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# **BALLAST WATER AND BIOINVASION: BRAZILIAN LEGISLATION AND THE PROTECTION OF MARINE ENVIRONMENTAL RISKS**

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## **ABSTRACT**

This article analyzes the use of water as ballast to balance the vessels, as well as the existing legislation in the country that protects, monitors and punishes those who are responsible for illegal shedding in national jurisdiction waters. That is important, considering ballast water has become a national and international risk with serious consequences such as bioinvasion. It was discovered that ballast water has become one of the fastest forms of marine pollution because it acts quietly. In an attempt to avoid environmental and economic losses, several conventions and international treaties were agreed between countries such as the United Nations Convention on the Law of the Sea, 1982, adopted in Montego Bay. At the national level, Brazil has important institutions for marine environmental protection such as ANVISA, the National Health Surveillance Agency; ANTAQ, National Agency of Waterborne Transport and broad legislation such as Law (6938/81), the National Environmental Policy; the Criminal Environmental Law (9.605/98) and, specifically, NORMAM 20, issued by the Brazilian Navy's Directorate of Ports and Coasts, which states that every ship to moor at national ports must prove the exchange of ballast water at sea. The research used the legal and theoretical methodology, deductive reasoning and literature from technical and government sites. The results show that Brazil

has a concern over the issue and the national legislation proves the effort to prevent marine pollution. However, research in the field is necessary so that invading organisms are discovered prior to the pollution. In addition to that, legislation and supervision must be improved.

**Keywords:** Ballast water; bioinvasion; marine pollution.

## *A ÁGUA DE LASTRO E A BIOINVASÃO: A LEGISLAÇÃO BRASILEIRA NA PROTEÇÃO DOS RISCOS AMBIENTAIS MARINHOS*

### RESUMO

*Este artigo analisa a utilização da água como lastro para o equilíbrio de navios, assim como a legislação existente no país que protege, fiscaliza e pune os responsáveis pelo deslastre ilegal em águas de jurisdição nacional. Este fato é importante, tendo em vista que a água de lastro transformou-se em risco nacional e internacional com consequências graves como a bioinvasão. Foi descoberto que essa água passou a ser uma das formas mais rápidas de poluição marinha, porque age silenciosamente. Na tentativa de evitar as perdas ambientais e econômicas, várias convenções e tratados internacionais foram acordados entre os países como a Convenção das Nações Unidas sobre o Direito do Mar, 1982, adotada em Montego Bay. Em nível nacional, o Brasil possui instituições importantes para a proteção ambiental marinha como ANVISA, Agência Nacional de Vigilância Sanitária; ANTAQ, Agência Nacional de Transportes Aquaviários e uma legislação ampla como a Lei (6938/81), Lei de Política Nacional de Meio Ambiente; Lei de Crimes Ambientais (9.605/98) e, especificamente, a NORMAM 20, editada pela Diretoria de Portos e Costas da Marinha do Brasil, que estabelece que toda embarcação ao arribar em portos nacionais deve comprovar a troca da água de lastro em alto mar. A pesquisa utilizou a metodologia jurídico-teórica, com raciocínio dedutivo e técnica de pesquisa bibliográfica e em sites governamentais. Os resultados apontam que o Brasil tem uma preocupação com o tema e a legislação nacional comprova o esforço em evitar a poluição marinha, no entanto pesquisas no campo são necessárias para que organismos invasores sejam descobertos antecipando-se à poluição. Também a legislação e fiscalização devem ser aprimoradas.*

**Palavras-Chave:** *Água de lastro; bioinvasão; poluição marinha.*

## INTRODUCTION

Ballast water is not a recurring subject and many are not aware of it once its use worldwide is recent. The ballast water in ships started to be used in the 19th century, a time when the huge impacts that it could cause on the entire planet were unknown.

Ballast is necessary to keep the balance of ships when they are unloaded, that is, ships need weight when they are completely unloaded. Thus, water started to be used as ballast. Previously and on that purpose, stones and sand were used, but such use was more complex and not that effective.

However, through ballast, water transfer and unloading in opposite sides of the world have been imposing damages to human health, to biodiversity, to marine ecosystems and also to fishing activities. The negative result is absorbed by the environment and the economy of the countries involved.

In what regards international relations, the issue of ballast water is directly related to international trade. The interdependence between the States is becoming stronger and stronger and it is essential for the implementation of international and national treaties and standards to reduce the impacts of bioinvasion.

Thereby, differently from other forms of marine pollution such as oil spill, environment recovery may take place when early and correct decisions are made.

However, in case of bioinvasion, rebalancing the biota is almost impossible once the development of invading species is indistinguishable within a short period of time.

In face of the impacts of ballast water, this research aims at assessing the existing national and international legislation and checking whether it has been following the mission of protecting coastal waters. At the same time, we inquire the kind of crime that is appointed to those who cause the damage, at a national level.

