Science, Education and Innovations in the Context of Modern Problems

Issue 11, Vol. 8, 2025

Title of research article

Safeguarding Marine Biodiversity Beyond National Jurisdiction: Legal and Institutional Mechanisms for Protecting the High Seas in the Context of Sustainable Development and Global Environmental Governance

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Issue web link	https://imcra-az.org/archive/385-science-education-and-innovations-in-the-context-of-modern-problems-issue-11-vol-8-2025.html
Keywords	Biodiversity, High Seas, Marine Biodiversity, International Community

Abstract

Biodiversity in the high seas plays a vital role in achieving social and economic development for the peoples of the world as an important source of food, providing employment opportunities, and improving human living and well-being. However, it has recently been suffering from the extinction of many marine species and the shrinking of their natural range as a result of the increasing pace of economic activities. This has caused concern in the international community and has highlighted the urgent need for action to curb the dangerous pace of successive biodiversity losses in the high seas.

This study seeks to shed light on the nature of marine biodiversity, its levels, and the most important legal and institutional mechanisms established by the international community to ensure the sustainable management and protection of biodiversity in areas beyond national jurisdiction.

Citation. Cherifa T. (2025). Safeguarding Marine Biodiversity Beyond National Jurisdiction: Legal and Institutional Mechanisms for Protecting the High Seas in the Context of Sustainable Development and Global Environmental Governance. *Science, Education and Innovations in the Context of Modern Problems*, 8(11), 715–733. https://doi.org/10.56352/sei/8.11.56

Received: 20.02.2025	Accepted: 08.208.2025	Published: 09.09.2025 (available online)

Introduction:

Biodiversity is the fundamental pillar that ensures the continuity of life on Earth, as humans rely on it in their daily lives. Ecosystem services provide a wide range of products that humans use continuously, including food

and other essential resources. Marine areas, particularly the high seas, are rich in biodiversity, covering approximately 71% of the Earth's surface and playing a vital role in sustaining human life.

Human understanding and knowledge of the oceans and seas have developed significantly, especially with advances in technology, which have enabled broader exploration and discovery. The global perception of oceans has shifted, recognizing them as a source of numerous benefits revealed through modern technologies. This growing awareness has also intensified global conflicts, highlighting the need for an international framework and agreements. Several key treaties have been established, including the Geneva Conventions of 1958, the United Nations Convention on the Law of the Sea (UNCLOS) of 1982, and the United Nations Agreement on Marine Genetic Resources in Areas Beyond National Jurisdiction – High Seas Treaty of 2023, alongside numerous international conferences.

Study Problem:

Recently, the world has become increasingly aware of the threats facing biodiversity in the high seas. It has become essential to balance the vast ecosystem services provided by marine biodiversity with the risks arising from its excessive and continuous exploitation. It is now recognized that what was once considered inexhaustible is, in fact, limited, and what was perceived as constant is subject to change. Accordingly, the international community seeks to establish collective, consensual solutions to this crisis by balancing diverse social needs with the necessary measures to protect and conserve biodiversity in the high seas, Therefore, the current study seeks to answer the following question:

What are the most important legal mechanisms established by the international community to conserve biodiversity in the high seas?

Study Objects:

Our current study seeks to achieve the following objectives:

- Understanding the nature of biodiversity in general and marine biodiversity in particular.
- Highlighting the levels of marine biodiversity.
- Recognizing the importance of conserving biodiversity in areas beyond national jurisdiction "marine areas".
- Analyzing the legal mechanisms established by the international community to conserve biodiversity in the high seas.

Study Methodology:

Our current study relies on the descriptive-analytical approach to understand the nature and levels of biodiversity in the high seas, and to analyze the environmental and economic importance of its conservation in marine areas beyond national jurisdiction. It also studies the legal mechanisms adopted by the international community to protect biodiversity in the high seas, including relevant international agreements and treaties such as the United Nations Convention on the Law of the Sea, the Geneva Convention, and the Convention on the Protection of Marine Genetic Resources in Areas Beyond National Jurisdiction. The study relies on an analysis of legal texts, international reports, and academic research with the aim of providing a comprehensive vision of the legal frameworks and mechanisms for the conservation of biodiversity in the high seas.

1. The Concept of Biodiversity:

1.1. The Concept of Biodiversity Among Natural Scientists:

The term biodiversity is directly associated with organic life, and its origin goes back to the Greek word "Bios", which means "life"[1]. Although the concept of biodiversity is relatively modern, the idea of diversity within the living world has a long history[2]. It has drawn the attention of naturalists and philosophers since ancient times. For instance, the writings of Plato on the perfection of the world included notions and meanings related to what we now recognize as biodiversity[3]. Nevertheless, it was widely believed that natural resources were eternal and inexhaustible, and there was little concern for the protection of biodiversity, as species were considered abundant and self-sustaining.

The term biodiversity was first introduced by Lovejoy in 1980, primarily to describe the number of species[4]. Over the past three decades, several concise definitions have been developed, incorporating a variety of criteria to explain the concept. Eventually, the term biodiversity became closely associated with life on Earth as a whole.

Professor Virgine Maris defined biodiversity as "the variety of living organisms at different levels of organization, including genetic variation, ecosystems, and functional diversity, which corresponds to the wide range of ecological roles performed by ecosystems"[5]. In the same context, Professor Sarker noted that defining biodiversity is inherently complex, since the science of biology itself is characterized by complexity and constant change[6].

Ernst Mayr defined a species as "a group of interbreeding natural populations that are reproductively isolated from other such groups"[7]. This definition is essentially based on the concept of reproductive isolation, which relies on the capacity for interbreeding.

Thomas Aquinas believed that the very existence of diversity stems from the will of the First Cause, namely God. He argued that "the distinction and multiplicity of things arise from the intention of the First Agent, who is God. God creates beings in order to communicate His goodness to creation, a goodness that must be reflected in them. Since no single creature can adequately represent this divine goodness, God brought forth multiple and diverse beings so that what is lacking in one may be supplied by another. Thus, the goodness that exists in God in simplicity and unity is manifested among creatures in plurality and diversity. In this way, the whole universe shares in the divine goodness and represents it more perfectly than any single creature could"[8].

