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Maritime stakeholder perceptions on challenges and opportunities to ratify the Ballast Water Management Convention in Ecuador: perspectives from maritime decision-makers and port state control officers

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Maritime Stakeholder perceptions on challenges and opportunities to ratify the Ballast Water Management Convention in Ecuador:

Perspectives from maritime decision-makers and Port State Control Officers.

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Declaration

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

Malmo, September 20th ,2022

Supervised by: Dr. Mary Wisz

Dr. Aspasia Pastra

Professors of World Maritime University

Acknowledgments

I would like to start by thanking God for allowing me to develop this brilliant academic program in one of the most prestigious universities worldwide. I would also like to thank God because in spite of the difficult initial times due to the pandemic, things were improving and the students were able to return to the classrooms to follow the classes in the most didactic way possible as it is face-to-face learning.

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My Dad is now in heaven and this goes for him too.

Abstract

Title of Dissertation: **Maritime Stakeholder perceptions on challenges and opportunities to ratify the Ballast Water Management Convention in Ecuador: Perspectives from maritime decision-makers and Port State Control Officers.**

Degree: **Master of Science**

This dissertation investigates the challenges and opportunities facing Ecuador's ratification of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 from the International Maritime Organization (IMO). The study addresses the ratification process. It examines the role of Ecuadorian Maritime Authority's decision makers and Port State Control in order to identify the challenges, barriers, benefits, and actions to be addressed in case of ratification. This dissertation also addresses stakeholder perceptions of how compliance with the Ballast Water Management Convention (BWMC) regulations can protect the marine environment.

The research utilized a qualitative research method in the form of semi-structured interviews with key stakeholders (seven engaged in policy decision-making and six members of the Port State Control). Interviews were transcribed, coded, and studied through thematic analysis. The results of the interviewers underscored the barriers to the ratification process in Ecuador.

Moreover, the results highlighted the benefits of accession. The analysis further confirmed that these stakeholders agree that the ratification of the BWMC for Ecuador is important, and will help to protect its maritime environment from the spread of non-indigenous species.

KEYWORDS: Ballast Water Management Convention (BWMC), Marine Reserve Zones, non-indigenous species, Invasive aquatics species (IAS).

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List of Abbreviations

BWMC	Ballast Water Management Convention
BW	Ballast Water
BWMS	Ballast Water Management System
BWM	Ballast Water Management
BWE	Ballast Water Exchange
BWTS	Ballast Water Treatment System
BWMP	Ballast Water Management Plan
BWRF	Ballast Water Record Form
CDB	Convention on Biological Diversity
COC	Certificate of Competency
D-1	Ballast Water Exchange Standard
D-2	Ballast Water Performance Standard
DIRNEA	Ecuadorian National Directorate of Aquatic Spaces
FAO	Food and Agriculture Organization of the United Nations
GLOBALLAST	Global Ballast Water Management Programme
HAOP	Harmful Aquatic Organisms and Pathogens
III CODE	Implementation of IMO instruments Code
IMO	International Mariitme Organization
MEPC	Marine Environment Protection Committee
PSC	Port State Control
ROCRAM	Operational Network for Regional Cooperation of Maritime Authorities of the Americas
SMS	
UNCLOS	United Convention of the Law of the Sea
UN	United Nations

Introduction

1.1. Ballast water is a source of challenges for the ocean.

The Non-indigenous species in the ocean are living organisms introduced intentionally or unintentionally, outside of their natural ecosystem through human activities (Olenin, et al., 2010). The potential to spread to other locations with an adverse effect on biodiversity, ecosystems, human health, and socioeconomic values establishes them as Invasive Aquatic Species (IAS).

It should also be added that the introduction of non-native species into new marine ecosystems is identified through shipping and this problem has been increasing in view of the new designs of metal hulled ships allowing the use of ballast water instead of solid materials. These ballast waters are absorbed, transported, and discharged from one region to another in different environments. The impact of the introduction of non-indigenous species has been catastrophic in many parts of the world and continues to grow with the expansion of trade and maritime traffic in the oceans (International Maritime Organization, 2017).

Consequently, Carlton (1996) and Pimentel & Morrison, (2005) stated that some of these species have demonstrated the ability to establish new environments outside their natural habitat, which has threatened native species, causing ecological damage and even becoming a threat to the health and economy of countries, the reason why they have been classified as invasive.

In addition, the International Maritime Organization (2004) indicated that the transport of invasive species is often, but not exclusively, associated with the transport of commercial activities of ships; i.e. through hull fouling and or wet and dry ballast, making port environments entry sites for biological invasions. At the time, 90% of global trade is conducted via ships that inadvertently and unwittingly transported aquatic species from one region to another (Awad, et al., 2014).

This means that the increase in the rate of species introduction is attributed to the increase in trade across the ocean since the 20th century, a scenario that has been benefited by the development of technology, speed, and frequency of maritime

transport, all of which makes ballast water the most active vector of marine invasions (Tamelander, et al., 2010). So, just as shipping is essential to the global economy for moving cargo and goods over long distances, sea operations have the benefit to operate at the best cost-benefit (UNCTAD, 2008).

To reduce the risks posed by ballast water, a number of measures have been adopted worldwide to regulate this issue regarding water loading and discharge. One of them is the IMO Resolution 868 (20) of 1997 (IMO, 2004), which considers, whenever possible, ballast water to be changed at least 200 nautical miles from the nearest shore and in waters at least 200 meters deep (Regulation B-4 of the International Convention for the Control and Management of Ships Ballast Water and Sediments). This replaces the coastal water that was generally loaded into the port with low salinity instead of high salinity ocean water (Minton, et al., 2005). The basis for adopting this measure defines that coastal organisms are killed by the increased salinity as they are slushed into the ocean water, and the same is true for ocean organisms as they are discharged into the receiving port waters (Brickman & Smith, 2007). This significantly reduces the risk of bio invasion either by physical displacement and/or biocidal effects (Hülsmann & B.SGalil, 2001). However, despite the corrective measures taken, it is estimated that ballast water is responsible for the transfer of approximately 7,000 to 10,000 species of marine microbes, plants, and animals globally every day, although there are few confirmed cases of species introduction by this route (Carlton, et al., 1999). When this scenario has been evidenced, its consequences have been catastrophic and irreversible, and precautionary approach suggests that every ship carrying ballast water should be treated as a potential risk (David & Perkovic, 2004).

