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INTERNATIONAL LAW AND OCEAN NOISE POLLUTION: LEGAL EFFECTS OF THE RECOGNITION OF SOUND AS A SOURCE OF OCEAN POLLUTION

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ABSTRACT

Despite the seriousness and clear international nature of the problem, there is no global or regional agreement which specifically addresses the deleterious effects of anthropogenic noise in the oceans. The purpose of this article is to investigate the extent to which such emissions may constitute marine pollution under the United Nations Convention on the Law of the Sea (UNCLOS), and what practical implications this entails from the point of view of the legal regime applicable to such activities. For this purpose, an applied research, of theoretical nature and descriptive and explanatory purposes, with a qualitative approach and deductive and systemic reasoning, is carried out, through the analysis of documentary and bibliographic sources. The article concludes that noise pollution fulfills all the requirements of the UNCLOS definition of marine pollution and, therefore, the provisions of that treaty on marine pollution and protection of the marine environment are fully applicable to the anthropogenic emission of noise in the oceans. In addition, there are several other international legal instruments applicable to marine noise pollution, which rules out the

hypothesis of a normative void on the subject and highlights the need to think about other causes of the increase of this type of pollution, so that it can be efficiently addressed.

Keywords: International Law. Marine pollution. Ocean noise pollution. Legal regime.

DIREITO INTERNACIONAL E POLUIÇÃO SONORA MARINHA: EFEITOS JURÍDICOS DO RECONHECIMENTO DO SOM COMO FONTE DE POLUIÇÃO DOS OCEANOS

RESUMO

Apesar da gravidade e da clara natureza internacional do problema, não existe, até este momento, nenhum acordo global ou regional que trate especificamente do combate aos efeitos deletérios da emissão de ruídos antropogênicos nos oceanos. O objetivo deste artigo é investigar em que medida essas emissões podem configurar poluição marinha, nos termos da Convenção das Nações Unidas sobre Direito do Mar (CNUDM), e que repercussões práticas isso acarreta, do ponto de vista do regime jurídico aplicável a essas atividades. Desenvolve-se, para tanto, pesquisa aplicada, de natureza teórica e finalidade descritiva e explicativa, com abordagem qualitativa e raciocínio dedutivo e sistêmico, mediante análise de fontes documentais e bibliográficas. Conclui-se que a poluição sonora preenche todos os requisitos da definição de poluição marinha da CNUDM, pelo que as disposições desse tratado acerca da poluição marinha e da proteção do meio ambiente marinho são plenamente aplicáveis à emissão antropogênica de ruídos nos oceanos. Verifica-se, ademais, que existem diversos outros instrumentos jurídicos internacionais aplicáveis à poluição sonora marinha, pelo que a hipótese de um vazio normativo sobre o tema resta afastada, havendo, assim, de se pensar em outras causas do recrudescimento dessa espécie de poluição, a fim de que ela possa ser eficientemente combatida.

Palavras-chave: *Direito Internacional. Poluição marinha. Poluição sonora marinha. Regime jurídico.*

INTRODUCTION

The harmful effects of once-ignored anthropogenic noise in the

oceans play today a prominent role among the concerns of international society. The theme was also the subject of debate at the Oceans Conference, a global event to promote sustainable development in the seas and oceans, held under the auspices of the UN in June 2017 in New York (ONU, 2017).

The intensification of the use and exploitation of the sea on a global scale - one already speaks of an "industrialization of the oceans" (STOCKER, 2016) - entails the intensification of noise emitted, among many other sources, by ship traffic, by prospecting and extracting oil and gas and by military sonar, which causes negative impacts on the marine biota.

Aside from the inescapable dilemmas of animal ethics involved when it comes to human activities that cause suffering, pain and even death to living beings, the anthropogenic emission of sound in the oceans also produces significant changes in the complex marine ecosystem networks, including which seriously affects the ecological balance essential not only to the conservation of marine biodiversity but also to the well-being and healthy quality of life of human beings themselves.

In fact, environmental damages caused to the marine environment often slip through the human patrimony by ricocheting, for example, reflecting on environmental damage to human health and food, human rights set forth in art. 25 of the Universal Declaration of Human Rights, to the detriment of the right to a healthy life, guaranteed, among others, by art. 1 of the Rio Declaration on Environment and Development, 1992.

It can also be highlighted the consummation of economic damages, due to the impacts on the food chains and the consequent shortage of marine living beings of commercial importance, as well as the direct damages to human beings, such as the acoustic aggressions to divers in areas used for tourism or recreation (MCCARTHY, 2001).

Despite the gravity of the issue, the most important international treaty in the field of the Law of the Sea, the United Nations Convention on the Law of the Sea (CNUDM) of 1982, did not address it expressly .Nor is there any other treaty or normative document of global spectrum that clearly and specifically governs the issue of the environmental impacts of the emission of anthropogenic noises in the oceans.

This lack of specific global standardization of the issue is even more worrying given the fact that most oceans are composed of international waters (FAO, 2017), beyond the jurisdiction of States, which are also subject to the harmful effects of anthropogenic noise.

In these regions, apart from the difficulties of inspection and protection due to the geographic extension, there is the aggravation that purely individual efforts are of little use in the fight against marine noise

pollution and in guaranteeing effective acoustic protection of living resources, thus, raising the need of an energetic action by the International Law.