Thus, it is noticeable that the research is justified by the importance of the subject that was formerly unknown and it is nowadays a reason for a lot of concern, especially in countries such as Brazil that have a long extension of coastal areas.

Once the conceptual, ideological and doctrinaire aspects of the subject were emphasized, the research uses the legal-theoretical method to

present deductive reasoning in view of references to standards, rules and general principles so as to explain the content of the assumptions assessed. Bibliographic research was used together with consultation of government journal sites.

## 1 CONCEPT OF BALLAST WATER

According to (BRAZIL/NORMAM20/DPC, 2015) the “Maritime Authority Standard for Ship Ballast Water Management”, ballast water “is the water with its suspended particles taken onboard inside the ballast tanks to control the trim, band, draft, stability or ship tensions” (NORMAM/DPC, 2015).

ANVISA also states an almost identical concept of ballast water through Resolution 217: “The water placed into the tanks of a ship to change its draft, change its flotation conditions, regulate its stability and improve its maneuverability” (BRAZIL/ANVISA/RDC, 2015).

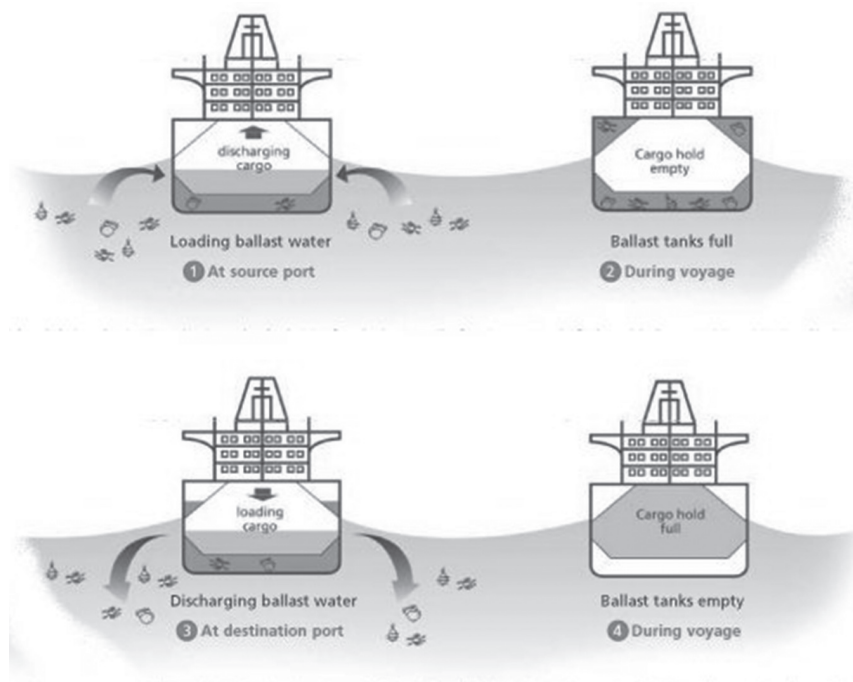
Marine pollution through ballast water has been increasing worldwide as well as has the concern of the countries that are affected by it.

Marine transport in Brazil is the most important route for the transportation of goods. According to information from the National Department for Waterborne Transport, ANTAQ, tonnage exported was 96% of the total tonnage and imports reached 89% in 2012. There is a total 670.3 million tonnes of trade flow to and from other countries. From that total amount, 525.4 million tonnes were shipped and 144.8 million tonnes were unloaded from other countries (BRAZIL/ANTAQ, 2015). The data shows, in addition to the importance of international trade relations, the number of ships that dock in Brazil and that certainly discharge ballast water near the Brazilian coast.

### 1.1 Procedures and use of ballast water

Ballast water is a usual procedure in large size ships, for the safety of ship balance.

Ship balance depends on water ballast for its stability according to figures 1 and 2 below. When the ship unloads the goods from its holds, it needs the ballast to return. Figures 3 and 4 show holds loaded and ballast water tanks empty.



Source: Globallast<sup>1</sup> website

On ballast water, Collyer says that “by 1880, stones and sand were used. From then on, the use of water became widespread and a better replacement has not been found so far” (COLLYER, 2007).

It turns out that ballast, although ideal for ships, became a global risk with severe consequences. Puthucherril says that “oceans cover nearly seventy percent of our planet and sixty percent of world’s population lives in coastal areas” (PUTHUCHERRIL, 2011, p. 382). The population living in coastal areas is exactly the one that needs the goods traded the most.

Ballast water was found to be one of the fastest ways of marine pollution. That fact changed the scenario of international and national legislations once bioinvasion is silent and quick.

Water, which travels long distances, “introduces hitchhiking, aquatic species into new environments and threaten existing aquatic ecosystems” (PUTHUCHERRIL, 2011, p. 382). Those aquatic species that travel in a large aquarium, that is, ship tanks, generate economic losses and

<sup>1</sup> Site Globallast. available at: <http://globallast.imo.org/index.asp?page=problem.htm&menu=true>. Access: Feb 10, 2015.

also losses related to endemic species where they are dumped.