On the other hand, ballast water is transported by ships in all world´s oceans and it is understood by design that most of them must store seawater in spaces called ballast tanks to sustain the stability of the vessels. Furthermore, while a ship is in transit, what happens to the water contained in the ballast tank is a process of settlement of microorganisms that transform into sediments concentrated on the bottom (GEF/UNPD/IMO GloBallast Partnerships Programme and WMU, 2013).

Moreover, Aquatic Invasive Species (AIS) have been considered a huge threat to the oceans, as they have been found to cause enormous environmental, economic and general public damage. The challenges facing the oceans for the preservation of marine ecosystems should be addressed by all countries, with the implementation of international policies to reduce the transmission of pathogens from one region to another through the maritime transport of ships (Globallast Partnerships, 2022).

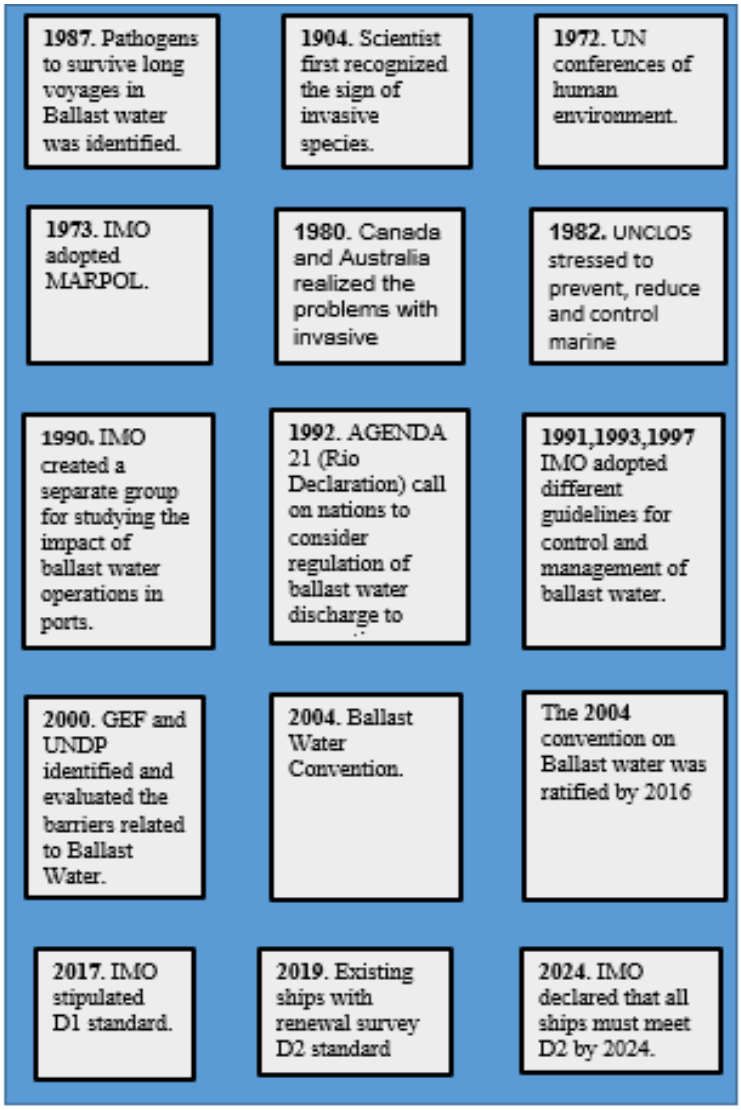
In this context, it is essential to have a greater level of effective implementation regarding ballast water management. As expressed by Murphy, et al., (2006), the lack of a reliable tool to determine whether the exchange water ballast procedure is effective. The management control relies on the confidence that the procedures are declared in documents regulated by the BWMC, which are usually submitted by the ship´s master to the Port State Control Surveyor, also known as the Harbor Master (IMO, 2021).

According to R.Murphy, et al., (2013) with these documents, self-reported data would be the only resource used in order to identify compliance with ballast water management. A visual inspection of the ballast water carried out in the port could be inoperative without effective control, given the possible similarities between ballast water and receiving port water both of which are marine waters.

The challenges facing the oceans regarding these threats are therefore very significant, and the main sectors where the impacts are most evident are economic, social, and environmental. In response to these challenges, ballast water has been managed with international and national policies according to the following timeline:

Figure 1

Sequence of Ballast Water International Regulations



Source: adapted by the author from (Lakshmi, Priya, & Achari, 2021) DOI: 10.5772/intechopen.99552.

1.2. Ballast Water Management Convention as an International Policy.

As expressed in the previous item, a major threat to marine ecosystems is caused by invasive species. As it has been identified that a major form of transmission to introduce species to new environments occurs through shipping, so it was necessary to address this problem at the international level for all member states of the International Maritime Organization in order to create an international legal instrument to prevent this devastating impact (IMO, 2017). The prior support to give force and

validity to this international policy is based on Article 196(1) of the United Nations Convention on the law of the sea (UNCLOS), which states that:

> States shall take all measures necessary to prevent, reduce and control pollution of the marine environment resulting from the use of technologies under their jurisdiction or control, or the intentional or accidental introduction of species, alien or new, to a particular part of the marine environment, which may cause significant and harmful changes thereto" (International Maritime Organization, 2009,p.1).