In view of this situation, the question arises as to whether the harmful effects of anthropogenic noise emissions on the oceans can conform to the definition of marine pollution brought by CNUDM and, if so, what practical repercussions this would bring from the point of view of legal protection (international normative bases) of the marine environment against environmental damages of an acoustic nature .This article is dedicated to answering these questions.

In addition to the urgency of the subject, the absence of express global normative discipline and the harmful potential generated by the ignorance of the subject, which leads to omission in the confrontation of the problem, research is also justified by virtue of its innovation under Brazilian law , considering that the national legal literature has paid little attention to the subject.

The present research is of the applied type, has a theoretical nature and a descriptive and explanatory purpose .The approach used is qualitative, with a predominance of documentary and bibliographic sources. The reasoning is eminently systemic and deductive, guided by the epistemological paradigm of complexity.

In an attempt to respond adequately to the problem and achieve the central objective, we chose to divide the work into four main parts. Initially, it assesses what the CNUDM means by marine pollution and how it disciplines this issue .Then it analyzes the nature and the effects of anthropogenic noise in the marine environment, demonstrating that they can legitimately be considered “marine pollution” under international law. In the third topic, from the exposition of the previous topic, we discuss the international legal-normative framework applicable to the anthropogenic emission of noises in the oceans, as a way to protect the marine environment. At the end, the conclusions of the research are presented.

1 THE SCOPE OF THE LEGAL CONCEPT OF MARINE POLLUTION: THE PROBLEM OF MARINE SOUND POLLUTION

In compliance with item 36 of the Plan of Implementation of the World Conference on Sustainable Development, held in Johannesburg in 2002 (ONU, 2002), and in line with Goal 14 of the 2030 Agenda for Sustainable Development ASSEMBLEIA GERAL DA ONU, 2015), the First Integrated Global Marine Assessment - World Ocean Assessment I, with the collaboration of hundreds of experts from various countries,

was prepared in December 2015 under the auspices of the UN General Assembly.

The purpose of this evaluation was to produce and disseminate technical and scientific knowledge about the oceans in order to better understand the benefits that the oceans provide to mankind and the human impacts on the oceans (ONU, 2015), ensuring the conservation and sustainable use of the oceans, seas and marine resources.

The report compiled from the first World Oceans Assessment (ONU, 2015) notes that anthropogenic noise in the oceans grew in the latter half of the 20th century. Most of the noise comes from commercial vessels, which produce sounds in the same frequency range used by many marine mammals for communication. Because they are low frequencies, the noise caused by ships is able to propagate efficiently in the sea, affecting the marine biota located at long distances of the emitter.

Other significant sources of noise in the oceans, according to the report, are seismic exploration by the offshore hydrocarbon industry as well as sonars. The installation of submarine cables and *offshore* renewable energy equipment as well as dredging projects, albeit to a lesser degree, may also emit potentially harmful underwater noises.

It was also noted that while much is being done to reduce noise from ships, little attention is paid to the routes traveled by ships, nor to the effects of these noise routes.

On the other hand, it is verified that a great part of the studies on the adverse impacts of the anthropogenic emission of noises in the oceans turn to the marine mammals (DOTINGA; ELFERINK, 2000), mainly to cetaceans, but the UN report informs that these impacts , as has been shown in scientific studies, affect at least 55 marine species, including fish, sea turtles and invertebrates.

These facts give an account of the seriousness and complexity of the problem and raise questions about the performance of international law in its regulation. According to Dotinga and Elferink (2000), the question of anthropogenic sound emission in the marine environment is typically of interest to International Law because: a) many marine activities that generate noise in the marine environment are international or cross-border by nature, such as navigation; b) the competence of a State to adopt measures that regulate the emission of sounds in the oceans is circumscribed by international law; c) activities that produce noises in the oceans are often practiced in areas beyond the jurisdiction of States (international waters) or subject to the jurisdiction of more than one State; (d) the propagation of sound in the oceans may be transboundary; (e) marine noise pollution

may affect migratory species living temporarily in areas subject to the jurisdiction of distinct States beyond the jurisdiction of States.

As a matter of international concern and detrimental to the marine environment and human beings, marine pollution has received attention from international law over the years.

The United Nations Convention on the Law of the Sea (CNUDM), an international treaty concluded in Montego Bay in 1982, whose breadth and density earned it the nickname "Constitution of the Sea", is the main international legal document to normalize, in a broad manner, marine pollution by addressing a number of its sources in a specific and detailed way, such as pollution from land-based sources, pollution by dumping, pollution from ships and pollution from and through the atmosphere.

The CNUDM provisions on marine pollution are, in the view of some, one of the most salutary aspects of this treaty, in which future international regulatory agreements must seek to establish a foundation (GJERDE, 2012). The CNUDM is an example of a *umbrella* treaty (SCALASSARA, 2008), ie a treaty which lays down general rules on the basis of which other less solemn and/or more specific international acts may be celebrated to supplement their provisions and ensure greater effectiveness.

In building this framework, the advent of CNUDM was the first time an international treaty encompassed all forms of marine pollution (GJERDE, 2012), imposing on States the obligation to adopt measures necessary for the prevention, reduction and control of environmental pollution regardless of their source, in addition to harmonizing their policies in this regard (ONU, 1982).