Ballast water discharge is so severe that the above mentioned author considers that

Ballast water discharge and its attendant introduction of invasive species has been identified as one of the four greatest threatens to the world's oceans. To place the magnitude of the threat into context, at least three billion tons of ballast water are discharged each year, an amount that far exceeds the volume of any other ship-source discharge. (PUTHUCHERRIL, 2011, p. 382)

The migration of aquatic organisms has always taken place in the oceans, but with the expansion of trade between countries, the use of ballast water by ships, the movement of those species in waters that have never been navigated before was made easier.

Thus, "unicellular organisms, small invertebrates, eggs, cysts, larvae and occasionally fish of various species are contained within these waters" (PUTHUCHERRIL, 2011, p. 387) that travel in merchant or tourism ships.

With the new inhabitants, in waters where there are no natural predators, those species spread in a dangerous way to the existing biota and become a bioinvasion.

## **2 THE DANGER OF BIOINVASION**

One of the most well-known cases of introduction of exotic species into an environment via ballast water took place in the United States of America in the 80's. That case had a lot of repercussion due to the significant resulting impact, as Tony George informs:

One of the most publicized cases was the introduction of the zebra mussels into the Great Lakes in the 1980s, supposedly via ballast water discharges. Within fifteen years of its introduction, the zebra mussel caused significant havoc in the ecosystem by reducing levels of phytoplankton, the base of the aquatic food web. The zebra mussel also competes with native mussels or clams for food and habitat and it may interfere with the native reproduction patterns to the point of extinction. (PUTHUCHERRIL, 2011, p.388)

Gauthier and Steel inform that, in addition to the Zebra Mussel<sup>2</sup>, which caused negative impacts in Canada, other species have been found:

In 1980, Environment Canada commissioned Bio-environmental Services Ltd (1981) conducted the first study on ballast water in Canada. Sampling of ballast water in 55 ships from 10 worldwide locations entering the Great Lakes – St. Lawrence system revealed that all contained viable aquatic organisms and even raw sewage in one instance. Over 150 phytoplankton species and 56 invertebrates were identified. Although not identified in the samples, this study was the first to suggest the zebra mussel (*Dreissena polymorpha*) as a potential invader to the Great Lakes as a result of ballast water discharges. (GAUTHIER; STELL, 1996, p.11)

Once there were no natural predators, and due to its great reproductive capacity, large agglomerates of that specie were formed and started to encrust with water collection, pipe, pump, duct and industry cooling systems, causing great damage.

The case of the zebra resulted in such an impact that it was brought to the agenda of discussions of IMO - International Maritime Organization in 1988 and, since then, the MEPC<sup>3</sup>- Marine Environment Protection Committee, founded in 1973, implements the legislation to control ballast water. That agency has been improving in order to be able to prepare legal provisions regarding management and guidelines for the implementation of ballast water control.

At that time, the event became known in an aggressive way in the economy of both the United States and Canada. That episode had an impact on the economy as Kyle informs in his researches at EPA, (Environmental Protection Agency):

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2 *Dreissena polymorpha*, *Dreissena bugensis* or Zebra Mussel: native from Eastern Europe, *Dreissena polymorpha* was introduced through ballast water in the area of the Great Lakes at the border between Canada and the US (CARTON, 1995, p.313-371), involuntarily migrating to North American waterways. Nowadays, that species can be found in over 40% of the entire waterway network in the US. Statistic data from 2006 reveal that American states spent over five billion dollars to try to contain and repair the damages resulting from that bioinvasion. That exotic species has been threatening the oyster industry and, consequently, put hundreds of work positions at risk. The zebra mussel has also blocked water admission at the pump stations used by the cities for water supply, hydroelectric power stations, etc.

3 MEPC: Marine Environment Protection Committee, founded on November, 1973. That committee coordinates prevention and control activities related to marine pollution caused by ships. Available at: <<http://www.imo.org/>>. Access: March 21, 2015.

Invasive species are extremely costly to the Great Lakes. To put numbers on the matter, “the most comprehensive estimate of Great Lakes basin economic and environmental costs, while [...] suggests annual cost of US\$5.7 billion, including US\$ 4.5 billion in damage to commercial and sport fishing.”<sup>4</sup> (LANDIS-MARINELLO, 2007, p. 138).

Brazil was not exempt from this threat, especially with its 8,511,965 km<sup>2</sup> that place it as the 5<sup>th</sup> country in the world in territorial extension. It has a coastal area of 7,367 Km, it is bathed by the Atlantic Ocean and it holds the greatest biodiversity on Earth.

Because of those positive qualifications, some aquatic invader species have been identified in Brazil.