There are numerous definitions of biodiversity, and these vary according to different perspectives. Some scholars describe it as a widely used term without a single, unified definition, while others restrict its meaning to internal biological variation. The reason behind this divergence lies in the pressing need for a precise definition of biodiversity, since it inevitably plays a crucial role in shaping future policies and programs, as well as in guiding critical decision-making in the present.

1.2. The concept of biodiversity in international law:

[1] Pour G. Beuf, Les Notions de Biodiversité et de Nature ne Peuvent être Confondues, Puisque la Nature St Apparue Avant la Vie Puis sa Diversité. Dossier "La biodiversité", Lettre de l' Académie des Sciences, Publication de L' Académic des Sciences, No. 31, 2012, P. 18.

[2] Gabriela Roxana Carone, Plato and the Environment, Environmental Ethics, Vol. 20, Issue 2, 1998, PP. 115- 133.

[3] Aristote, Histoire des Animaux, Gallimard, Paris, 1994, P. 56.

[4] Ian Swingland, Biodiversity, Definition of, The Durrell Institute of Conservation and Ecology University of Kent, January 2013, PP. 377- 391.

[5] Virginie Maris, la Protection de la Biodiversité: Entre Science, Ethique et Politique, Thèse de Doctorat en Philosophie Présentée à La Faculté des Arts et des Sciences, Département de Philosophie, Université de Montréal, Sep 2006, P. 8.

[6] S. Saker, Defining Biodiversity A Assessing Biodiversity, University of Texas, Austin, 2000, P. 10.

[7] R. L. Mayden, A Hierarchy of Species Concepts: The Denouement in The Saga of The Species Problem, In M. F. Claridge, H. A. Dawah & M. R. Wilson, Species: The units of diversity, Chapman & Hall, 1997, PP. 381- 423.

[8] Thomas d'Aquin, Somme Théologique - Tome 1, Les éditions du cerf, Paris, 1999, P. 490.

The first significant global emergence of the concept of biodiversity took place at the National Forum on Biodiversity, held in Washington in September 1986[1]. This forum served as a wake-up call to public authorities and society at large regarding the dangers posed by biodiversity loss. Since then, the protection of biodiversity and the quest to define its concept have become major environmental and political issues, both at the national and international levels.

Following that forum, a press conference was held during which a group of prominent biologists declared that biodiversity was facing a true crisis, representing a serious threat to all humankind, embodied in the ongoing extinction crisis that endangers human civilization itself. This announcement created a profound and lasting impact[2], and since then, the collective awareness of the value of biodiversity has continued to grow, along with an increased recognition of the dangers posed by its erosion.

In 1996, Delong provided a more comprehensive and precise definition of biodiversity, stating that: "Biodiversity is a characteristic of an area and refers to the variety within and among living organisms and biological processes, whether occurring naturally or modified by humans. Biodiversity can be measured in terms of genetic diversity, species differences, biological communities, and ecological processes, as well as the structure of each. It can also be observed and assessed at any spatial scale, ranging from small habitat sites to the entire biosphere"[3].

Faced with the widespread concern over the crisis threatening life on Earth and warning of a looming environmental catastrophe, international efforts converged to hold the Earth Summit in Rio de Janeiro in 1992. It was at this conference that the first clear definition of the term *biodiversity* appeared in Article 2 of the Convention on Biological Diversity (CBD), which states: "Biological diversity means the variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems"[4]. This convention is considered the true foundation for adopting the concept of biodiversity in a way that ensures its protection and the sustainable use of its components, with the ultimate goal of safeguarding and maintaining ecological life.

Efforts have also converged to define the concept of biodiversity, and the United Nations Environment Programme (UNEP) defines it as: "The variability among living organisms from different sources, whether terrestrial, marine, or other aquatic ecosystems of which they are a part. Biodiversity encompasses all living organisms and the ways in which they interact with one another, as well as the patterns of their interaction with the natural environment in which they live"[5].

At the same time that we come to understand what biodiversity truly means, we also recognize the risks that threaten it, as well as how technological development and human intervention impact this diversity and jeopardize its continuity—an issue that has now become evident to all. From this perspective, biodiversity can be described as the variety among living organisms across different environments, whether in the form of genetic diversity within species, or broader interconnections among various life forms. This diversity is essential for maintaining the integrity of Earth's ecosystems and safeguarding the continuation of vital ecological processes.

1.3. Levels of Biodiversity in Biomes:

[1] Virginie Maris, Op, Cit, P. 7.

Also See: David Takacs, The Idea of Biodiversity: Philosophies of Paradise, The Johns Hopkins University Press, Baltimore, 1996, P. 77.

[2] E. O. Wilson, Biodiversity, National Academy Press, Washington, 1988, PP. 493- 496.

[3] Ian Swingland, Op, Cit, PP. 377- 391.

[4] Article 2 of the United Nations Convention on Biological Diversity of 1992.

[5] Betty Queffelec, La Diversité Biologique: Outil D' Une Recomposition Du Droit International De La Nature- L' Exemple Marin, Thèse De Doctorat Université De Bretagne Occidentale Ecole Doctorale De Sciences De La Mer, 2006, P. 12.

Biodiversity in international marine areas is characterized by multiple levels that distinguish it and represent some of its most important features, including:

1.3.1. Marine biodiversity at the genetic level:

occurs as a result of the variation and diversity of genes. More specifically, it refers to the differences among individuals of the same species, where variations in DNA and the existence of groups with distinct genetic traits represent the inherited diversity within a given species.

This corresponds to the overall number of genetic characteristics contained in the genetic makeup of that species, and therefore reflects the level of diversity within the species itself. It is considered a fundamental aspect of biodiversity on Earth, since genetic variation within a species determines its ability to:

- evolve and adapt,
- survive and persist,
- and cope with different environmental pressures.

In this regard, the U.S. National Science Foundation (2007) highlighted that genetic diversity is strongly linked to biodiversity as a whole. Intraspecific diversity is essential for maintaining interspecific diversity, and it is also crucial for the survival of the species itself among other species. Conversely, the loss of genetic diversity generally leads to a decline in overall biodiversity and significantly increases the vulnerability of ecosystems[1].

In the same context, a European study conducted in 2012 confirmed that genetic diversity is highly important for the survival of a species, and that genetic richness is not necessarily linked to species abundance; in other words, high genetic richness does not have to occur only in places that host larger numbers of species[2].