It is known that the CNUDM, like any other legal text, is a product of its time, so it will always be linked to the time when it was negotiated and adopted (SCOVAZZI, 2016), that is, the period from 1973 to 1982 .However, this did not prevent it from anticipating the possibility of creating new forms of pollution and imposing on States, in art. 196, the same duties of prevention, reduction and control of pollution "resulting from the use of technologies under its jurisdiction or control" (UN, 1982).

This prediction has to be read in the light of the pervasive definition of "pollution of the marine environment" that the CNUDM has brought into its porch, taking for itself, in the interests of legal certainty, a definition that would typically fall to doctrine. It has the art. 1, 4, of CNUDM:

> ARTICLE 1
> Terms used and scope
>
> 1. For the purposes of this Convention:
>
> [...]
>
> (4) "pollution of the marine environment" means the direct or indirect introduction of substances or energy into the marine environment, including estuaries, by man, where it provokes or is likely to cause harmful effects such as damage to living resources and to marine life, risks to human health, hindrance to maritime activities, including fishing and other legitimate uses of the sea, alteration of the quality of sea water as regards their use, and deterioration of recreational facilities;

By bringing a legal definition of pollution of the marine environment, without restricting it to pollution sources known at the time of their negotiation, CNUDM stretched its own effectiveness, in that it has endowed its provisions on combating pollution of an *ad futurum* timing, immune to the obsolescence that usually characterizes legal texts, which can not keep pace with social changes and the pernicious effects of human development, which demand a response from the law.

In fact, art. 196 provides for new forms of pollution that may result from the use of (unspecified) technologies, and art. 1, 1, 4, characterizes as pollution the introduction by man of any substances or energy in the marine environment, where these cause or are likely to cause harmful effects.

The so-called marine noise pollution is not expressly foreseen in CNUDM. Was it, however, covered by the legal concept of pollution of the marine environment? Suffice to say: Is the anthropogenic emission of noise in the oceans a "substance" or "energy" capable of causing harmful effects on the marine environment?

2 SOUND POLLUTION: POTENTIAL RISK TO THE MARINE ECOSYSTEM

The answer to the question posed at the end of the previous topic presupposes an individualized examination of the two variables of the legal formula to characterize an activity, action or phenomenon as "marine pollution", according to the CNUDM: a) introduction of substance or energy; b) potentiality or effective production of harmful effects.

2.1 Sound as energy: fulfillment of the first requirement of art. 1, 1, 4 of CNUDM

The marine environment is not naturally silent. Since 1900, natural oceanic noises have been reported as interfering in submarine acoustic communication of naval vessels (NEO et al., 2014). Phenomena such as storms, winds, earthquakes and waves, for example, produce sounds that together with the sounds emitted by fauna constitute the natural sound *background* level of the oceans.This *background* level corresponds to natural sounds that are constantly present in the underwater environment to which marine organisms are adapted (MERCHANT et al., 2015).

However, after the intensification of large-scale industrial processes, population growth and the globalization of transport systems, there was a massive introduction of anthropogenic noise in the marine environment, compromising the sound balance of this ecosystem (SHANNON et al., 2016; MERCHANT et al., 2015). As a consequence, marine animals have been exposed to the different impacts of noise from activities such as navigation, oil and gas exploration, *offshore* construction and the use of sonars, for example, at local and regional scales (MERCHANT et al., 2015) .

Noise from human activities has come to be seen as a potential threat to marine animals when the importance of whale sound for the *Mysticeti* suborder was discovered in the 1970s. From this point on, in the 1980s and 1990s, marine sound pollution came to be seen by the scientific community as an environmental problem that needed means of control (WILLIAMS et al., 2015, SIMMONDS et al., 2014).

If we only consider physical aspects, there is no difference between sound and noise. However, sound is usually considered a sensory perception of interest, associated with pleasurable sensations, while noise is an unwanted sound, an unwarranted disturbance within a specific frequencyin a given soundtrack (CONCHA-BARRIENTOS; CAMPBELL-LENDRUM; STEENLAND, 2004). In this way, marine sound pollution is the result of the artificial introduction of noise in the oceans, causing impacts to sensitive marine organisms.

The United States Marine Mammal Commission (MMC), in a report published in 2007, defined sound as energy that manifests itself as a vibration or acoustic wave through a solid medium, liquid or gaseous, and is characterized by several parameters, such as sound pressure and intensity. Noise, in turn, was defined by Zajarkiewicch (2010) as energy emissions from vibratory phenomena that cause disturbance when captured

by the auditory system .Sounds and noises are therefore energy.

In this way, it seems clear that the emission of noise by anthropic activities, which are perceived by aquatic organisms, fits into the definition of marine pollution provided for in Article 1 of the United Nations Convention on the Law of the Sea (CNUDM), at least to it's first requirement.

2.2 Scientific evidence of negative environmental impacts caused by anthropogenic noise emissions in the marine environment

Underwater noises of anthropogenic origin have been considered as a global scale problem, affecting marine animals of varied taxa, including vertebrates such as mammals and fishes, and invertebrates such as mollusks and crustaceans (WILLIAMS et al., 2015). These impacts occur because many organisms require sound for communication between beings of the same species, for navigation and for the detection of prey, for example (MERCHANT et al., 2015). By affecting such separate organisms, marine pollution poses a risk to the health of the marine ecosystem as a whole.