The first record in South America was the one of the golden mussel (*Limnoperna fortunei*) from China and southeastern Asia. It was found in Prata River, on the coast of Argentina, in 1991. The studies evidenced that it was introduced via ballast water. The species was first registered in Brazil in Rio Grande do Sul in 1999. (BRAZIL, MMA, 2015)

In addition to that species, other invader ones such as the crab (*Charybdis hellerii*), from the Indian Ocean, invaded Salvador, São Paulo and Rio de Janeiro. The clam *Isognomon bicolor*, native from the Caribbean, impregnated the intertidal area on the Brazilian coast and resulted in the disappearance of several national species. (BRAZIL/MMA, 2015)

The problems resulting from bioinvasion require an advanced legislation, as well as pragmatic application. It is a quiet danger that advances all over the world, as Tony George explains:

Africa, Asia, the Mediterranean, South America and Australia have also experienced the adverse effects of alien species invasions via ballast waters. Even though the discharge of invasive species through ballast water represents just one method, or vector, of alien aquatic species introduction, it poses the greatest threat to marine biodiversity. Overall, the rate of introduction of non-indigenous species into native ecosystems is accelerated by the four Ts – Trade, transport, travel and tourism. (PUTHUCHERRIL, 2011, p. 390).

As we can see above, bioinvasion takes place not only through ballast water but ballast water is the priority of this paper.

Several studies point out the negative consequences of the

<sup>4</sup> “Invasive species are extremely expensive for the Great Lakes. Losses in numbers, according to EPA, are estimated at 7 billion dollars of economic and environmental losses, including 4.5 billion dollars in trade and fishing losses.”



introduction of invader species into the aquatic environment: “local and regional biodiversity losses, scenery changes, economic losses, in addition to the spread of pathogenic microorganisms such as the one that causes cholera”, (BRAZIL, NORMAM/20DPC, 2015). That is why it is necessary to take urgent measures such as adopting special legislation on the subject.

### 3 BALLAST WATER AND THE BRAZILIAN LEGISLATION

Ibrahim says that it was under the United Nations – UN that the subject “oceans” became notorious. In 1958, the first Convention of the United Nations on the Law of the Sea was edited on economic purposes (IBRAHIN, 2012, p. 33).

In that context, several conventions and treaties were agreed. They only had an economic focus once transfrontier pollution issues took unbelievable proportions. Due to that and as a consequence of aspects related to the law of the sea and environmental law, “[...] what we currently call Maritime Environmental Law was born to support and protect all the issues related to the maritime environment” (IBRAHIN, 2012, p. 32). Ibrahim explains that the greatest concern of that Law is transfrontier pollution, ballast water included.

We are going to list some of those international documents on ballast water in chronological order. The United Nations Convention on the Law of the Sea dated 1982 addresses the introduction of species that may cause negative impacts to the marine environment, which was agreed by Brazil through Decree 4361 on September, 2002<sup>5</sup>. (BRAZIL/DECREE 4361/2015)

The Montego Bay Convention in 1982 had the main objective of limiting the territorial sea and the exclusive economic exploration area.

Brazil has a role in the organization of the international legislation on the defense of the marine environment with ECO-92 in Rio de Janeiro through the Agenda 21, which established “a set of principles and a sustainable development action program for the 21<sup>st</sup> century” and recommended that the IMO and other international agencies took measures

5 In what regards water protection, general principles, art. 5, letter f: (f) reduce pollution, dejection, disposals, capture of lost or abandoned equipment, capture of non-target species, may they be fish or other (from now on simply non-target species), and impacts on associated or dependent species, especially threatened species, at the most through measures that include, as much as possible, development and use of fishing equipment and techniques that are selective, environmentally safe and cost efficient; [...]

regarding the transfer of organisms by ships” (IBRAHIN, 2012, p. 33).

The IMO (International Maritime Organization) is a specialized agency of the United Nations. It is responsible for the safety of shipping and the prevention of marine pollution from ships (US/IMO, 2015). Within IMO, there is the Maritime Safety Committee (MSC) and the Marine Environment Protection Committee (MEPC).

In face of the bioinvasion issue, IMO, during the 1993 Assembly, had to create global guidelines to decrease impacts. Resolution A.774 (18) was created, among other objectives, to define technological standards to be followed by all the countries on Earth. (US/IMO, 2015).

Against that background and influenced by the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, IMO also published Resolution A.868(20) in 1997 to complement Resolution A.774(18).

That Resolution was adopted on November 1997 and it objectively talks about “Guidelines for the control and management of ships’ ballast water to minimize the transfer of harmful aquatic organisms and pathogens”. Among IMO’s standards on that subject, this is the most important one and it is also the one that had the most impact on all of the countries. Due to its value, it is essential to quote its introduction:

[...] 1.1 Studies carried out in several countries have shown that many species of bacteria, plants, and animals can survive in a viable form in the ballast water and sediment carried in ships, even after journeys of several months’ duration. Subsequent discharge of ballast water or sediment into the waters of port States may result in the establishment of harmful aquatic organisms and pathogens which may pose threats to native human, animal and plant life, and the marine environment. Although other media have been identified as being responsible for transferring organisms between geographically separated water bodies, ballast water discharge from ships appears to have been among the most prominent. (US/IMO, 2015)

Thus, the Resolution evidences that the discharge of ballast water has really been the most important vehicle for the transfer of pathogenic organisms to ports worldwide.