Other previous regulations which underpinned and provided the impetus for the creation of an international policy to address ballast water management were the Convention on Biological Diversity (1992), the Rio de Janeiro Declaration on Environment and Development, and several IMO resolutions at the Marine Environment Pollution Committee level. After ballast water treatment became mandatory for the majority of merchant ships belonging to the maritime trade (Balaji, Yaakob, & Koh, 2014), the member states under the direction of IMO adopted on 13 February 2004 the "International Convention for the control and Management of Ships' Ballast Water and Sediments" which entered into force on 8th September 2017. BWMC is applicable to new and existing vessels that are constructed to transport ballast water. The main intention is to stop the introduction of invasive species like microorganisms and pathogens through the discharge of ballast water and sediments into new marine ecosystems causing a harmful impact (Singh, 2020).

In order to make a brief summary of the main regulations of the BWMC, the table below indicates the most relevant articles in compliance with each member ratified state.

Table 1

Relevant articles of the Ballast Water Management Convention.

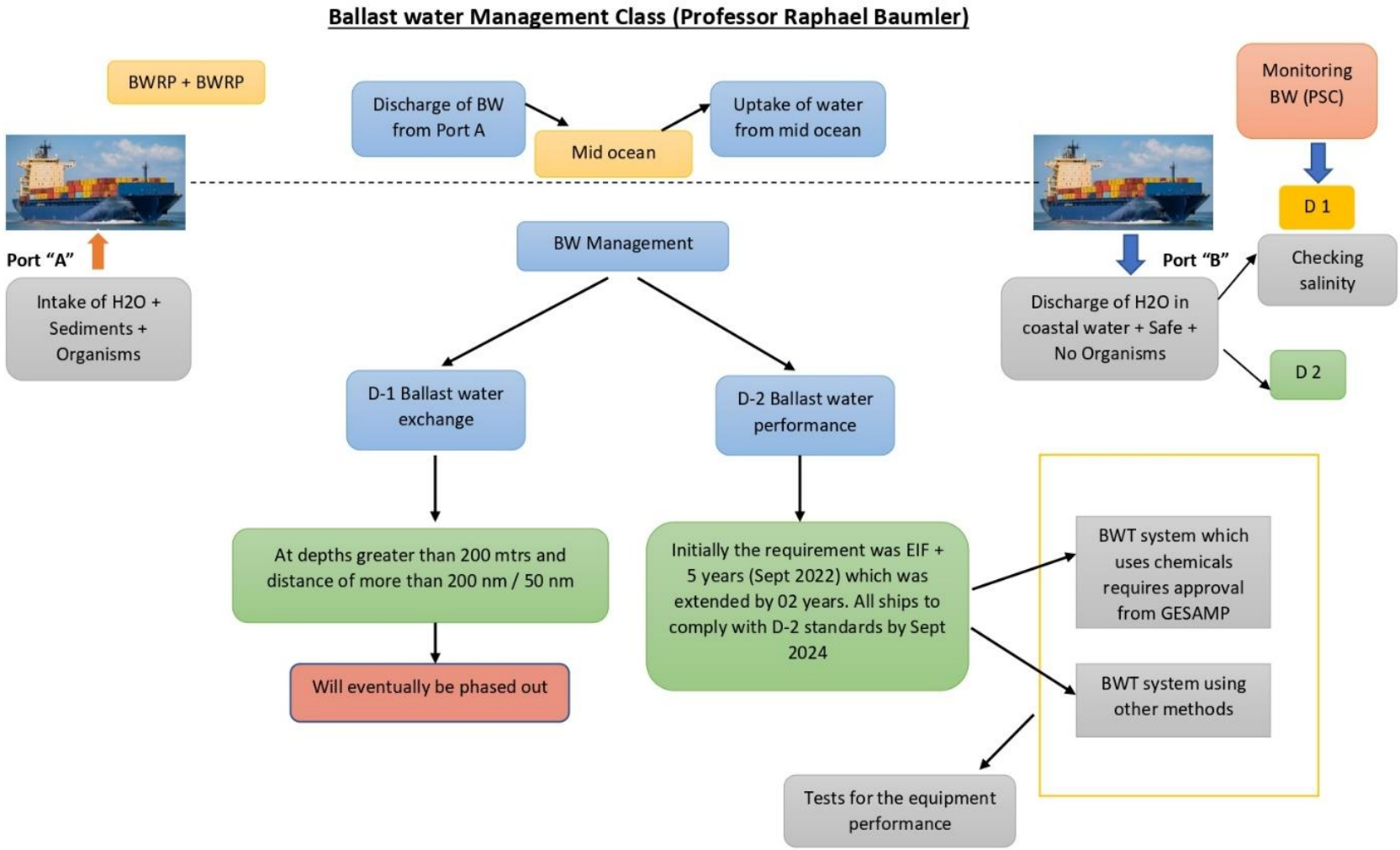
Application: All ships in international traffic carrying ballast water (Ships entitled to fly the flag or which operate under the authority of a party.	
Requirements	Ballast Water and Sediments Management Plan, Ballast Water Record Book, International Ballast Water Certificate, Ballast Water Management Procedures.
Article 2	Prevent, Minimize and Eliminate the transfer of harmful aquatic organisms.
Article 5	Reception facilities in ports and terminals.
Article 6	Scientific Technical Research and monitor ballast water in jurisdiction state.
Article 7 - Article 9	Port State Control Surveys and Inspections.
Article 13	International and Regional Cooperation.
Annex Section A	The way of Ballast Water discharge
Annex Section B	Regulation B-1 Regulation B-2 Regulation B-3 Regulation B-4
Annex Section C	Additional measures to prevent.
Annex Section D	Regulation D-1 Ballast Water Exchange Standard. Regulation D-2 Ballast Water Performance Standard. Regulation D-3 Approval Requirements.