1.3.2. Marine biodiversity at the species level:

Marine biodiversity at the species level refers to the number of different species represented within a single ecological region, which reflects the variation within one ecological community that comprises groups of similar individuals sharing traits that enable them to coexist[3].

Species diversity may include species richness, which refers to the number of species within an ecological community or region. Species richness in a given area can be determined by the number of different species found in specific sampling units within that area, and the results of these units are then used to estimate the overall species richness of the region. However, a major challenge lies in the limited financial resources available for taxonomy, which has resulted in insufficient knowledge, as not all species are counted but only a selected group that scientists believe to be representative of the rest within the same ecological region.

When addressing species diversity, it is important to note that two main aspects have been studied regarding its impact on ecosystem functioning: the relationship between biodiversity and productivity, and the relationship between biodiversity and stability within the ecological community. More diverse ecological communities tend to be more productive than those with less diversity. The abundance and richness of species

[1] Richard A Lankau and Sharon Y Strauss, Mutual Feedbacks Maintain Both Genetic and Species Diversity in a Plant Community, Journal of Science, Vol 317, Issue 5844, 2007, PP. 1561- 1563.

[2] Pierre Taberlet, Niklaus E Zimmermann, Thorsten Englisch and Andreas Tribsch, Genetic Diversity in Widespread Species is Not Congruent with Species Richness in Alpine Plant Communities, Ecology Letters Journal, Vol. 15, 2012, PP. 1439- 1448.

[3] Hanna Tuomisto, A Diversity of Beta Diversities: Straightening Up a Concept Gone Awry, Part 1, Defining Beta Diversity as A Function of Alpha and Gamma Diversity, Ecography, Vol. 33, Issue. 1, March 2010, PP. 2- 22.

within a single ecological community provide it with enormous productive capacity as well as a high level of stability in the face of environmental disturbances, enabling adaptation to diverse environmental conditions.

1.3.3. Marine biodiversity at the community level:

Marine biodiversity at the community level refers to all forms of diversity within ecosystems, ecological systems, and various habitats. The Convention on Biological Diversity of 1992 defined an ecosystem as "a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit"[1]. Based on this, the interaction between marine plants, different living species such as fish, and the surrounding marine environment is considered an ecosystem.

Thus, an ecosystem is characterized by several features: the multiplicity of living and non-living components, the interconnection of relationships among them, and its capacity for stability and continuity, while also allowing for change. Consequently, biodiversity at the community level within the ecosystem is essential for the survival of different species, which in turn guarantees the continuity of all natural communities that sustain life on Earth and support the growth of humankind[2].

2. The Importance of Preserving Biodiversity in Areas Beyond National Jurisdiction (Marine Areas):

The state of the world's seas and oceans is deteriorating, as the vast majority of marine problems that were identified long ago remain unsolved and are becoming increasingly complex. Reports from expert groups present a concerning assessment of the marine situation, calling for urgent measures to prevent this noticeable decline[3].

The increasing technological development places significant pressure on coastal areas along the world's shores. Consequently, concerns about the seas and oceans have become a matter of international attention and are at the forefront of global discourse. New risks have emerged that threaten to destroy habitats and pollute seas and oceans, largely as a result of various human activities such as sewage disposal and coastal industries. This, in turn, has a clear impact on the global economy, as it devastates vast areas of major international tourism destinations[4].

There are numerous activities undertaken by coastal states that impact oceans and seas, altering the natural balance required for the oceans to continue performing their vital functions necessary to ensure the proper continuity of planet Earth—an issue that raises serious concern. These activities not only hinder the path toward sustainable development but also threaten the balance established by the United Nations Convention on the Law of the Sea, thereby obstructing the achievement of the intended goals of developing the planet and striving for a better life. Among these activities are the methods employed in fishing, whether within each state's exclusive economic zones or in international waters. Hence, the importance of marine biodiversity emerges in confronting the threats it faces, which vary according to human activities and may take the form of overexploitation of resources, destruction of various habitats, and coastal pollution. Therefore, it is essential to address the changes that disrupt the performance of ecosystem services.

There are numerous reasons that call for the preservation of marine biodiversity. From an ecological perspective, marine biodiversity is a prerequisite for the stability and continuity of ecosystems. It also contributes to the ecosystem's capacity to withstand disturbances and to naturally restore its balance when subjected to disruption.

[1] Article 2 of the Convention on Biological Diversity, 1992.

[2] André de Paiva Toledo, Les Grands Enjeux Contemporains Du Droit International Des Espaces Maritimes Et Fluviaux Et Du Droit De L' environnement: De La Conservation De La Nature à La Lutte Contre La Biopiraterie, Thèse De Doctorat, Université Panthéon-Assas Paris II, October 2012, P. 390.

[3] Report Entitled "A Sea of Problems" Published in Reports and Studies No. 70, Joint Group of Experts on The Scientific Aspects of Marine Environmental Protection, United Nations Environment Programme, 15 January 2001.

[4] Report of The Secretary-General of the United Nations Issued at The Fifty-SIxth Session, dated 9 March 2001, Paragraph 2, A/56/58.

On the other hand, biodiversity constitutes the primary source of ecosystem services that benefit humanity both economically and otherwise, in direct and indirect ways, as it supports numerous essential functions.

In reality, marine biodiversity is a crucial factor for the continuation of human life on Earth and ensures the well-being of humankind. It provides an enormous and vital reservoir of primary resources used by humans, whether for food or medicine, while also maintaining water quality and thereby preserving the environment. Additionally, it plays a significant role in tourism; beaches and coral reefs in the seas are among the most important recreational means for enjoying the beauty of nature, offering various opportunities for economic prosperity to different nations[1].

Likewise, marine biodiversity represents an important source of economic, health, and cultural benefits. It is a key area of focus for sustainable development and the achievement of the Millennium Development Goals, as well as a central concern for the Global Environment Facility (GEF), due to the global scientific consensus that the world has become less biologically diverse in terms of genes, species, and ecosystems. This rapid loss of biodiversity poses a global threat to human life and well-being. For this reason, the GEF Strategy under the United Nations Development Programme (UNDP) seeks to ensure the conservation of biodiversity and the sustainable use of biological resources by working within the ecosystem approach. Furthermore, the UNDP supports efforts to mainstream biodiversity objectives into production sector activities, and its projects aim to strengthen policy frameworks and institutional capacities for the conservation of biodiversity[2].