For efficient protection, IMO organized the International Conference on Ballast Water Management in London in 2004. As a result, the International Convention for the Control and Management of Ships’ Ballast Water and Sediments was agreed and Brazil takes part in it. The

parties, by observing several other Conventions, agree:

[...] The Parties agree to totally and fully follow the provisions in the present Convention and its Attachment in order to prevent, minimize and, finally, eliminate the transfer of Harmful Aquatic Organisms and Pathogenic Agents through the control and management of ships' ballast water and sediments in it.

To follow all protection duties, Brazil, through its Environment Ministry, which is responsible for environment protection and preservation, and also through the Health Ministry's National Agency of Sanitary Surveillance (ANVISA), which is in charge of inspecting the possible causes of diseases that may compromise public health.

ANVISA is an important agency that manages ballast water. It checks the sanitary conditions of ships and also their ballast water. Thus, we can say that ANVISA is the main inspection and control agency in what concerns pollution via ballast water in Brazil.

### 3.1 ANVISA and the protection of the marine environment

ANVISA started an exploratory study on the impact of the sanitary quality of the ballast water discharged at the Brazilian coast in order to meet the goals set forth by the above mentioned Conventions. At the end of the research in 2002, water collections from different Brazilian ports showed that ballast water is a vehicle for pathogenic agents that result in relevant impacts to public health, that is,

all the surveyed microbiological indicators have been detected and the results evidenced the presence of marine bacteria cultivable in 71% of the ballast water samples analyzed, varying from 1000 to 5.4 million bacteria per liter of sample. It was also possible to evidence the transport of *vibrios* (31%). *Escherichia coli* (5%), *esterococos fecais* (22%), *Clostridium perfringens* (15%), *colifragos* (29%), *Vibrio colerae OI* (7%) and *V. colerae non OI* (23%) in samples of ballast water and (21%) in samples of plankton, 12 strains in 7 samples identified as *V. C. OI – EL TOR*, 2 of which are toxigenic. (BRAZIL/ANVISA, 2015)

Through the samples, it is possible to conclude that Brazil has to be concerned about bioinvasion. ANVISA must prevent sanitary issues related to ballast water. Nowadays, ships have to inform where the

water was collected, where it was changed and where it is going to be discharged.

To keep safe surveillance, ANVISA published technical regulations, RDC 217/2001, for the sanitary surveillance of ships, sanitary control ports and the provision of services related to public health and to the production and circulation of goods (BRAZIL/ANVISA 2, 2015).

That regulation establishes the legal representative or the person in charge of the ship and also the guidelines to be informed to the sanitary authorities regarding the ship's navigability conditions. Thus, ANVISA has the power to carry out a sanitary inspection in any ship and at any time (art. 15), RDC 217.

In what regards ballast water itself, article 19 of the RDC states that, considering navigability, safety and sanitary risk conditions, those ships are also under the responsibility of the sanitary and maritime authorities in case of "collection of ballast water in a geographic area that poses risk to the public health and to the environment and that is nationally or internationally recognized by the relevant public agencies" (RDC 217, 2015).

In title 5 of the RDC, articles 25, 26, 27, 28 and 29 talk specifically about the subject<sup>6</sup> and it is important to know what is said about it in Brazil.

Nevertheless, ANVISA is not by itself. Several national and international agencies work together to control the issue of ballast water and to face bioinvasion prevention. The Ministry of Transportation (MT), through the National Department for Waterborne Transport (ANTAQ), is in charge of controlling the merchant navy, ports and waterways before the Dock Company and it plays an important role in the control and prevention

6 Art. 25 The one who is directly in charge or the legal representative of a ship requesting Free Practice has to give the sanitary authority in charge at the Sanitary Control Port, prior to entrance, information regarding the storage of ballast water onboard and discharge in waters under national jurisdiction, forecasted on the Certificate of Request, according to Attachment IV in this Regulation.

Art. 26 The one who is directly in charge or the legal representative of the ship has to hand the sanitary authority, the moment it enters the Sanitary Control Port, information regarding ballast water by means of the Information Form on ballast water, signed by the Captain or by someone appointed by him/her, according to Attachment X of this Regulation.

Art. 27 Discharge of ballast water in waters under national jurisdiction, collected from a geographic area seen as a risk for public health and the environment, is conditioned to previous authorization from the sanitary authority after the Environment Federal Agency and the maritime authority are heard also regarding the need to implement the relevant prevention and control measures.

Art. 28 Every ship, at the discretion of the sanitary authority, is subject to the collection of ballast water samples for analysis to identify harmful and pathogenic agents, physical indicators and chemical components.