Several scientific studies have reported that changes in the acoustic pattern of the oceans have been able to cause alterations in the development, behavior, physiology and spatial distribution of marine fauna (MERCHANT et al., 2015). However, quantifying the effects of noise pollution on marine animals is an arduous task. This is because the sensitivity to anthropogenic noise varies from species to species and, within the same species, depends on factors such as gender, age and conditions in which the animal is found. In addition, sound pollution can induce organisms to associate biological responses, such as alterations in the pattern of vocalization, reduction and habitat change, which are behavioral changes difficult to attribute to this kind of pollution alone ((SHANNON et al., 2016; VOELLMY et al., 2014).

In addition to the behavioral impacts resulting from the physiological stress generated by the introduction of anthropogenic noise in the oceans, physical damage to hearing structures, loss of hearing capacity and even death of organisms exposed to high intensity noises are reported in the scientific literature (SIMMONDS et al. , 2014).

Marine mammals, especially cetaceans, are the ones most impacted by sound pollution because sound plays a fundamental role in the life of these beings, since it is related to a range of behaviors necessary for their existence. The artificial introduction of noise in the oceans is capable of interfering with the reception of acoustic signals by these animals, in a

phenomenon known as acoustic masking (ERBE et al., 2016).

Acoustic masking occurs when sounds of interest can not be properly detected by the marine animal hearing aid because they have been overlaid by unwanted noise of similar frequency (ERBE et al., 2016). Low frequency noises are the main responsible for this type of interference, reflecting in deficiencies in socialization, group cohesion, communication, feeding, changes in the swimming pattern and in the recognition between mother and cub of cetaceans (ERBE et al. 2016). Sound pollution is also able to reduce the frequency of whale song, a necessary mechanism for the reproductive success of males. This type of impact is capable of generating negative effects on the reproduction of individuals and the maintenance of whole populations of whales, such as humpback whales (CERCHIO et al., 2014).

Despite the dominance of research on disturbances caused by the introduction of artificial noises in marine mammals, it is well known that other animals, such as fish, are also impacted, although there are still vacuums of knowledge that prevent full understanding and analysis of the impact dimension in these organisms. For example, the analysis of the effects of noise pollution was made on only a fraction of the more than 32.000 species of fish currently known (HAWKINGS; PEMBROKE; POPPINS, 2015).

Although not all fish catch sounds in the same way, sources of high-intensity noise can cause them serious damage, such as damage to the auditory system and temporary auditory issues, in the case of fish with inner ear, increased heartbeat rates and endocrine system responses to stress (NEO et al., 2014; SMITH, 2004) .These negative responses may reflect growth rates, breeding rates, and, ultimately, species survival (SLABEKOORN et al., 2010), which, of course, may influence the availability of fishery resources for human consumption.

Several other scientific studies have been carried out in relation to other components of the marine fauna, and there is a considerable amount of evidence that leads to the production of harmful effects from the anthropogenic emission of noise. Acoustic damage caused to marine living beings thus fulfills the second requirement of the CNUDM to characterize an activity as marine pollution, so that it becomes possible to speak of marine sound pollution, the marine pollution modality involved by art. 1, 1, 4 of the CNUDM.

3 INTERNATIONAL LEGAL REGIME FOR SOUND POLLUTION: IS THERE A LEGAL LAW?

In spite of the clear international nature of the problem, there is at present no international or regional agreement dealing specifically with underwater sound, nor with its impacts on marine mammals (FIRESTONE; JARVIS, 2007), which, as exposed before, are the ones with more studies concerning impacts caused by noise pollution.

Nonetheless, it has been found that anthropogenic emissions of underwater noise can be legally classified as marine pollution, as defined by CNUDM, since they are a form of energy and cause harmful effects such as damage to living resources and marine life as a whole . Thus , there is no doubt that the provisions of the Sea Convention on Marine Pollution and on the Protection of the Marine Environment apply to noise pollution in the oceans (FIRESTONE; JARVIS, 2007).

Therefore, it is the duty of States to protect and preserve the marine environment from the deleterious effects of anthropogenic noise (Article 192 of CNUDM) and to take measures to prevent, reduce and control marine noise pollution, as well as to refrain from causing pollution damage by noise to other States and their environment (article 194, 1 and 2, CNUDM).

States also have the obligation to protect and preserve rare or fragile ecosystems, as well as the habitat of endangered or in risk ox extinction species and other marine life, safeguarding them from the damage that underwater noise come to cause them (article 194, 5, of the CNUDM).

Also applicable to marine sound pollution are the environmental protection duties set forth in CNUDM for the conduct of marine scientific research (FIRESTONE; JARVIS, 2007) - see arts. 240, “d” and 263, 3 of CNUDM - as well as to practice seabed activities under national jurisdiction (article 208) and in the Area (articles 145 and 209).

In addition, although it is not explicitly stated in CNUDM, it is true that States should be guided, even in the area of marine sound pollution, by the precautionary principle, which originated in International Environmental Law itself (CRETELLA NETO, 2012).

