relevant provisions of the TRIPS Agreement. This would involve establishing basic obligations in international intellectual property treaties for member states to limit the exclusivity of intellectual property based on public interest. It would also clarify that using The Specific Knowledge Information in certain areas, such as public health governance and the treatment of major diseases, is considered "based on public interest." Specifically, on the basis of the existing Article 30 of the TRIPS Agreement, paragraphs 2 should be added:

(2) Without prejudice to paragraph 1 of this Article, each Member shall adopt legislative, regulatory or other appropriate measures to ensure that injunctive relief in respect of patent rights shall be limited

or conditioned where necessary to safeguard important public interests. In particular, injunctive relief concerning patent rights over specific technical knowledge derived from the development of marine genetic resources in areas beyond national jurisdiction shall be restricted in circumstances including, but not limited to:

- (a) The prevention, containment, or control of public health emergencies or major outbreaks of infectious diseases;
- (b) Ensuring access to essential medicines, diagnostic tools, and vaccines;
- (c) The implementation of major public health programs involving the promotion of disease prevention, diagnosis, and treatment technologies.

On the other hand, fulfilling the aforementioned obligations relies on the ability to effectively identify The Specific Knowledge Information. To safeguard this prerequisite, international coordination is required to establish a mandatory disclosure mechanism for genetic resources within the patent field. Within the WIPO framework, driven by the "Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore" (IGC), established in 2000, the "Treaty on Intellectual Property, Genetic Resources and Related Traditional Knowledge" was adopted in May 2024. This treaty includes provisions such as the requirement to disclose genetic resources and related traditional knowledge during the patent application process (WIPO IPR-GRTK Treaty, 2024, Art 3). Although the treaty ultimately excludes its application to MGRs in ABNJ, it serves as a model for future discussions on establishing a mandatory disclosure requirement in patent applications involving MGRs in ABNJ.

5 Conclusion

The BBNJ Agreement addresses the gap in international treaties concerning the benefit-sharing of MGRs in ABNJ. However, since the BBNJ Agreement does not clearly define the legal status of MGRs in ABNJ, the debate continues over whether MGRs in ABNJ are common property or the common heritage of mankind. The legitimacy of privatizing specific knowledge and information derived from the development of MGRs in ABNJ through the intellectual property system is also questioned. To clarify the relationship between the benefit-sharing of MGRs in ABNJ and the intellectual property system, this paper explores the following dimensions: first, the theoretical debate on the legal status of MGRs in ABNJ; second, the inherent tension and adjustment path between the principle of the common heritage of mankind and the intellectual property system; third, the design of the benefit-sharing mechanism for MGRs in ABNJ within the framework of the intellectual property system.

This paper argues that from the perspective of global public interest and intergenerational equity, the principle of the common heritage of mankind is legitimate. Although the BBNJ Agreement does not explicitly classify MGRs in ABNJ as "common heritage of mankind," it still upholds this principle. Considering the increasing international legislative trend since the 20th century to limit the freedom of the high

¹³ Article 30 of the TRIPS Agreement states: "Members may provide limited exceptions to the exclusive rights conferred by a patent, provided that such exceptions do not unreasonably conflict with a normal exploitation of the patent and do not unreasonably prejudice the legitimate interests of the patent owner, taking account of the legitimate interests of third parties."

seas, the principle of the common heritage of mankind can be viewed as a restriction on the freedom of the high seas. This paper points out that under the principle of the common heritage of mankind, the privatization of the aforementioned specific knowledge and information through the intellectual property system is institutionally compatible and does not conflict with relevant provisions of the United Nations Convention on the Law of the Sea. Intellectual property protection can be combined with benefit-sharing, and the focus should shift to improving the benefit-sharing mechanism within the framework of the intellectual property system.

Based on the analysis of global challenges in benefit-sharing mechanisms for MGRs in ABNJ, and considering the characteristics of MGRs in ABNJ as well as their current level of commercial utilization, this paper proposes that within the current intellectual property system framework, benefit-sharing should prioritize non-monetary forms aimed at promoting utilization, highlighting the importance of enabling relevant beneficiaries to use The Specific Knowledge Information. To achieve this, it advocates for amending Article 30 of the TRIPS Agreement under the WTO framework, establishing a fundamental obligation for member states to limit the exclusivity of intellectual property patent rights in the public interest, and clarifying that using The Specific Knowledge Information in certain public interest-related fields constitutes a “public interest-based” scenario. Concurrently, Within the WIPO framework, it is recommended to explore the establishment of a mandatory disclosure system for patent applications involving MGRs in ABNJ, with reference to relevant treaty provisions on the disclosure obligations of genetic resources in the patent application process.

Author contributions

QX: Conceptualization, Supervision, Writing – original draft.
YJ: Writing – review & editing, Methodology, Formal Analysis.