Art. 29 It is forbidden to use ballast water tanks on purposes other than the ones they are aimed at. (ANVISA, 2015)

of marine pollution.

### **3.2 A National Department for Waterborne Transport (ANTAQ) and the Navy Command**

Brazil has 89 commercial ports and port terminals, of which 22 (17 maritime and 5 fluvial) are very relevant due to the volume of loading and unloading (SILVA; SOUZA, 2004, p.3). Thus, ANTAQ has the important mission of regulating, supervising and inspecting the activities of waterway transport service provision and the exploration of the port and waterway infrastructure. (BRAZIL/ANTAQ, 2015)

The Board of Ports and Coasts and the Port Authority are part of the Navy Command. They are in charge of the issues involving ballast water and they operate permanently along the Brazilian coast. The mission of DPC is to create standards related to its assignments as a representative of the Brazilian Maritime Authority (AMB), to manage the Maritime Professional Teaching System (SEPM), in addition to related activities such as normative and supervision technical activities regarding environmental management in order to contribute for the safety of the waterborne traffic, the prevention of water pollution and the safeguard of human life in the ocean. (DPC, 2015)

The Navy Authority, represented by the Board of Ports and Coasts of the Brazilian Navy prepared Maritime Standard n. 20 (NORMAM 20)<sup>7</sup> in force since 15/Oct/2005 and already revised by the Director of Ports and Coasts, Vice Admiral Cláudio Portugal de Viveiros, through Administrative Regulation n. 26 on January, 2014 (DPC, 2015).

The standard establishes that any ship that moors at national ports must show evidence of having changed the ballast water in the high seas to meet the provisions in the international Convention.

NORMAM 20 pre-establishes that all ships in Brazilian waters have to change the ballast water at least 200 nautical miles from the coast and 200 meters deep (DPC/NORMAM, 2015). It is essential that ballast water management procedures are correctly, efficiently and safely followed and that they do not result in unnecessary commercial delays.

<sup>7</sup> NORMAM 20: Management of Ships' Ballast Water. Brasilia: Official Government Gazette, 2005. Available at: [https://www.dpc.mar.mil.br/normam/N\\_20/N\\_20.htm](https://www.dpc.mar.mil.br/normam/N_20/N_20.htm). Access on March 20, 2015: in force on 15.Oct.2005, with the following objective: Establish requirements regarding prevention of pollution from ships in Brazilian Jurisdictional Waters (ABJ) in what regards ballast water management. The initial system is essentially based on changing ballast water according to the Resolution agreed by the International Maritime Organization (IMO)'s Assembly A.868(20) in 1997.

In some emergency or special cases, the Standard does not have to be followed. But the agent at the relevant Maritime Authority has to be informed of those exceptions. Some ships are exempt from following the Standard. However, those ships have to be careful so as to avoid environmental pollution and bioinvasion through shedding at the most.

The above mentioned standard also addresses ships that moor in river basins. In that case, they go through two shedding procedures: the first one, at least 200 nautical miles from the coast and the other one, before entering fluvial waters (DPC/NORMAM, 2015).

The Brazilian legislation goes far beyond techniques to discharge ballast water from commercial ships that need the balance. As mentioned above, ANVISA, ANTAQ and the Navy Command have the support of other laws and severe penalties to fight illegal shedding in the country.

### **3.3 Administrative and criminal legislation to protect the marine environment**

The National Environment Policy, Law 6938/81, outlined the promotion of environmental quality in the country. Protection measures were reinforced and confirmed in the 1988 Constitution, article 225.

Regarding maritime protection, the 1988 Brazilian Constitution establishes that the Federal Government is in charge of creating the laws that regulate issues related to the oceans, navigation, port regimes, sanitary measures, national and international trade, as already mentioned.

In what concerns Criminal Law, in case of environmental damages, some laws may be used to protect the marine environment such as the Criminal Code, Chapter III about the crimes against public health. On this regard:

Art. 267 – Cause epidemics through the propagation of pathogenic germs:

Penalty – confinement from 10 (ten) to 15 (fifteen) years.

§ 1st – If death results from the fact, the penalty is doubled.

§ 2º - In case of fault, the penalty is of imprisonment from 1 (one) to 2 (two) years, or, in case of death, from 2 (two) to 4 (four) years. (BRAZIL, Criminal Code, 2015)

It became clear along the research that ballast water can certainly be a vector of diseases that reach not only the marine biota, but also citizens who fish for a living in the encompassed area, not to talk about the

economic issues that may result.

The Environmental Crime Law, Law 9.605 dated 1998, addresses the criminal and administrative penalties resulting from conducts and activities that may harm the environment. It was not specifically thought for ballast water, but it encompasses protection for the issue.