In order to ensure the effective conservation of biological resources, the Reykjavik Conference was held from 1 to 4 October 2001 in Iceland, jointly organized by the Government of Iceland and the Food and Agriculture Organization of the United Nations (FAO)[3], on the topic of responsible fisheries within marine ecosystems. The Conference Declaration expressed the firm commitment of participants to integrate ecosystem-related considerations into fisheries management, with the aim of promoting sustainable and responsible fishing practices. It further highlighted that fishing activities have significant impacts on seabed habitats across the world, although these impacts vary depending on the spatial and temporal distribution of fishing, as well as the type of habitats and environmental conditions in which they occur[4].

Thus, it is the States that bear the primary responsibility for formulating the applicable regime for the conservation of marine biodiversity and for ensuring its effective implementation. Various industrial activities, as major users of the oceans, play an important role in international efforts aimed at addressing marine environmental issues and promoting the sustainable development of oceans and seas[5]. In this regard, it is noted that the World Ocean Council—an international alliance of business and industry sectors concerned with corporate responsibility for the oceans and operating within the framework of the United Nations Global Compact—is currently engaged in a growing number of projects designed to enhance the contribution of the private sector to the stewardship and conservation of the seas and oceans.

Hence, the importance of preserving marine biodiversity is manifested in the following points:

2.1. Reducing pollution caused by human activities:

[1] Catherine Aubertin, Florence Pinton et Valérie Boisvert, Les marchés de la biodiversité, IRO Edition, Marseille, Paris, 2007, P. 21.

[2] R. A. Mittermeier and I. A. Bowles, The Global Environment Facility and Biodiversity Conservation: Lessons to Date and Suggestions for Future Action, Biodiversity and Conservation 2, 1993, PP. 637- 655.

[3] Report of the Secretary-General of the United Nations, Fifty-seventh session, 7 March 2002, Oceans and the Law of the Sea, paragraph 174, A/57/57.

[4] FAO Fisheries Report No. 658, Supplement FIID/R658, Suppl. (A).

[5] Report of the Secretary-General of the United Nations, sixty-third session, entitled Oceans and the Law of the Sea, A/63/63.

Pollution affecting the seas and oceans resulting from human activities poses a serious threat to the integrity of the marine environment and its biodiversity, and consequently to human life as a whole. Human-induced pollution accounts for approximately 80% of marine pollution sources, impacting the most productive areas of the marine environment. Furthermore, the marine environment is exposed to risks from physical changes along coastal zones, including the destruction of ports that are vital for maintaining the health of ecosystems[1].

The discharge of sewage is considered one of the greatest threats to the marine environment worldwide, leading to severe and catastrophic effects. It contributes to the spread of diseases, solid debris, toxic substances, and persistent organic pollutants, particularly when sewage is mixed with industrial liquid waste containing chemical elements[2].

Over the past three decades, the discharge of sewage into coastal areas has increased significantly, particularly in developing countries due to inadequate basic sanitation facilities and their inability to keep pace with population growth. Global technological advances have also amplified human-induced threats to the oceans. Among the most severe of these threats are non-biodegradable wastes, which alter the natural sediment loads and lead to significant negative impacts worldwide, affecting human health, poverty alleviation, food safety, and food security, as well as certain industries[3].

In fact, decades of increasing marine pollution have led to a significant rise in nitrogen levels, contributing to the rapid expansion of oxygen-depleted zones in certain coastal areas. As a result, vast stretches of coastal waters experience the growth of harmful algal blooms, which severely impact marine biodiversity. This severe depletion of oxygen in coastal waters leads to negative consequences and serious repercussions for economically important fisheries, while also disrupting ecosystem services and overall biodiversity[4].

To mitigate the severe impact of sewage on the seas and oceans, the Jeju Initiative was held in the Republic of Korea, emphasizing the importance of addressing the environmental aspects of the Johannesburg Plan of Implementation related to water and sanitation. It highlighted the necessity of incorporating the ecosystem approach to account for the demand for sanitation services and their effects on coastal waters[5].

Population growth and increased economic activities in coastal areas also lead to the expansion of construction, causing changes in coastal ecosystems, including coral reefs, shorelines, and beaches. The affected ecosystems include areas of depleted fish stocks, which are of critical importance for global food security. Their destruction represents a growing threat to the food security of coastal populations. Within the framework of the project addressing the physical degradation of habitats, the Coordinating Office of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities developed key principles and sectoral checklists to enhance existing institutional and legal frameworks[6].

There are numerous human activities and practices that affect the integrity of the oceans and contribute to their pollution, with the impacts being particularly evident in developing coastal countries. These activities disrupt the oceanic ecosystem and weaken its biodiversity, which in turn contributes to climate change and exacerbates global warming. Consequently, the international community seeks to limit such activities. In this context, the United

[1] Tolga Akdemir and Goktug Dalgic, The impact of the marine sewage outfalls on the sediment quality: The Black Sea and the Marmara case, Saudi Journal of Biological Sciences, Vol. 28, 2021, PP. 238- 246.

[2] Website of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities, available at: https://archive.iwlearn.net/persga.org/index-2.html.

[3] United Nations Programme, Global Environment Outlook 3, Arvescan Publications, 2002.

[4] United Nations Programme, Global Environment Outlook Yearbook 2003/2004.

[5] Proceedings of The Joint Meeting of The Governing Council of The United Nations Environment Programme/Global Ministerial Environment Forum at its Eighth Special Session, Held in Jeju, Republic of Korea, From 29 to 31 March 2004.

[6] Nelson Rangel-Buitrago, Francois Galgani and William J. Neal, Addressing the Global Challenge of Coastal Sewage Pollution, Vol. 201, Issue 11, April 2024, PP. 1- 13.

Nations Convention on the Law of the Sea (1982) provides the legal framework enabling states to protect the marine environment from pollution originating from human sources, as outlined in Articles 194, 207, and 213. Following this approach, the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities has offered guidance and support to national authorities to develop and implement sustainable measures to prevent the degradation of the marine environment due to human activities[1].