Source: (International Maritime Organization, 2017) for further information: https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships%27-Ballast-Water-and-Sediments-(BWM).aspx

Once there are accepted solutions to address marine environmental problems related to ships' ballast water and their prevention through the application of this studied convention, it is necessary to know that every vessel engaged in international trade shall comply with its regulations (Batista, et al., 2017). An attempt is made to clarify the practical compliance of the ballast water management aboard the vessels with the simple explanation of the following figure:

Figure 2

Summary of Ballast Water Management methods aboard Vessels



Source: Notes of Prof. Raphael Baumler's class on WMU. Classmate S. Harinder, 2022.

The acceptance and concern of the BWMC by the members' states of the International Maritime Organization is becoming more and more relevant every day and the support shows that up to the present day 86 countries have already ratified this international instrument, representing 91.19% of the international merchant fleet worldwide (United Nations, 2021). Moreover a few years ago, in 2019, the Code for Approval of Ballast Water Management Systems became mandatory and some amendments related to the examination of these systems and certification are in process so far. The growth in addressing this problem is remarkable and its international scope is becoming increasingly important in order to preserve and protect the marine ecosystems of IMO member states against the dangers of untreated ballast water. It could be stated that the legal policy to solve this problem is already in place but its implementation and the control of its compliance by the states are additionally necessary.

1.3. Port State Control and BWMC relationship.

According to Wankhede (2019), Maritime Administrations of the states around the world in order to ensure that the international fleet coming to their ports of jurisdiction is in the appropriate conditions in terms of international regulations and in compliance with the standards of the International Maritime Organization, execute the Port State Control (PSC) survey to the foreign vessels as a general practice. The ballast water management plant is one of the main certificates included in the PSC inspections and verifications aboard a ship and as stated by (Chen, Kang, & Liu, 2022) the relevance for port state control inspections is strongly recommended for better ballast water management and these surveys may address the verification of valid documents and even sampling the ships ballast water to meet a performance standard.

The powers that enable a state to exercise authority as a Port State are the international conventions to which it has been ratified. Therefore, there are several legal instruments that develop the commitment to this important role which are presented below:

Table 2

Legal support of Port State Control role

Legal instrument	Section detailed
IMO Instruments Implementation Code (III CODE) Resolution A. 1070(28)	- Article 57, 59, 60, 61, 62. (IMO, 2013)
United Nations of Law of the Seas (UNCLOS)	- Part XII Section VI Article 218 (United Nations, 2002)
Requirements form IMO Ballast Water Management Convention	- Article 9 Item 1,2,3 Inspections of ships. - Article 10 Item 1,2,3,4 Detection of violations and control of ships (International Maritime Organization, 2009)

Note: Elaborated by the author.

In addition, IMO Resolution A.682(17) is a valuable document that addresses international cooperation for the control of ships' discharges and even more clarifies the main tasks of the port state role for each member state surveyors. In order to keep a performance standard, the role is divided into eight regions through Memorandums of Understanding (MOU) for regional implementation and enforcement (IMO, 2019). The following table indicates the different MOUs highlighting the applicable to this study:

Table 3

Port State Control Regimes

1	Paris MoU	Europe and the North Atlantic
2	Tokyo Mou	Asia and the Pacific Region
3	Acuerdo de Vina del mar	Latin America Region
4	Caribbean MoU	Caribbean Region
5	Abuja MoU	West and Central Africa
6	Black Sea MoU	Black Sea
7	Mediterranean MoU	Mediterranean Sea
8	Indian Ocean MoU	Indian Ocean
9	Riyadh MoU	Persian Gulf
10	USCG	The United States

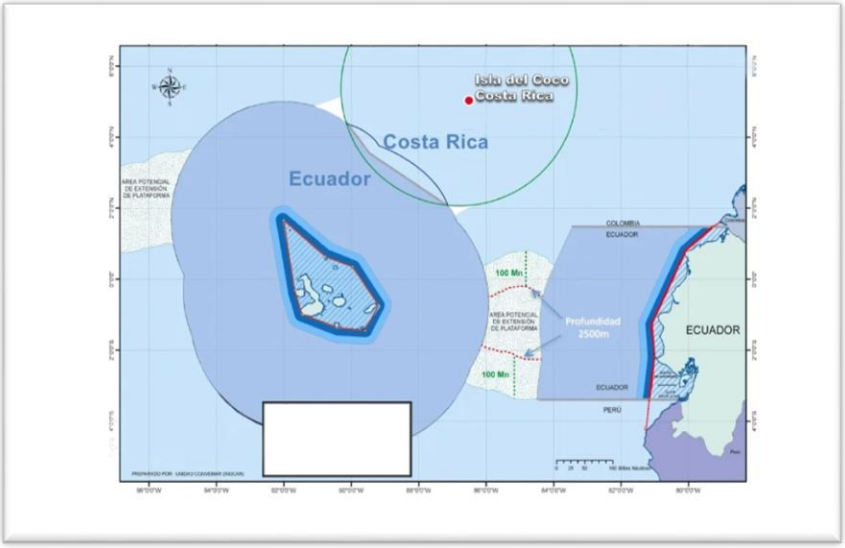
Source: Adapted International Maritime Organization. Further info https://www.imo.org/en/OurWork/IIIS/Pages/Port%20State%20Control.aspx

1.4. BWMC in Ecuador.

Ecuador is a country located in South America, specifically in the northwest direction. It is considered the middle of the world and shares boundaries with Colombia in the North, Peru in the South and East, and Costa Rica on the west side because of the maritime limits. The strategic location connects maritime transport and trade with international routes from everywhere through the Panama Canal with Europe and Asia in the Pacific Ocean. According to SENPLADES (2017), Ecuadorian Maritime Jurisdictional Spaces include internal waters, territorial sea, Economic Exclusive Zone with contiguous zone, Continental Plattform, and maritime spaces out of jurisdiction but with country interests. The National Territory extension in Ecuador is 1.349.357,07 divided into land territory 257.217,07 and maritime territory 1.092.140,00. Only in this relationship between land and maritime territory, it can be visible that the responsibility of Ecuador is five times bigger in maritime extension than on land and make this country a dependent sea state by history and excellence.