It is important to say that administrative penalties are independent from the criminal and civil responsibility and both administrative and criminal violations “are actions or omissions against the legal order, in face of the violation or threat to harm legally relevant goods”. (DINO NETO; BELLO FILHO; DINO, 2011, p. 400)

Law 9.605/98, article 70, §1 establishes that the relevant authorities in charge of drawing up the notice of environmental violation and starting administrative proceedings are the employees at environmental agencies that are part of the National Environment System – SISNAMA appointed for inspection activities, as well as the agents serving at the Ministry of the Navy’s Port Authority (BRAZIL, Law 9.605/98, 2015).

In case of infraction regarding ballast water, it is possible to apply that law by using articles 70 to 76, which set forth all the administrative procedures, and also article 54:

Art. 54. Cause pollution of any kind at such levels that it may result in damages to human health, or that cause the death of animals or the significant destruction of the flora:

Penalty – imprisonment from one to four years, and fine. (BRAZIL, Law 9.605/98, 2015)

We notice that people responsible for ships discharging ballast water near the Brazilian coast that result in pollution and damages to human health and to marine fauna can also be included into the above mentioned article. Paragraph three of the same articles says: “Those who fail to adopt, whenever required by the relevant authority, caution measures in case of risk of severe or irreversible environmental damage incur in the same penalties foreseen in the previous paragraph” (BRAZIL, Law 9.605/98, 2015). The ‘previous paragraph’ mentioned above is the one that establishes a 5-year imprisonment penalty.

The law that exclusively addresses ballast water has already been mentioned herein, that is, Standards of the Marine Authority for the Management of Ships’ Ballast Water (NORMAM-20/DPC), but, due to

Resolution A.868 (20), Law 9.966 was published on April 24, 2000. It rules the prevention, the control and the inspection of the pollution resulting from the discharge of oil and other harmful or hazardous substances in waters under national jurisdiction.

Article 2 of that law sets forth several important concepts and definitions such as the definition for ship and for harmful and hazardous substances. It also includes the maritime and port authorities. Important concepts on ballast water are also listed on items 17 and 18:

XVII – clean ballast: ballast water in a tank that, since it transported oil for the last time, was subject to cleaning at such a level that, if such ballast was discharged by the standing ship in clean and quiet waters, in a bright day, it would not produce visible traits of oil on the surface of the water or at the nearby shore, nor would it produce sludge or emulsion under water surface or the nearby shore;

XVIII – tank of residues: any tank specifically aimed at the temporary storage of tank drainage and washing liquids and other mixes and residues; (BRAZIL, Law 9.966/00, 2015)

Despite the fact that the law mainly addresses the discharge of oil, some of its articles clearly mention ballast water transportation and discharge. Articles 11, item 7; 15; 16; 18 and 21 approach that subject<sup>8</sup>.

Art. 15. It is forbidden to discharge, in waters under national jurisdiction, harmful or hazardous substances ranked in category “A”, defined in art. 4 of this Law, including the ones temporarily ranked as such, in addition to ballast water, residue from tank washing or other mixes that contain such substances.

<sup>8</sup> Art. 11. Any ship that transports harmful or hazardous bulk substances must have a cargo log book, pursuant to Marpol 73/78, which may be requested by the maritime authority, by the relevant environmental agency and by the oil industry regulator agency, in which annotations regarding the following operations are written down: [...]VII – transfer of dirty ballast water into water environments; [...].

Art. 16. It is forbidden to discharge, in waters under national jurisdiction, substances ranked in categories “B”, “C”, and “D”, defined in art. 4 of this Law, including those that are temporarily classified as such, in addition to ballast water, tank washing residues and other mixes that contain them, except when the following conditions are cumulatively met:

I – the situation in which the discharge takes place is included in the cases allowed by Marpol 73/78;

II – the ship is not in the limits of an ecologically sensitive area;

III – the procedures for discharge are duly approved by the relevant environmental agency.

§ 1 The sanitary sewage and waters served from ships, platforms and their support facilities are equivalent, in terms of criteria and conditions for discharge, to the substances classified in category “C”, defined in art. 4 of this Law.

§ 2 Discharges mentioned in the previous paragraph must also meet the conditions and the regulations imposed by the sanitary surveillance legislation. [...]. Art. 18. Except in the events foreseen by this Law, the discharge of garbage, ballast water, tank and basement washing residues or other mixtures that contain oil or harmful or hazardous substances of any category can only take place in residue receipt and treatment facilities, according to provisions in art. 5 of this Law.



[...]

Art. 21. The circumstances in which the discharge, in waters under national jurisdiction, of oil and harmful or hazardous substances, or mixes that contain them, of ballast water and other pollutant residues is authorized does not exempt the person in charge from repairing damages to the environment and indemnifying the economic activities, the public and the private assets for the losses resulting from that discharge. (BRAZIL, Lei 9.966/00, 2015)

The Law mentioned above forbids the discharge of ballast water in waters under national jurisdiction, except in special situations. However, the ship representative is made responsible for the damages to the environment and for compensating the losses in case of pollution when discharging ballast water.