2.2. Reducing pollution resulting from maritime transport activities:

Maritime transport is one of the most important modes of transportation in the modern era. Nevertheless, shipping activities can generally pose a threat to the marine environment, with heightened risks in areas with fragile ecosystems. Hazards arising from shipping and maritime transport may result from discharges associated with ship operations or from pollution, whether intentional or accidental, involving solid or liquid substances, oil, and other materials. Maritime shipping can also introduce alien species that cause physical damage to marine habitats, in addition to accidents that may lead to severe environmental harm. Furthermore, ships are often coated with toxic antifouling paint to protect the vessel's structure, which can also adversely affect marine organisms and their habitats through physical impacts[2].

2.3. Safety in the Management of Hazardous Waste:

Waste that can be transported across different maritime borders to the high seas or near the coasts of certain countries may pose a threat to marine biodiversity. Such waste can also present a direct threat to humans in these areas due to the toxic and hazardous materials it may contain, as well as the damage caused by its transport via ships and disposal into seas and oceans. To address these risks, the Basel Convention of 2004 was adopted concerning the control of transboundary movements of hazardous wastes and their disposal. Subsequently, the Basel Convention Secretariat signed a Memorandum of Understanding with the Secretariat of the 1983 Convention for the Protection and Development of the Marine Environment to ensure joint protection of the marine environment, with the main focus of this cooperation being the proper management of hazardous wastes to prevent marine pollution.

Probo Koala, chartered by the company Trafigura, dumped thousands of tons of toxic hazardous waste. This incident resulted in loss of life, contamination of water sources, and various health and environmental damages[3]. The event served as a global warning about the dangers of disposing of waste by dumping it into oceans or seas and the severe consequences such actions pose to humanity. Consequently, the Eighth Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes sought to enhance cooperation with the International Maritime Organization (IMO) regarding systems to prevent pollution from ships. The United Nations Environment Programme (UNEP) and the Basel Convention Secretariat also supported activities to rehabilitate polluted areas through the Côte d'Ivoire Trust Fund under UNEP to assist in cleanup efforts[4].

3. International Mechanisms for the Protection of Biodiversity in the High Seas:

As a result of the severe depletion of living marine resources, signs of an impending environmental catastrophe have emerged, causing alarm within the international community and highlighting the urgent need to establish legal and institutional mechanisms. Accordingly, this study will examine the legal framework for the

[1] The Global Programme of Action, adopted by the International Intergovernmental Conference held in Washington in October–November 1995, as reported in document A/51/116.

[2] IMO Resolution A/22/927, Annex 2, paragraphs 2.1 and 2.2.

[3] Statement delivered by Ms. Kuwabara Yamamoto, Executive Secretary of the Basel Convention Secretariat, at the opening of the eighth meeting of the Conference of the Parties UNEP/CHW.8/16.

[4] Open-ended Working Group of the Basel Convention, resolution 1/VII on Côte d'Ivoire, note by the Secretariat, UNEP/CHW/OEWG/6/2, para. 2.

protection of biodiversity in the high seas, as well as the institutional framework responsible for safeguarding living marine resources.

3.1. The Legal Framework for the Protection of Biodiversity in the High Seas:

As a result of the ongoing deterioration of biodiversity in the high seas, the international community recognized the urgent need to take action and develop immediate solutions, embodied in a robust legal framework to address the threats to the sustainability of these resources. These measures have been implemented through international treaties, among the most important of which are:

3.1.1. Geneva Convention on Fishing and Conservation of the Living Resources of the High Seas 1958:

This convention is considered one of the most important international agreements in the field of marine biodiversity conservation[1]. Article 2 of the convention defines protection as "all measures and protection programs that enable the maximum sustainable yield of these resources to ensure a continuous food supply for human consumption"[2]. The convention also established mechanisms for safeguarding marine biodiversity, placing most of these responsibilities in the hands of the coastal state for economic reasons, given the proximity of fishing grounds to its territorial waters and its knowledge of fishing conditions in nearby areas.

The coastal state is granted the right, in cases of unilateral exploitation in the high seas, to take necessary measures to conserve biological resources[3]. If the exploitation involves more than one state in the same marine area, it must be managed through joint agreements between the relevant states[4]. The coastal state may also take unilateral measures to protect biodiversity in the high seas, provided that there is a state of necessity and that such measures are based on scientific principles; these measures are limited to foreign fishermen. Furthermore, the convention grants rights to the coastal state based on the concept of special interest[5].

However, this convention ultimately failed, as it entered into force only eight years after its adoption, and major maritime powers refrained from ratifying it due to the special privileges it granted to coastal states. These privileges concerned the exploitation of living resources in areas adjacent to their shores and the adoption of unilateral measures according to the degree of necessity and urgency, without clearly designating the authority responsible for determining such necessity, thereby exposing the risks of subjective assessment. Moreover, the extension of coastal state rights into high seas areas undermines a fundamental principle of international law—namely, the principle of the freedom of the high seas.

3.1.2. The 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES):

It is an international treaty designed to regulate global trade in endangered wild plants and animals[6]. To achieve this, it established preventive mechanisms such as banning trade in species at risk of extinction[7] and requiring requiring member states, when exporting any species listed in the convention's annexes, to issue an export permit

[1] Geneva Convention on Fishing and the Conservation of Living Resources of the High Seas, signed on 28 April 1958.

[2] Article 2 of the Geneva Convention, Op, Cit.

[3] Article 3 of The Same Agreement.

[4] Article 5 of The Same Agreement.

[5] Article 6 of The Same Agreement.
Also See: Yong Wang and Xin Pan, Reasonable Restrictions on the Freedom of Fishing in High Seas Marine Protected Areas from an International Law Perspective: An Analysis, Sec. Marine Fisheries, Aquaculture and Living Resources, 17 April 2023, PP. 1- 14.

[6] Convention on International Trade in Endangered Species of Wild Fauna and Flora, signed on 3 March 1973.

[7] Article 8 of The Same Agreement.

through a designated national authority[1]. The treaty also emphasizes international cooperation to safeguard species threatened with extinction.