Figure 3

Ecuadorian Maritime Zones according UNCLOS



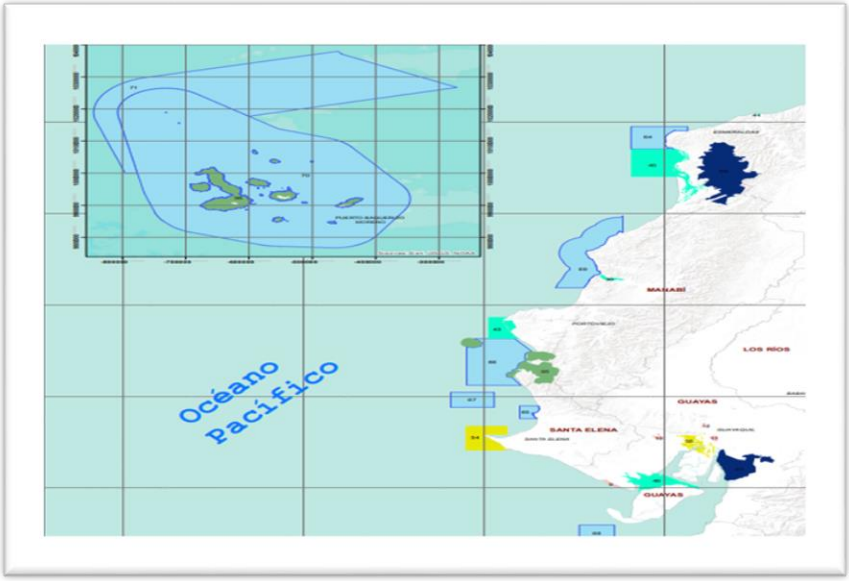
Source: (Ecuadorian Presidence , 2012). https://es.slideshare.net/PresidenciaEc/3-mics-convemar?next_slideshow=1

1.4.1 Ecuador and the current status of the convention.

Ecuador is a member state of the International Maritime Organization and at the moment it has ratified 29 out of 52 IMO conventions as international instruments (IMO, 2022), however, the Ballast Water Management Convention is not on the list of ratification in the country despite the huge extension of jurisdictional water responsibility mentioned previously. In addition, Ecuador has eight marine protected areas within its jurisdictional waters (Ministry of Environment, 2022), they are distributed in different regions in the Continental area and the Galapagos Archipelago. These marines' reserve areas are highly protected by the state due to the importance of the unique ecosystems with native species of the region that make them highly sensitive and vulnerable.

Figure 4

Marine Protected Areas of Ecuador



Source: (Ministry of Environment, 2022). https://www.ambiente.gob.ec/areas-prrotegidas/

In the economic sector through sea benefits, Ecuador's aquaculture exports correspond to more than 95% of farmed shrimp, and because of this growth in international trade Ecuador has become the world's leading shrimp exporter (FAO, 2018), however by history, the aquaculture sector has been suffered several threats coming from different diseases which caused significant loses as an example in the ninety decades the white spot virus originating from another region and possibly transported by ships in ballast tanks as a vector of transmission. According to Restrepo, et al. (2018), the white spot virus pathogen in Ecuador was confirmed in 1999 and even this disease became an epidemic a few years later for that reason, this virus has been considered the most terrible negative impact on aquacultural farming of shrimp. The pathways that originated this epidemic in the past could be the aquarium trade, the frequency of imports of shrimp production, and recreational fishing but moreover, the ballast water is recognized as the major unintended vector with tragic consequences for the marine environment being part of this devastating historical event (Mendoza, et al., 2014).

Addressing the social sector concerning health, there was another detrimental impact in Ecuador in the past, the cholera bacteria. Cholera is a disease that causes

gastroenteritis by the ingestion of the “Vibrio Colerae” bacteria and the first case in Ecuador was informed in 1991 (Malavade, et al., 2010). It was not only a local disease but a regional in South America which affects as an epidemic in some countries in the recent past. It is important to mention that a practical investigation with samples collected and tested from ten ships coming from different environments, demonstrated that the cholera bacteria was incrusted in five out of ten ballast water samples evidencing the transmission in this way (Meena, et al., 2022). These past events prompted the development of relevant measures for the prevention and mitigation of external pathogens leading to new severe impacts in the social, economic, and environmental fields. Following this concern, Ecuador as a sovereign state through its maritime administration and in cooperation with all stakeholders involved in the maritime sector adopted regulations to face the problem of ballast water.

The responsibilities and competencies to address the prevention of invasive species in the jurisdictional waters of Ecuador are shared between the maritime administration and the ministry of environment according to its Law Constitution (cita constitution), however, the competence regarding the marine environment is led by the Ecuadorian Navy as a Maritime Authority that through the Marine Environmental Management Department, elaborates the strategic plans concerning problems of Ballast Water (DIRNEA, 2021). At the moment the Ballast Water Management Convention in Ecuador is currently being discussed at a political level. At a strategic and tactical level, the authorities involved have already submitted all the corresponding reports of convenience for ratification but nowadays the country is not part of the convention yet. Despite this limitation, the Ecuadorian maritime administration is conducting coordination with the national environmental authorities and with the IMO at the international level in order to issue policies and actions concerning marine environmental preservation.