Planned in numerous global and regional treaties on the environment, as well as in international non-cogent instruments, in national legal systems and in national and international jurisprudence, the precautionary principle, such as its influence, has already been considered by some as a rule of customary law (SIRINSKIENE, 2009), source of International Law, according to art. 38 of the Statute of the International

Court of Justice (ICJ, 1945).

In its most accepted wording, envisaged in the Rio Declaration of 1992, adopted at the end of the United Nations Conference on Environment and Development (Eco-92), the precautionary principle provides that "when there is a threat of serious or irreversible damage, the absence of absolute scientific certainty will not be used as a reason for the postponement of economically viable measures to prevent environmental degradation "(UN, 1992a).

According to Gillespie, there is a great deal of scientific uncertainty about the impacts of sound pollution on marine species (GILLESPIE, 2007), which provides a fertile soil for the application of the precautionary principle, since the protection of these species cannot wait for an absolute scientific certainty - epistemologically unattainable (PRIMO, OLIVEIRA, 2017), and, on the contrary, must be regulated in advance, in order to avoid or minimize the consummation of damages.

Apart from the CNUDM, there are other global and regional instruments that can provide legal and normative bases for the protection of the marine environment, in relation to the anthropogenic emission of noise, although not specifically related to the definition of marine pollution contained in art . 1 of the Montego Bay Convention.

An example would be the International Convention for the Regulation of Whaling, completed in 1946. This treaty provided for the creation of the International Whale Commission (CIB), which is dedicated, among other things, to studying, evaluating and disseminating information on methods of maintaining and increasing the whaling species (ONU, 1946).

At least since 1996, the CIB's Scientific Committee has been studying the effects of anthropogenic noise on whales by producing documents and recommendations to States in order to minimize the risk of damage from noise pollution caused on cetaceans (FIRESTONE, JARVIS , 2007), considering that hearing is the main purpose of these animals, which use it for feeding, migration and reproduction (INTERNATIONAL WHALING COMMISSION , 2016).

In 2014 the CIB participated in an international project dedicated to the study and mapping of the cetacean sound landscape in order to provide scientific support to managers and political agents by characterizing, monitoring and managing the potential chronic or cumulative impacts of anthropogenic noises in these marine mammals (INTERNATIONAL WHALING COMMISSION, 2016) .More recently, in 2016, the CIB prepared a study on the impacts of the *"masking"*, a phenomenon that occurs when other sounds (including anthropogenic) block or mask

the sounds of which cetaceans rely on to survive (INTERNATIONAL WHALING COMISSION , 2016).

Another international treaty that can help regulate, albeit indirectly, the problem of marine noise pollution is the 1992 Convention on Biological Diversity (CDB), which imposes on parties the duty to adopt measures for the conservation and sustainable use of biological diversity , including through the establishment of protected areas, in order to avoid or minimize negative impacts (ONU, 1992b).

In principle, there is nothing to prevent the provisions of the CDB from being applied in relation to marine noise pollution, where this entails damage to biodiversity.Nevertheless, as Weilgart points out, there are few scientific studies on the impacts of sound pollution on marine biodiversity (WEILGART, 2008).

Also the Agreement for the Implementation of the CNUDM Provisions on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks of 1995 may provide some normative support for marine sound pollution even beyond fisheries and species of fish it approached (FIRESTONE; JARVIS, 2007), since it's art. 5, "d" and "f", imposes on States fishing at sea a duty to: a) assess not only the impacts of fishing but also those of other human activities on target populations and species belonging to the same ecosystem or that depend on or are associated with target populations" (ONU, 1995), which may include, for example, marine mammals; b) minimize pollution - and, as we have seen, the anthropogenic emission of noise in the oceans can constitute marine pollution - and impacts on associated or dependent species, particularly endangered species.

The Bonn Convention on the Conservation of Migratory Species of Wild Animals may also serve as a legal basis for the acoustic protection of marine life,III, 4, "b" and "c", imposes a duty to prevent, remove, compensate or minimize, in an appropriate manner, the adverse effects of activities or obstacles that seriously hinder or impede the migration of certain migratory species, as well as , as far as possible and appropriate, to prevent, reduce or control the factors that put in risk or could threaten these species (FIRESTONE; JARVIS, 2007).

It should be noted that the Conference of the Parties to the Bonn Convention has consistently undertaken efforts to deepen scientific knowledge on marine noise pollution and to protect highly migratory species from the harmful effects of such pollution. At COP 12 of the aforementioned Convention, which took place in 2017, the project to develop and adopt a set of guidelines on environmental impact assessments for ocean noise-generating activities (UNEP, 2017) was continued, reinforcing the forecast

in Article 206 of CNUDM, which, while leaving States a considerable margin of discretion (ELFERINK, 2012), provides for the assessment of potentially polluting activities (ONU, 1982), including in sound terms.

The provisions of the International Convention for the Prevention of Pollution from Ships (MARPOL), concluded in London on November 2, 1973, and its Protocol of 1978 on marine noise pollution, may also be considered.According to Palmer, the fact that MARPOL limits the concept of pollution to the release of "harmful substances" (art 2) would lead to the conclusion that MARPOL does not apply to the release by ships of sound energy in the oceans (PALMER, 2009).