As for remedial mechanisms, these include imposing fines for trading or possessing listed species, requiring governments to submit periodic reports on such activities, and encouraging the adoption of stricter domestic laws to regulate the possession, trade, and transport of wild species covered by the annexes[2].

The convention further provides for enforcement mechanisms through a designated national authority responsible for issuing export and import permits, alongside a scientific body tasked with offering technical guidance. In addition, a Conference of the Parties (COP) convenes every two years to review the implementation of the convention and enhance its effectiveness, with the possibility of admitting "observer members"[3].

The convention also includes three appendices[4]:

- **Appendix I**: Includes wild plant and animal species that are threatened with extinction and are strictly prohibited from international trade.
- **Appendix II**: Covers species of wild plants and animals that are not necessarily currently endangered but could become so unless trade is closely regulated.
- **Appendix III**: Contains species for which a member state has requested the cooperation of other parties to help control and monitor trade.

3.1.3. The 1982 United Nations Convention on the Law of the Sea (UNCLOS):

This convention is regarded as one of the leading agreements in the field of marine biodiversity protection, as it established a set of preventive mechanisms to safeguard biodiversity. It granted coastal states the right to determine the allowable catch within their exclusive economic zones[5], while also requiring states to cooperate in conserving living resources in areas beyond national jurisdiction. In cases where their nationals exploit similar or different living resources, states are expected to enter into negotiations to adopt conservation measures, and, when necessary, to establish regional fisheries organizations[6].

When setting allowable catch limits, states are required to adopt conservation measures for high seas living resources based on the best available scientific evidence regarding catch levels and other relevant data, with the aim of maintaining and restoring fish stocks at levels that can ensure maximum sustainable yield[7].

Furthermore, states engaged in high seas fishing are obligated to take into account the interests of other states operating in the same area, whether coastal or landlocked, particularly concerning the conservation of fish stocks. This includes interconnected species spanning both exclusive economic zones and high seas areas, highly migratory species, marine mammals, as well as anadromous and catadromous fish species[8].

[1] Article 6 of The Same Agreement.

[2] Article 14 of The Same Agreement.

[3] Article 11 of The Same Agreement.

[4] Rayudu Venkateswarlu, G. Chandra Mowleswari, B. Kanaka Lakshmi and V Vijay Lakshmi, CITES And the International Protection of Biodiversity, Vol. XXVI, Issue 1, 2025, PP. 7401- 7053.

[5] Article 61 of the 1982 Convention on the Law of the Sea.

[6] Article 118 of the same agreement.

[7] Article 119 of the same agreement.

[8] Articles 63 to 67 of the same agreement.

The convention also imposed a general obligation on states to protect the marine environment from pollution[1], while emphasizing international and regional cooperation in developing global protection standards[2]. It required the establishment of monitoring and environmental assessment programs to address marine pollution risks[3], along with the duty to publish findings and submit them to international organizations, making such information accessible to all states[4].

However, the convention has been criticized for lacking remedial mechanisms, such as the creation of institutions dedicated to monitoring and assessing the environmental and biodiversity status of the seas. Instead, it relied solely on preventive measures, which fall short of effectively addressing the problem of marine biodiversity degradation.

3.1.4. The Convention on Biological Diversity of 1992:

This convention encompasses all ecosystems that serve as habitats for living species, whether plant or animal. Article 2 refers to two main concepts of conservation: in situ conservation, which means the protection of ecosystems and natural resources, as well as the maintenance and restoration of species populations capable of surviving in their natural surroundings, including domesticated or cultivated species within marine environments; and ex situ conservation, which refers to safeguarding biodiversity components outside their natural habitats. These measures are divided into those related to conservation and the establishment of facilities, and those focused on rehabilitating threatened species and regulating all biological resources[5].

The primary objectives of this convention are to protect biodiversity, ensure the sustainable use of its components, and promote the fair and equitable sharing of benefits, including the transfer of technology among member states[6]. The agreement obliges each contracting party to develop national strategies and programs for biodiversity protection, integrating them into all sectoral plans. It also requires identifying activities that threaten biodiversity, taking measures to restore endangered species to their original state[7], encouraging scientific research, and implementing education and training programs for specialists[8]. Additionally, states must promptly notify others in the event of imminent or serious threats within or beyond their national jurisdiction, establish national arrangements for emergencies and accidents, and commit to rehabilitating ecosystems degraded by invasive species, restoring them to their natural state[9]. Furthermore, the convention promotes the development of scientific research based on genetic resources, the application of biotechnology, and the equitable sharing of its benefits[10].

As for implementation mechanisms:

• **Conference of the Parties (COP):** Composed of all governments and economically integrated regional organizations that have ratified the treaty. Its role is to review progress, establish committees, and create new mechanisms to implement proposed programs.

[1] Article 192 of the same agreement.

[2] Article 197 of the same agreement.

[3] Article 204 of the same agreement.

[4] Article 205 of the same agreement.

Also See: George Barrie, The 1982 United Nations Law of the Sea Convention: Unresolved Issues Remain, Vol. 42, Issue 3, 2021, PP. 529- 546.

[5] Article 9 of the Convention on Biological Diversity of 1992.

[6] Carsten Neßhöver, Heidi Wittmer and Christian Prip, Biodiversity Governance – A Global Perspective from the Convention on Biological Diversity, In book: Biodiversity in the Green Economy, June 2015, PP. 289- 308.

[7] Article 9 of the Convention on Biological Diversity of 1992.

[8] Article 12 of the same agreement.

[9] Article 8 of the same agreement.

[10] Article 19 of the same agreement.

• **The Secretariat:** Responsible for organizing meetings, assisting in the collection and dissemination of information, and coordinating with international organizations.

• **Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA):** Consists of government representatives with expertise and provides recommendations to the COP on scientific and technological matters[1].

3.1.5. United Nations Agreement on Marine Genetic Resources in Areas Beyond National Jurisdiction – High Seas Treaty:

In recent years, the conservation and sustainable use of marine biodiversity—particularly marine genetic resources—has gained global significance. This development reflects the international community's growing recognition of the potential scientific, commercial, and industrial value of genetic materials found in areas beyond national jurisdiction.

Advances in deep-sea research and biotechnology have heightened interest among marine scientists and biologists in exploring and utilizing these resources. Yet, access and capacity to benefit from marine genetic resources remain uneven, as only a few countries possess the necessary infrastructure, technology, and research capabilities[2].