The following table indicates the current regulations in force regarding ballast water in Ecuador highlighting the role of Port State Control with the international fleet:

Table 4

Ballast Water Regulations in Ecuador

Legal Instruments regarding Ballast Water Management	
Law Constitution	Art 86 Environmental Preservation
UNCLOS	Art 196(1) The prevention of the Accidental or intentional species introduction.
Organic Law of Navigation and Maritime-River Safety Management. Official Register No 472.	Art 13. Port State Control regarding marine protection and prevention.
- Resolution No. 115 – Seawater-Ballasted ships from abroad. - - Resolution No. 29 Rules for the Control of Ballast Water and Sediment Management of Ships.	- 28 August 2001. Foreign vessels with ballast water shall exchange their ballast 50 nautical miles away before entry to ports. - 19 June 2019. Prevention and control of Ballast Water Management and Sediments.
Note: there is no BWMC ratification by Ecuador	

Source: (United Nations, 2002) UNCLOS. (National Assembly, 2021) The National Assembly Republic of Ecuador. (FAO, 2001) FAO Data base.

1.4.2 Overview of Port State Control inspections procedures in Ecuador.

The common steady growth in the size of container ships is representing a threat to the main trends that have been registered in the shipping industry in the last fifteen years. It is estimated that in the South American region, which includes Ecuador, there will be a greater number of post-Panamax ships (ECLAC, 2020). This event represents an immense responsibility for the Ecuadorian Maritime Authority to face the challenge of international merchant shipping traffic and the rising number of vessels that would arrive at the ports of the jurisdiction. Just for a brief clarification with relevant data promulgated through the United Nations Development Goal number

14 “Life Under Water”, more than fourteen thousand vessels per year cross to or from the Panama Canal through the Caribbean Sea and the Pacific Ocean.

Moreover, the transfer of invasive aquatic species through the exchange of Ballast Water is one of the four greatest threats to the oceans causing a deep social-health, environmental and economic impact (Economic Commission for Latin America and the Caribbean, 2019).

At the National level, according to the Undersecretary for Ports and Maritime and River Transport reported on the 2020 management, even with the effect of Covid-19, the shipping service was not interrupted and the maritime traffic movement correspond to international traffic in continental ports with a total of 3386 vessels in both the public and private port system. On the route to the Galapagos Archipelago, a total of 45925 tons of cargo was transported due to the demand (Ministry of Transport and Public Works, 2020). According to the data provided the demand for the fulfilment of the Port State Control role in Ecuador needs an effective performance, and therefore the education, capacity building, and training of its inspectors is a topic of concern.

In order to face this important challenge of exercising Port State Control over the international fleet, Ecuador belongs to international entities in the region such as ROCRAM (Regional Organization for Cooperation among Maritime Authorities of America Continent) and CPPS (Commission Permanent of South Pacific). International authority as a member state of the IMO regarding PSC is received through the Viña del Mar Agreement, however, in order to carry out the inspections to foreign vessels concerning the Ballast Water Management Convention, there would be the limitation of being able to address in those items due to the lack of ratification of the same. SEE A SAMPLE IN APPENDICES PART C.

The aim of this thesis will be to provide results that support the importance of the BWMC for Ecuador and identify the role of Port State Control inspections with the application of the BWMC in case of accession, in this way large-scale marine invasive species impacts due to ballast water will be prevented and the jurisdictional waters will be preserved.

1.5 Research Questions.

The dissertation aims to address the following research questions:

1. What are the challenges for the BWMC ratification in Ecuador by the stakeholder's perspective?
2. What are the opportunities for BWMC accession in Ecuador by the stakeholder's perspective?
3. What would be the benefits of the ratification of the BWMC in Ecuador by the stakeholder´s perspective?
4. What are the best measures for Port State Control to prevent non-indigenous aquatic Species by the stakeholder's perspective?

This study will address these questions with an analysis of stakeholder interviews.

2.0 Methodology

In this Research, two types of interviews were conducted with a qualitative approach. The first round of interviews was made with seven expert participants in the decision and policy-making sector, and the second one was applied with six experts Port State Control Surveyors. The aim of this first round was to evaluate the current ratification process of the Ballast Water Management Convention in the state. The next part developed in the second interview was to know the current situation of Port State Control Inspections and the improvement of the performance in their measures in case of BWMC ratification.

According to Mills & Birks (2014), The qualitative method is very useful because its main purpose is to evaluate the situation that impacts the groups or individuals in a specific social and cultural context, so the outcome produced is much higher in quality. In that order, the credibility, transferability, dependability, and confirmability of the data collection in this research was appropriate in order to have a real interaction with the sectors related to the ratification process of the BWMC and the Port State Control inspections in the case of Ecuador.

2.1 Semi-Structured Interview Analysis

2.1.1 Interview Questions

According to Dearnley (2005), the conduction of semi-structured interviews in practice can be considered an excellent view sharing in order to achieve a good understanding of the management process and for that reason, they can be flexible and predetermined in advance. In this document, one group of professionals with vast experience working in decision and policy making in this sector contributed with real-time information on the current situation for the BWMC ratification process. On the other hand, six participants from the maritime environmental sector collaborated with relevant data on the situation of ballast water management control inspections aboard ships, as they are all surveyors who could also deliver information about the possible improvement of inspection performance in case of ratification of the convention.

Data collection by interviews were made by zoom with a duration of no more than forty minutes in each one, all the interviews were recorded. During the zoom meetings, the panelists of each sector (policymakers and PSC surveyors) were interrogated with open-ended questions in order to collect current information on the BWMC situation in Ecuador. The topics of the questions were related to the following:

Table 5

Topics BWMC Policies in Ecuador

Evaluation of IMO BWMC in Ecuador (Policy decision making).
Work Sector.
Experience in the policy decision-making sector.
The current state of BWMC.
Barriers to ratification in Ecuador.
Potential Benefits after ratification.
Challenges with the adoption of the BWMC.
The importance of BWMC ratification.
Actions to be taken after ratification.

Steps in the ratification process.
Regional Cooperation.
The role of PSC in Ecuador after ratification.
The benefits of BWMC ratification.

Note: Prepared by the author.