This conclusion, however, is questionable in that sound can constitute a harmful substance to the marine environment, depending on the intensity and form of the sound. Moreover, the MARPOL Preamble itself states the objective of "achieving the complete elimination of intentional pollution of the marine environment by oil and other harmful substances", expressly emphasizing that "this purpose can be better achieved by creating rules which are not restricted to pollution by oil, having a universal meaning " (ONU, 1973).

In any event, the *International Maritime Organization* (IMO), a permanent international body responsible for administering the application of MARPOL 73/78 and promoting maritime safety and the protection of the marine environment, has actively contributed to the minimize the problem related to marine sound pollution (PALMER, 2009).

In 2014, the IMO issued a document entitled "Guidelines for the reduction of underwater noise in commercial shipping to address adverse impacts on marine life" (IMO, 2014), applicable to any commercial vessel, although not mandatory. This document provides a series of measures that can be taken to reduce noise emissions in the oceans, such as measuring the noise levels emitted by ships, changes in vessel *design* , replacement of parts and machinery, cleaning of propellers, reduction of speed of vessels and adoption of other routes, in order to prevent the vessel from navigating in sensitive, vulnerable or specially protected areas.

Many other international instruments exist, capable of regulating the problem of marine noise pollution, including at the regional level. As we can see, the absence of global, specific and cogent regulation of this kind of pollution does not mean that there are no legal rules applicable to the matter.

Even if noise pollution were excluded from the concept of marine pollution provided for in CNUDM - which does not seem admissible given the clear fulfillment of the requirements of art. (1) of this treaty, the

hypothesis of a normative vacuum is removed, given the plurality of legal instruments that, although not specifically dedicated to the regulation of marine pollution, may be applicable to it.

CONCLUSION

The emission of anthropogenic noise in the oceans is an example of human introduction of energy into the marine environment and can cause damage to living resources and marine life. Indeed, it has been found that artificial noise in the oceans can seriously impair marine fauna, for example, auditory masking, acoustic damage and trauma at the morphological and cellular level, change in individual or social behavior, altered body metabolism, induced emigration (horizontal and vertical migration), imbalance of the prey-predator relationship, regional population imbalances, changes in the marine population distribution and in the abundance of marine species reduction, among many other harmful alterations.

It seems clear, therefore, that it is possible to qualify the anthropogenic emission of noises in the oceans as a kind of marine pollution, according to the definition brought by art. 1 of CNUDM, because the two requirements set out therein are fulfilled.

This finding has practical relevance with regard to the legal treatment of the human introduction of sounds in the oceans. As a kind of marine pollution, noise pollution is covered by all CNUDM provisions governing pollution of the marine environment, which rule out the possibility of a regulatory vacuum on the problem.

In addition to the CNUDM, there are other global and regional instruments that can provide legal and normative bases for the protection of the marine environment with respect to the anthropogenic emission of noises in the oceans, but not specifically related to the definition of contained marine pollution in art. 1 of the Montego Bay Convention.

Examples include the International Convention for the Regulation of Whaling, the Convention on Biological Diversity, the Agreement for the Implementation of the CNUDM Provisions on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, the Bonn Convention on the Conservation of Migratory Species of Wild Animals and, perhaps, MARPOL, in addition to the standards produced by the IMO itself.

This finding suggests that if the problem of sound pollution in the oceans persists - and has become even more serious - this is not due to

a normative void from the point of view of international law, but to other factors, such as , perhaps the lack of political will in the implementation of international treaties, the prevalence of economic interests to the detriment of norms of environmental protection, or even the difficulty of monitoring compliance with the normative requirements of acoustic protection of the marine environment, which opens new research fronts and causes new lines of research and new legal problems to be addressed by the Academy.

REFERENCES

ASSEMBLEIA GERAL DA ORGANIZAÇÃO DAS NAÇÕES UNIDAS. *Resolução nº 70, de 21 de outubro de 2015:* Transforming our world: the 2030 Agenda for Sustainable Development. Disponível em: <http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E>. Acesso em: 02 jul. 2017.

CERCHIO, Salvatore et al. Seismic Surveys Negatively Affect Humpback Whale Singing Activity off Northern Angola. *Plos One***,** [s.l.], v. 9, n. 3, e86464, 11 mar. 2014.

CONCHA-BARRIENTOS, M., CAMPBELL-LENDRUM, D.; STEENLAND, K. *Occupational noise:* assessing the burden of disease from work-related hearing impairment at national and local levels. 9. ed. Genebra: Organização Mundial da Saúde, 2004.

CORTE INTERNACIONAL DE JUSTIÇA. *Estatuto da Corte Internacional de Justiça.* Disponível em: <http://www.icj-cij.org/en/statute>. Acesso em: 05 jul. 2017.

CRETELLA NETO, José. *Curso de direito internacional do meio ambiente*. São Paulo: Saraiva, 2012, p. 229.

DOTINGA, Harm M.; ELFERINK, Alex G. Oude. Acoustic pollution in the oceans: the search for legal standards. *Ocean Development & International Law*, v. 31, n. 1-2, p. 151-182, 2000. Disponível em: < http://www.tandfonline.com/doi/pdf/10.1080/009083200276102?needAccess=true>. Acesso em: 04 jul. 2017.