With no intention to exhaust the study of the legislation regarding ballast water pollution, it was seen that Brazil is backed by measures that guarantee marine environment protection. However, as mentioned above, application and monitoring have to be aggressive because, in case of pollution, it is impossible to insure that a tragedy can be avoided.

The best way to avoid pollution caused by shedding is to insure the principles in Environmental Law, that is, prevention and precaution, and as much research as possible about the treatment for the water used as ballast.

As Ibrahim says (2012), as more advanced methods for the treatment of ballast water are developed, standard A.868 (20) is going to be adapted to attend to new facts. Meanwhile, the Board of Ports and Coasts, according to its assignments as a maritime authority jointly with Law 6.938/81, art. 3; Law 9.537/97<sup>9</sup>, art. 4; Law 9.605/98, art. 61 combined with 9 Law 9.537/97 Talks about the safety of waterway traffic in waters under national jurisdiction and takes other measures. Art. 4. The maritime authority has the following attributions: I – create standards to: a) qualify and register waterway workers and amateurs; b) traffic and permanence of ships in waters under national jurisdiction, as well as their inlet and outlet from ports, wharfs, anchorages and marinas; c) carry out naval inspections and surveys; d) tonnage, definition of free board, capacity, identification and classification of ships; e) ship register and Ownership Register inspection; f) ceremonial and use of uniforms onboard national ships; g) register and certification of heliports on ships and platforms for approval by the relevant agency; h) carry out works, dredging, mineral survey and mining under, on and at the margins of waters under national jurisdiction in what concerns the order of the waterway space and the safety of navigation, to harm of duties in face of the other relevant agencies; i) register and operation of marinas, clubs and nautical sports entities in what regards the protection of human life and the safety of navigation in the open sea and internal waterways; j) register navigation companies, experts and classifier companies; l) establish and operate navigation signs and aids; m) application of penalties by the Captain; II – regulate piloting services, establish piloting areas in which the use of the service is mandatory and specify the ships that are excused of the service; III – define ships' safety crew, insuring to the interested parties the right of appeal whenever they disagree of the number set forth; IV – define equipment and accessories to be approved for use onboard ships and platforms and set forth the requirements for approval; V – establish minimum number of safety equipment and acces-

art. 70, as well as Resolution 217/01 of ANVISA, forecast the possibility that DPC adopts measures to preventively guarantee the protection of the Brazilian Marine Environment. (IBRAHIN, 2012)

Environmental problems happen constantly and that demonstrates the environmental crisis that affects all the countries. That is also the understanding of (BALIM; MOTA E SILVA, 2014, p.184) “Environmental and social problems are more and more frequent and complex, the solutions cannot be found in the technique nor in science, and a society that is more conscious of its position in the world starts demanding and looking for its values again.” However, to fully agree with that position would be to discredit science and technique when solving the problems regarding ballast water since it is subject to studies to solve the pollution of the oceans.

## **FINAL CONSIDERATIONS**

Water was one of the best inventions to be used as ballast for ships. It is necessary for balance. However, no one had ever thought that it could cause bioinvasion, which is a form of marine pollution with significant environmental and economic impacts.

Bioinvasion, as well as the Zebra Mussel, resulted in a lot of losses in Canada and in the United States. Those were emblematic cases that were taken before IMO (International Maritime Organization)’s Marine Environment Protection Committee. That is the agency that regulates the safety of navigation and the prevention of maritime pollution at an international level.

IMO published Resolution A.868 (20) in 1997 with the guidelines to control and manage ships’ ballast water.

Brazil has also suffered with the pollution of invader species and it still runs the risk, even with specific legislation on the subject in force in the country. In order to prevent and face that danger, ANVISA, National Agency for Sanitary Surveillance; ANTAQ, National Department for Waterborne Transport; the Board of Ports and Coasts and the Port Authority are directly responsible for the issues that involve ballast water, and they permanently act on the protection of the marine environment.

The Brazilian Marine Authority prepared Maritime Standard 20

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sories for ships and platforms; VI – establish the limits of interior navigation; VII – establish requirements regarding safety and habitability conditions and the prevention of pollution by ships, platforms or their support facilities; VIII – define maritime and interior areas to build temporary shelters where ships can anchor or stick for repairs; IX – carry out naval inspection; X – carry out inspections, directly or by appointment to specialized entities. (BRAZIL, LAW 9.537/97, 2015)

(NORMAM 20) that, among other aspects, establishes that every ship that moors at national ports has to prove that the ballast water was changed in high seas according to the international provisions. That helps decrease the risk of bioinvasion at the Brazilian coast. In case of illegal shedding, Law 9.605/98 and the Law of Environmental Crimes can be applied. The last one sets forth the authorities that can draw up infraction notices and start administrative proceedings.

Brazil is concerned about the issue and the national legislation evidences the effort to avoid marine pollution. However, field research is necessary so that invader organisms are identified prior to pollution. It is also necessary to carry out a study in order to define the most sensitive areas that should be protected by inspection due to their original environmental value.

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