Table 5 shows the evaluation scheme of IMO BWMC in Ecuador (Policy decision making), work Sector, experience in the political decision-making sector, the current status of BWMC, barriers to ratification in Ecuador, potential benefits after ratification, challenges with the accession of the BWMC, the importance of BWMC ratification, measures to be taken after ratification, steps in the ratification process, regional cooperation, the role of the PSC in Ecuador after ratification, and the benefits of BWMC ratification.

Table 6

Topics PSC situation in Ecuador

Evaluation of PSC inspections regarding BWMC in Ecuador.
Work Sector
Experience in the PSC inspections.
Deficiencies in the control of BWM
The need for BWMC ratification?
Potential benefits.
Inspections Challenges with BWMC ratification.
Modifications in the PSC sector after BWMC ratification.
Port Reception Facilities in Ecuador for BW.
Surveyor training and capacity building.
International cooperation to the Surveyors.

The contribution of the BWMC to the Marine Reserve Areas.
Quantity of competent Personnel.

Note: Prepared by the author.

Table 6 shows the evaluation of the PSC inspections with respect to BWMC in Ecuador. Here are exposed aspects such as: work sector, experience in the Port State Control inspections, deficiencies in BMW control, the need for BWMC ratification, potential benefits, inspections Challenges with the ratification of BWMC, modifications in the PSC sector after the ratification of BWMC, Port Reception Facilities, training of surveyors, international cooperation for surveyors, the contribution of the BWMC to the Marine Reserve Areas, and the number of competent personnel.

2.1.2 Ethics Approval

The interviews were submitted for the WMU Ethics approval on Tuesday, April the 5th, 2022, and approved on Wednesday, April the 13th, 2022. The anonymous identity of the panelist prevailed and the consensus form was delivered to them and signed in order to certify the validity of the information obtained before starting with the interviews. Furthermore, participants were notified that their answers would be used for academic purposes only. Therefore, the experts have the clearance to answer the questions provided in the section results.

2.1.3 Selection of the panellists.

At this stage of the study, the questions were formulated for expert panelists from two important sectors related to the Ballast Water Convention who, with their knowledge, experience in the field, and work related to the research topic, contributed with real and updated information on the current regulations about the control of ballast water and sediments in Ecuador and at the same time how its practical implementation is achieved with the inspections of international flagships that enter to

the ports of jurisdiction and in their tanks they occupy ballast water from other parts of the world which might carry microorganisms or non-native species on them.

2.1.4 Transcribing, Coding of Themes for Answers

For this research, the Zoom application was used in order to have the video and voice recording of the participants in real-time, then the content was transcribed using the use of Google transcription and, in turn, the translation from Spanish to English in a reliable way. It was confirmed personally that the transcription was correct. In the end, the coding of the responses in themes was carried out.

The main reason for this study was to collect relevant information on the perceptions of seven experts in the field of policy-decision making and six experts in the PSC inspections sector in relation to Ballast Water Management Control in the country, therefore, the interviews were adapted on 4 main themes divided each 2 into the areas mentioned before:

In policy-making:

- Barriers to the ratification of the convention.
- Benefits of the Convention in case of adoption.

In Port State Control:

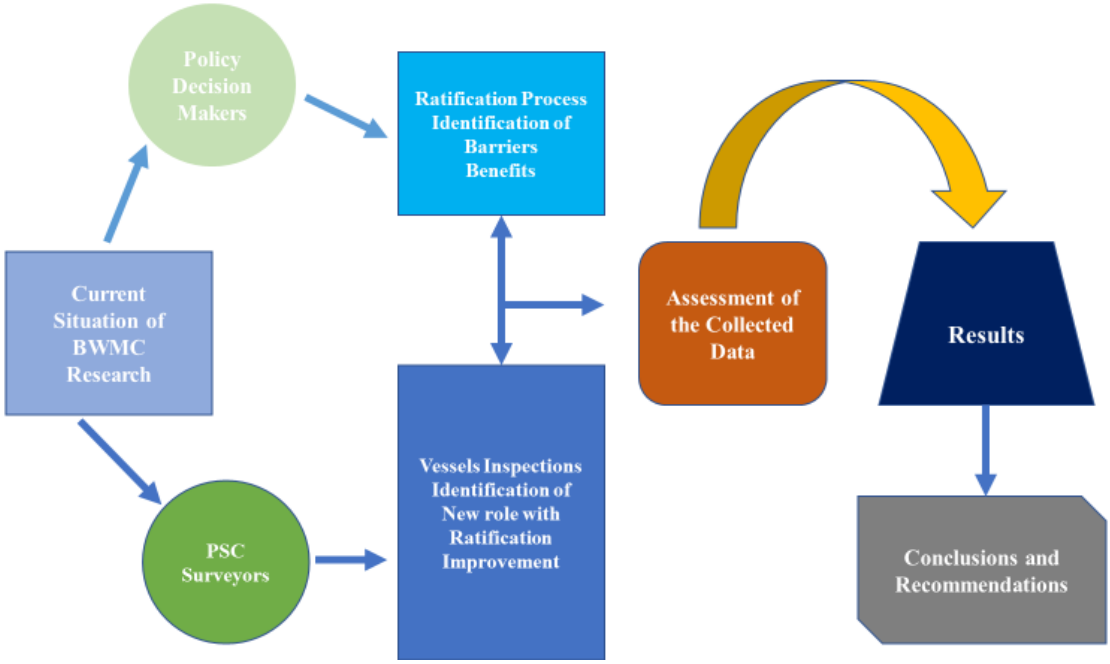
- New roles in case of ratification.
- Improvement of the control and protection of marine ecosystems.

2.2 Scenario Evaluation.

Once the data collection of this research was obtained, it was synthesized and adapted in relation to the themes of the dissertation. Likewise, it was divided into two main blocks to analyze both parts independently and later connect them to each other to provide support for the importance of the ballast water convention in policy decision-making and PSC. The content of the information obtained within its narrative is presented later in the development of the results and serves as a structure for the elaboration of the conclusions and recommendations of the present investigative work.