ELFERINK, Alex. G. Oude. Environmental impact assessment in areas beyond national jurisdiction. *The International Journal of Marine and Coastal Law*, v. 27, n. 2, p. 449-480, 2012. Disponível em: <http://booksandjournals.brillonline.com/content/journals/10.1163/157180812x636598>. Acesso em: 08 jun. 2017.

ERBE, Christine et al. Communication masking in marine mammals: A review and research strategy. *Marine Pollution Bulletin***,** [s.l.], v. 103, n. 1-2, p.15-38, fev. 2016.

FIRESTONE, Jeremy; JARVIS, Christina. Response and responsibility: regulating noise pollution in the marine environment. *Journal of International Wildlife Law and Policy*, v. 10, n. 2, p. 109-152, May 2007. Disponível em: < http://www.tandfonline.com/doi/full/10.1080/13880290701347408>. Acesso em: 02 jul. 2017.

FOOD AND AGRICULTURE ORGANIZATION (FAO). *Common oceans facts:* marine areas beyond national jurisdiction (ABNJ). Disponível em: <http://www.fao.org/fileadmin/user_upload/common_oceans/docs/i7381en.pdf>. Acesso em: 07 jul. 2017.

GILLESPIE, Alexander. The Precautionary Principle in the Twenty-First Century: A Case Study of Noise Pollution in the Ocean. *The International Journal of Marine and Coastal Law*, v. 22, n. 1, p. 61-87, 2007. Disponível em: <http://booksandjournals.brillonline.com/content/journals/10.1163/157180807781475227>. Acesso em: 29 jun. 2017.

GJERDE, Kristina M. Challenges to protecting the marine environment beyond national jurisdiction. *The International Journal of Marine and Coastal Law*, Leiden, v. 27, n. 4, p. 839-847, 2012. Disponível em: < http://booksandjournals.brillonline.com/content/journals/10.1163/15718085-12341255>. Acesso em: 11 jun. 2017.

HAWKINS, Anthony D.; PEMBROKE, Ann E.; POPPER, Arthur N.. Information gaps in understanding the effects of noise on fishes and invertebrates. *Reviews In Fish Biology And Fisheries,* [s.l.], v. 25, n. 1, p.39-64, 12 set. 2014.

IMO. *Guidelines for the reduction of underwater noise from commercial shipping to address adverse impacts on marine life*. Disponível em: <http://www.imo.org/en/MediaCentre/HotTopics/Documents/833%20Guidance%20on%20reducing%20underwater%20noise%20from%20commercial%20shipping,.pdf#search=underwater%20noise>. Acesso em: 08 jul. 2017. Tradução nossa.

INTERNATIONAL WHALING COMISSION. *Environmental concerns:* anthropogenic sound. Disponível em: < https://iwc.int/anthropogenic-sound>. Acesso em: 05 jul. 2017.

MCCARTHY, Elena M. International Regulation of Transboundary Pollutants: The Emerging Challenge Of Ocean Noise. *Ocean and Coastal Law Journal*, v. 6, n. 2, p. 257-292, 2001. Disponível em: <http://digitalcommons.mainelaw.maine.edu/cgi/viewcontent.cgi?article=1227&context=oclj>. Acesso em: 07 jul. 2017.

MERCHANT, Nathan D. et al. Measuring acoustic habitats. *Methods In Ecology And Evolution*, [s.l.], v. 6, n. 3, p.257-265, 27 jan. 2015.

MMC – U.S. MARINE MAMMAL COMMISSION. *Marine Mammals and Noise:* A Sound Approach to Research and Management. A Report to the US Congress from the Marine Mammal Commission. Bethesda, 2007.

NEO, Y.y. et al. Temporal structure of sound affects behavioural recovery from noise impact in European seabass. *Biological Conservation***,** [s.l.], v. 178, p.65-73, out. 2014.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS. *Acordo para a Implementação das Disposições da Convenção das Nações Unidas sobre o Direito do Mar de 10 de dezembro de 1982 sobre a Conservação e Ordenamento de Populações de Peixes Transzonais e de Populações de Peixes Altamente Migratórios*, Nova Iorque, 1995. Disponível em: <http://www.planalto.gov.br/ccivil_03/decreto/2002/D4361.htm>. Acesso em: 06 jul. 2017.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS. *Convenção das Nações Unidas sobre o Direito do*

Mar, Montego Bay, 10 de dezembro de 1982. Disponível em: <http://www.planalto.gov.br/ccivil_03/decreto/1990-1994/anexo/and99165-90.pdf>. Acesso em: 25 jun. 2017.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS. *Convenção Internacional para a Prevenção da Poluição Causada por Navios*, Londres, 1973. Disponível em: <http://www.planalto.gov.br/ccivil_03/decreto/d2508.htm>. Acesso em: 07 jul. 2017.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS. *Convenção Internacional para a Regulamentação da Pesca da Baleia*, Washington, 1946, art. 4, 1, c. Disponível em: <http://legis.senado.gov.br/legislacao/ListaPublicacoes.action?id=229065>. Acesso em: 06 jul. 2017.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS. *Convenção sobre Diversidade Biológica*, Rio de Janeiro, 1992b. Disponível em: < http://www.mma.gov.br/informma/item/7513>. Acesso em: 05 jul. 2017.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS. *Declaração do Rio sobre Meio Ambiente e Desenvolvimento*, Rio de Janeiro, 1992a. Disponível em: < http://www.onu.org.br/rio20/img/2012/01/rio92.pdf>. Acesso em: 06 jul. 2017.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS. *Plan of Implementation of the World Summit on Sustainable Development*, Joanesburgo, 2002. Disponível em: <http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD_PlanImpl.pdf>. Acesso em: 02 jul. 2017.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS. *The First Global Integrated Marine Assessment: World Ocean Assessment I*. Disponível em: <http://www.un.org/depts/los/global_reporting/WOA_RegProcess.htm>. Acesso em: 02 jul. 2017.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS. *The Ocean Conference*: Concept Paper on Partnership dialogue 1: Addressing marine pollution. Disponível em: <https://oceanconference.un.org/documents>. Acesso em: 09 jun. 2017.