Without clear regulation of scientific exploration and a proper interpretation of the freedom of marine scientific research, developing and least-developed countries risk being excluded from research opportunities and from equitable sharing of the benefits derived from these resources. Such exclusion could compromise their rights to access scientific progress and technological gains[3].

Conflicting legal frameworks regulating deep-sea resource exploitation—including the principles of high seas freedom and the Common Heritage of Mankind (CHM)—have generated significant ambiguities and disagreements between developing and developed countries[4].

To resolve these uncertainties regarding marine biodiversity conservation and sustainable use, the international community launched negotiations that led to the adoption of the Biodiversity Beyond National Jurisdiction (BBNJ) Treaty. This treaty was formally approved on June 19, 2023[5], as a new implementing agreement under the United Nations Convention on the Law of the Sea (UNCLOS), following nearly two decades of intensive international negotiations.

Ideological differences between the Global North and South—reflecting disparities in economic development and technological capacity—emerged clearly during negotiations for the legally binding BBNJ Treaty. The primary points of contention concerned the legal status of marine genetic resources and the application of the Common Heritage of Mankind (CHM) principle[6].

Developing countries advocated for applying the CHM principle consistently with UNCLOS, emphasizing equitable access and benefit-sharing, while developed countries stressed the principle of high seas freedom. To

[1] Charles-Hubert Born and Nicolas De Sadeleer, Droit International Et Communautaire De La Biodiversité, Paris Dalloz, 2004, P. 101.

[2] Robert Blasiak et al., Corporate Control and Global Governance of Marine Genetic Resources, Science Advances, Vol. 4, Issue 6, 2018, PP. 1-7.

[3] Eleftheria Asimakopoulou and Essam Mohammad, Marine genetic resources in areas beyond national jurisdiction: a common heritage of mankind, IIED Briefing, 2019, PP. 1- 4.

[4] Yoshifumi Tanaka, Reflections on the Conservation and Sustainable. Use of Genetic Resources in the Deep Seabed beyond the Limits of National Jurisdiction, Ocean Development and International Law, Vol. 39, Issue 2, 2008, PP. 130–139.

[5] The BBNJ Agreement was formally adopted by consensus on June 19, 2023. To date, the Agreement has now 84 signatories. Available at: https://treaties.un.org/.

[6] Raphael Magno Vianna, and Jonathan Ruillé, Conservation and Sustainable Use of Marine Biodiversity in Areas Beyond National Jurisdiction, Human Sea Program, European Research Council and University of Nantes, Vol. 23, Issue 1, 2017, PP. 1- 9.

bridge this divide, negotiators adopted a pragmatic approach focusing on access and benefit-sharing (ABS) rather than a formal information-sharing mechanism.

In the final stages, states agreed to enshrine both the CHM principle and the freedom of marine scientific research, along with other high seas freedoms, as overarching principles and approaches in Article 7 of the BBNJ Treaty[1].

A key legal implication of the information-sharing mechanism for marine genetic resources in areas beyond national jurisdiction (ABNJ) is the requirement for equitable and fair access to benefits. The access and benefit-sharing (ABS) system obliges states to ensure that benefits derived from ABNJ resources are shared fairly, while preserving these resources for the interests of the international community, including future generations.

The BBNJ Treaty, particularly Article 11, establishes the framework for benefit-sharing. Part II of the treaty emphasizes fair and equitable benefit-sharing, capacity building (especially for countries with special needs), marine scientific research, and marine technology transfer. It covers both monetary and non-monetary benefits, including digital sequence information (DSI), technology transfer, capacity-building initiatives, and biodiversity conservation[2].

Thus, equitable access and benefit-sharing in ABNJ is the central focus of discussions, reflecting the obligations set out in the BBNJ Treaty.

Provisions on renewable energy resources, developed over two decades of negotiations, focus on benefit-sharing, including both financial compensation and technology transfer. Disagreements persisted over whether monetary benefits should be included in the benefit-sharing system, and negotiations continued throughout the fifth session of the International Governmental Committee[3].

An initial compromise stipulated that monetary benefits under the Non-Nuclear Renewable Energy Resources Agreement would be used solely for capacity building and advancing treaty objectives. Part II of the agreement provides guidance on managing activities related to renewable energy resources and on equitable distribution of both monetary and non-monetary benefits. Future parties are responsible for ensuring compliance with these regulations.

The BBNJ Treaty establishes a committee on access and benefit-sharing and an information-sharing mechanism to facilitate the exchange of wild plant genetic resources and associated data. This framework promotes scientific research and ensures equitable benefit distribution, including a notification system to monitor compliance across the value chain[4].

Monetary benefits are deposited into a special fund to support capacity building and implementation activities, with developed countries contributing through milestone payments, marketing fees, periodic charges, or other mechanisms as determined by the future Conference of the Parties (COP26)[5].

3.2. The Institutional Framework Responsible for the Protection of Living Marine Resources:

[1] Article 7 of The ABNJ consists of the seabed, the ocean floor and subsoil, and the high seas.

[2] Part II of the BBNJ Agreement

[3] Daniel Kachelriess, The High Seas Biodiversity Treaty: An Introduction to 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, IUCN, 2023, P. 11.

[4] Articles 15 and 51. of the BBNJ Agreement

Also See: Paul Oldham et al., Digital Sequence Information in the UN High Seas Treaty: Insights from the Global Biodiversity Framework-related Decisions, LSE Law School Policy Briefing, Vol.53, 2023, PP. 1- 6.

[5] Article 14 of BBNJ Agreement.

The United Nations has been a pioneer in fostering initial concern for the protection of biodiversity through its efforts from the Stockholm Conference of 1972 to the Rio de Janeiro Conference of 1992, followed by subsequent international conferences and forums. Specialized organizations have also played a complementary role in supporting these efforts.

3.2.1. United Nations (UN):

International organizations have played a major role in developing the necessary mechanisms for the protection of marine biodiversity by regulating activities related to maritime safety, promoting the sustainable development of marine resources, and strengthening international cooperation in this field.