References

- BBNJ (2023). The Agreement 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. Available online at: <https://www.un.org/bbnjagreement/en/bbnj-agreement/text-bbnj-agreement> (Accessed May 10, 2025).
- CBD (1992). Convention on biological diversity. Available online at: https://legal.un.org/avl/pdf/ha/cpbcbd/cpbcbd_e.pdf (Accessed May 10, 2025).
- Chiarolla, C. (2014). Intellectual property rights and benefit sharing from marine genetic resources in areas beyond national jurisdiction: current discussions and regulatory options. *Queen Mary J. Intellectual Property* 4, 171–194. doi: 10.4337/qmjip.2014.03.01
- Contreras, J. L., and Husovec, M. (eds.) (2022). *Injunctions in patent law: transatlantic dialogues on flexibility and tailoring* (Cambridge: Cambridge University Press).
- Diamond v. Chakrabarty, 447 U.S. 303. (1980). Available online at: https://www.supremecourt.gov/opinions/79pdf/79-139_14d2.pdf (Accessed May 10, 2025).
- Garcia, D. (2021). Global commons law: norms to safeguard the planet and humanity's heritage. *Int. Relations* 35, 422–445. doi: 10.1177/00471178211036027
- Hardin, G. (1968). The tragedy of the commons. *Science* 162, 1243–1248. doi: 10.1126/science.162.3859.1243
- Heafey, E. (2014). Access and benefit sharing of marine genetic resources from areas beyond national jurisdiction: intellectual property-friend, not foe. *Chi. J. Int'l L.* 14, 493–523. Available online at: <https://chicagounbound.uchicago.edu/cjil/vol14/iss2/5>.
- IISD/ENB @ BBNJ IGC-2 (2019). IISD/ENB @ BBNJ IGC-2 | 25 march-5 april 2019 (New York: IISD RS). Available online at: <https://enb.iisd.org/oceans/bbnj/igc2>.
- IISD/ENB @ BBNJ IGC-3 (2019). IISD/ENB @ BBNJ IGC-3 | 19–30 aug 2019 (New York: IISD RS). Available online at: <https://enb.iisd.org/oceans/bbnj/igc3>.
- ITPGRFA (2001). International treaty on plant genetic resources for food and agriculture. Available online at: <https://www.fao.org/plant-treaty/overview/en/> (Accessed May 10, 2025).
- Jaspars, M., and Brown, A. (2020). Benefit sharing: Combining intellectual property, trade secrets, science and an ecosystem-focussed approach [Working Paper]. Available online at: <https://www.abdn.ac.uk/law/research/working-papers-696.php> (Accessed May 10, 2025).
- Jørem, A., and Tvedt, M. W. (2014). Bioprospecting in the high seas: existing rights and obligations in view of a new legal regime for marine areas beyond national jurisdiction. *Int. J. Mar. Coast. Law* 29, 321–343. doi: 10.1163/15718085-12341319
- Kiss, A. (1985). The common heritage of mankind: utopia or reality? *Int. Journal: Canada's J. Global Policy Anal.* 40, 423–441. doi: 10.1177/002070208504000302
- Lemley, M. A. (2005). Property, intellectual property, and free riding. *Tex L. Rev.* 83, 1031–1075. doi: 10.2139/ssrn.582602

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fmars.2025.1631043/full#supplementary-material>

- Noyes, J. E. (2011). The common heritage of mankind: past, present, and future. *Denv. J. Int'l L. Pol'y* 40, 447–471. Available at: <https://digitalcommons.du.edu/djilp/vol40/iss1/24/>.
- Posner, R. A. (2014). *Economic analysis of law*. 9th ed (New York: Wolters Kluwer Law & Business).
- Scovazzi, T. (2013). "Open questions on the exploitation of genetic resources in areas beyond national jurisdiction," in *Proceedings of the ASIL annual meeting*, vol. 107. (Cambridge University Press, Cambridge), 119–122. doi: 10.5305/procanmeetasil.107.0119
- Tanaka, K. (2016). Publication, Dissemination and Transfer of the Information and Knowledge Resulting from Marine Scientific Research Related to Marine Genetic Resources from Areas beyond National Jurisdiction: Regulation through the UNCLOS? *J. Faculty Law* 209, 1–51. Available online at: https://aichiu.repo.nii.ac.jp/?action=repository_uri&item_id=7661&file_id=22&file_no=1.
- Thambisetty, S. (2021). "Biodiversity beyond national jurisdiction: (Intellectual) property heuristics," in *Marine biodiversity of areas beyond national jurisdiction*. Ed.D. Tladi (Brill Nijhoff, Leiden), 131–146. doi: 10.1163/9789004422438_008
- Thambisetty, S. (2025). The unfree commons: freedom of marine scientific research and the status of genetic resources beyond national jurisdiction. *Modern Law Rev.* 88, 300–332. doi: 10.1111/1468-2230.12923
- Thornton, H. (2006). John selden's response to hugo grotius: the argument for closed seas. *Int. J. Maritime History* 18, 105–128. doi: 10.1177/084387140601800206
- TRIPS (1994). Agreement on trade-related aspects of intellectual property rights. Available online at: https://www.wto.org/english/docs_e/legal_e/27-trips.pdf (Accessed May 10, 2025).
- UNCLOS (1982). United nations convention on the law of the sea. Available online at: https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf (Accessed May 10, 2025).
- United Nations (1972). Principles relating to marine scientific research. Document A/AC.138/SC.III/L.18. Available online at: https://www.dipublico.org/conferencias/mar/pdf/papers/A_AC.138_SC.III_L.18.pdf (Accessed May 10, 2025).
- WIPO IPR-GRTK Treaty (2024). *WIPO Treaty on Intellectual Property, Genetic Resources and Associated Traditional Knowledge*. Available online at: <https://www.wipo.int/treaties/en/ip/gratk> (Accessed May 10, 2025).