PALMER, Michael T. Regulating ocean noise: a non-traditional threat to maritime security. *Maritime Affairs*: Journal of the National Maritime Foundation of India, v. 5, n. 2, p. 86-112, 2009. Disponível em: < http://www.tandfonline.com/doi/abs/10.1080/09733150903569349>. Acesso em: 06 jul. 2017.

PRIMO, Diego de Alencar Salazar; OLIVEIRA, Carla Mariana Aires. Certeza científica absoluta e falibilismo: análise epistêmica do princípio da precaução. In: ASENSI, Felipe et. al. (Orgs.). *Novos direitos e transformação social*. Rio de Janeiro: Multifoco, 2017, p. 271-286. Disponível em: <http://institutodialogo.com.br/wp-content/uploads/2017/03/novos_direitos_e_transformacao_social.pdf?utm_campaign=livros_finais_-_caed-jus_2016&utm_medium=email&utm_source=RD+Station>. Acesso em: 15 jun. 2017.

SCALASSARA, Lecir Maria. *Poluição marinha e proteção jurídica internacional*. Curitiba: Juruá, 2008, p. 98.

SCOVAZZI, Tullio. The negotiations for a binding instrument on the conservation and sustainable use of marine biological diversity beyond national jurisdiction. *Marine Policy*, v. 70, p. 188-191, Aug. 2016. Disponível em: < http://www.sciencedirect.com/science/article/pii/S0308597X16301488>. Acesso em: 11 jun. 2017.

SHANNON, Graeme et al. A synthesis of two decades of research documenting the effects of noise on wildlife. *Biological Reviews***,** [s.l.], v. 91, n. 4, p.982-1005, 26 jun. 2015.

SIMMONDS, M.; DOLMAN, S.; WEILGART, L.. *Oceans of noise:* A WDCS Science report. Wiltshire: Whale And Dolphin Conservation Society, 2004. 168 p. Disponível em: <https://uk.whales.org/sites/default/files/oceans-of-noise.pdf>. Acesso em: 29 ago. 2017.

SIRINSKIENE, Agne. The status of precautionary principle: moving towards a rule of customary law. *Jurisprudencija:* mokslo darbai, v. 4, n. 118, p. 349-364, 2009. Disponível em: <https://www.mruni.eu/upload/iblock/b27/20sirinskiene.pdf>. Acesso em: 07 jul. 2017.

SLABBEKOORN, Hans et al. A noisy spring: the impact of globally rising underwater sound levels on fish. *Trends In Ecology & Evolution*, [s.l.], v. 25, n. 7, p.419-427, jul. 2010.

SMITH, M. E.. Acoustical stress and hearing sensitivity in fishes: does the linear threshold shift hypothesis hold water? *Journal Of Experimental Biology*, [s.l.], v. 207, n. 20, p.3591-3602, 15 set. 2004.

STOCKER, Michael. Industrialization of the ocean. *Mission blue*, Napa, 11 aug. 2016. Disponível em: <https://www.mission-blue.org/2016/08/industrialization-of-the-ocean/>. Acesso em: 08 jun. 2017.

UNEP. *UNEP/CMS/COP12/Doc.24.2.2:* Marine noise. Disponível em: <http://www.cms.int/sites/default/files/document/cms_cop12_doc.24.2.2_marine-noise_e_n.pdf>. Acesso em: 05 jul. 2017.

VOELLMY, Irene K. et al. Acoustic noise reduces foraging success in two sympatric fish species via different mechanisms. *Animal Behaviour*, [s.l.], v. 89, p.191-198, mar. 2014.

WEILGART, Linda S. The Impact of Ocean Noise Pollution on Marine Biodiversity. *International Ocean Noise Coalition*, 2008. Disponível em: <https://awionline.org/sites/default/files/uploads/documents/Weilgart_Biodiversity_2008-1238105851-10133.pdf>. Acesso em: 07 jul. 2017.

WILLIAMS, R. et al. Impacts of anthropogenic noise on marine life: Publication patterns, new discoveries, and future directions in research and management. *Ocean & Coastal Management***,** [s.l.], v. 115, p.17-24, out. 2015.

ZAJARKIEWICCH, D. F. B. *Poluição sonora urbana:* principais fontes: aspectos jurídicos e técnicos. 235f. Dissertação (Mestrado em Direito das Relações Sociais) - Pontifícia Universidade Católica de São Paulo, São Paulo. 2010.