At the forefront of international organizations concerned with the protection of marine biodiversity is the United Nations (UN). Its direct involvement is carried out through several bodies, such as the UN General Assembly, which serves as the international forum for discussing issues related to the seas and the exploitation of their living resources. It has convened numerous conferences, the most notable being the Third United Nations Conference on the Law of the Sea, which adopted the 1982 United Nations Convention on the Law of the Sea (UNCLOS), as well as the 1992 United Nations Conference on Environment and Development, which adopted Agenda 21 and the Convention on Biological Diversity (CBD).

The UN has also sought to combat destructive fishing methods harmful to ecosystems, adopting several resolutions to curb drift-net fishing. Furthermore, the General Assembly adopted the World Charter for Nature on 24 October 1982, emphasizing the need to conserve natural resources, avoid their waste, and protect living organisms and ecosystems.

Additionally, the United Nations Environment Programme (UNEP) was established by General Assembly Resolution 2997 (1972) to support international efforts in protecting the environment and biodiversity. Its objectives include safeguarding the environment and terrestrial systems and preventing marine pollution[1].

Among the conferences convened under the auspices of the UN are:

- The Stockholm Conference on the Human Environment of 1972:

This conference was held in Stockholm, Sweden, from June 5–16, 1972, and represents the fundamental basis for the development of international environmental law. It resulted in a Declaration on the Human Environment, which stated that the natural resources of the Earth—including air, water, soil, animals, and plants, particularly representative samples of natural ecosystems—must be safeguarded for the benefit of present and future generations[2]. This principle highlights the necessity of protecting biodiversity in the seas and ecological systems.

- The 1992 Conference on Environment and Development:

This conference was held in Rio de Janeiro, Brazil, or what is called the Earth Summit, from June 3 to 14, 1992, where the issue of biodiversity emerged as a global concern through the signing of the Convention on Biological Diversity, which is considered the first international agreement for the protection of biodiversity, its sustainable use, and the reconciliation between environment and development, as it covers all ecosystems and living resources[3].

- The World Summit on Sustainable Development 2002:

[1] Jacqueline Morand-Deviller, Le Droit De L' Environnement, Estem, Paris, 1996, P. 59.

[2] United Nations Conference on the Human Environment, Stockholm, 5-16 June 1972.

[3] United Nations Conference on Environment and Development, Rio de Janeiro, Brazil, 3-14 June 1992.

The World Summit on Sustainable Development was held in Johannesburg, the capital of South Africa, from August 26 to September 4, where the conference emphasized the necessity of giving a role to local communities in the field of biodiversity protection, taking the necessary measures for the sustainable management of fisheries, strengthening the role of regional organizations, and supporting the implementation of international agreements.

In conclusion, we deduce that most of the work of international conferences takes the form of non-binding recommendations; however, through their recurrence and their adoption by consensus among participating states, they have become the cornerstone in building the foundations of international environmental law[1].

3.2.2. Specialized Agencies:

The specialized agencies of the United Nations, as international organizations, have played a major role in seeking to establish an international mechanism for the protection of biodiversity of marine living resources. Here, we attempt to highlight the most prominent of these agencies:

- The United Nations Educational, Scientific and Cultural Organization (UNESCO):

This organization was established in 1945 and has made significant efforts in the field of marine biodiversity protection through the activities of UNESCO's Intergovernmental Oceanographic Commission, and the management of the Biogeographic Information System, which forms part of the international program for the exchange of biodiversity data and information at both regional and global levels. It has also provided the scientific basis for creating a global inventory of marine areas of ecological and biological importance that must be protected within the framework of UNESCO's World Heritage Marine Programme. Furthermore, it has implemented the International Environmental Education Program (IEEP), which began in 1975 in cooperation with the United Nations Environment Programme (UNEP). In this context, on November 2, 2001, the Universal Declaration on Cultural Diversity was issued, reflecting the interdependent relationship between culture and biodiversity[2].

- Food and Agriculture Organization (FAO):

It was officially established on October 24, 1945, as a specialized international organization that seeks to achieve a better level of nutrition and living standards for humanity, arising from the collective will of states. FAO works to support international cooperation in the field of nutrition and is linked to the United Nations through the Economic and Social Council, which regulates its legal relationship by means of coordination agreements for the protection of marine biodiversity.

As a result, 27 fishing areas were established worldwide, supervised by regional fisheries bodies to ensure the protection, development, and sound management of living marine resources. Several voluntary FAO codes were also adopted, such as the Code of Conduct for Responsible Fisheries, approved by the Conference of the Organization at its 28th session under Resolution 4/95 on October 31, 1995, and the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated (IUU) Fishing adopted on June 23, 2001.

These voluntary, non-binding instruments aim to establish principles of responsible fishing and create standards for preparing and implementing national programs to protect and develop fishery resources in a sustainable and rational manner[3].

[1] Peter Doran, World Summit on Sustainable Development (Johannesburg) – An assessment for IISD, International Institute for Sustainable Development, Briefing Paper, November 2002, PP. 1- 32.

[2] Salah Abdul Rahman Al-Hadith, The International Legal System for the Environment, PhD Thesis, University of Baghdad, Iraq, 1997, P. 82.

[3] Soulaimane Soudjay (LA FAO) Organisation Des Nation Unies Pour Alimentation et l Agriculture L Harmattan, Paris, 1996, P. 19.

Conclusion:

From what we have presented, it is clear to us that biodiversity in the high seas is important for maintaining the balance necessary for the existence of all living organisms on Earth and for the management of livelihoods. Therefore, it is the responsibility of all humans to preserve this diversity. We have discussed the legal and institutional mechanisms that the international community has sought to establish to protect this diversity. Finally, we recommend encouraging international cooperation to establish marine protected areas, focusing on areas suffering from resource degradation, working to strengthen international cooperation in gathering information, developing tools for analysis and prediction, establishing monitoring and evaluation programs, and working to coordinate scientific research programs in the field of biodiversity in the high seas. International environmental courts must also be established as a means of deterrence, specializing in environmental crimes in the high seas.

Acknowledgment

The author extends sincere appreciation to the Faculty of Law, University of Algiers 1, for providing academic support and resources that facilitated this research. Gratitude is also expressed to colleagues and experts in environmental and maritime law whose feedback and insights significantly enriched this work.

Conflict of Interest

The author declares that there is no conflict of interest related to the research, authorship, or publication of this article.

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