Figure 5

Procedure of qualitative research. Data collection



Note: Prepared by the author.

3.0 Results

3.1 Data collection

In this part, the data collection was done through two sets of interviews addressed to the two research sectors of the BWMC. The following tables will present the background of the interviewed panelist, and their delivery of information concerning each topic of the questionnaires presented in ANNEX A. A summary of the different causes faced by the BWMC in Ecuador considering the themes found for the following analysis is also presented. The research sectors addressed are the policy decision and the port state control. All panelist contributes as volunteers and none of them did receive any payment for the interviews. The quotations implemented in the results do not consider names, positions, or hierarchies in order to keep the confidentiality and anonymity of the information collected for academic purposes.

Table 7

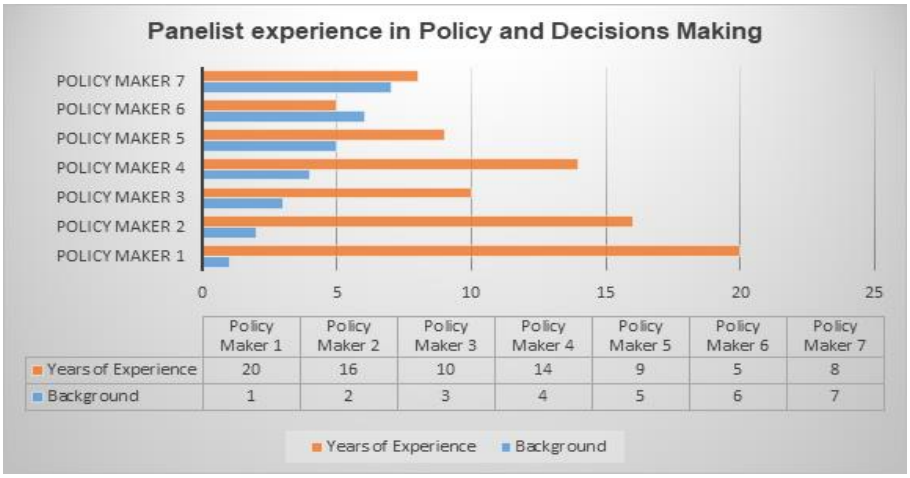
List of Panellists in Policy decision-making

Panelists	Background/sector	Years of Experience
Policy Maker 1	1. Technical Maritime Department at DIRNEA (Ecuadorian Maritime Authority)	20
Policy Maker 2	2. Head of IMO Ecuadorian Mission to London (Environmental Committee)	16
Policy Maker 3	3. Technical Maritime Legal Advisor at DIRNEA	10
Policy Maker 4	4. Head of IMO Ecuadorian Mission to London 2 (Environmental Committee)	14
Policy Maker 5	5. Technical Maritime Advisor at the Ministry of Defense	9
Policy Maker 6	6. Chief of the Security Department at Maritime Administration	5
Policy Maker 7	7. Chief of the Environmental Management Department at DIRNEA	8

Note: Prepared by the author.

Figure 6

Experience and background connected with table 7



Note: Prepared by the author.

Table 8

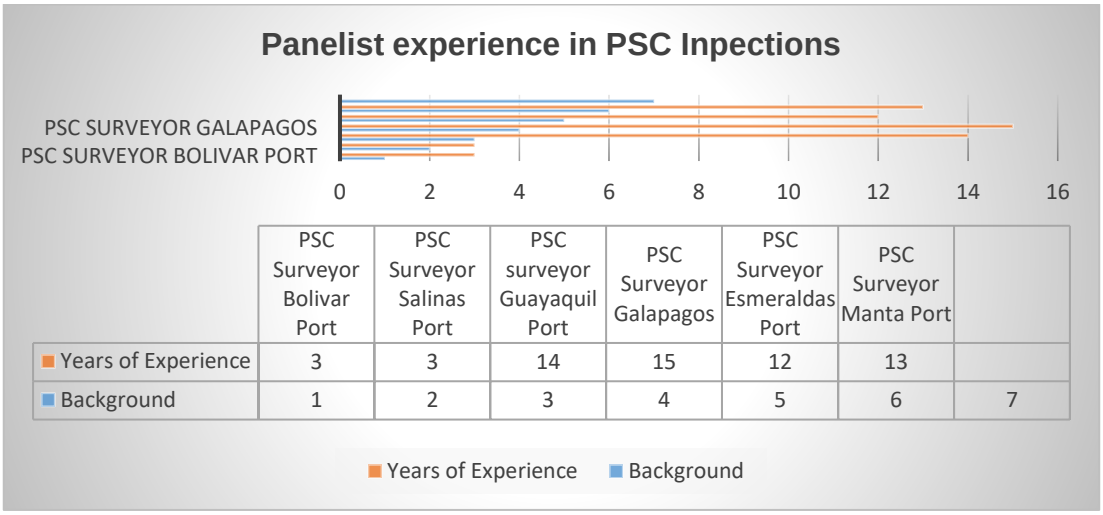
List of Panellists in PSC Surveyors

Panelists	Background/sector	Years of Experience
Inspector 1	PSC Surveyor Bolivar Port	3
Inspector 2	PSC Surveyor Salinas Port	3
Inspector 3	PSC Surveyor Guayaquil Port	14
Inspector 4	PSC Surveyor Galapagos Archipelago	15
Inspector 5	PSC Surveyor Esmeraldas Port	15
Inspector 6	PSC Surveyor Manta Port	12

Note: Prepared by the author.

Figure 8

The main ports of Ecuador and experience of PSC Surveyors



	PSC Surveyor Bolivar Port	PSC Surveyor Salinas Port	PSC surveyor Guayaquil Port	PSC Surveyor Galapagos	PSC Surveyor Esmeraldas Port	PSC Surveyor Manta Port	
Years of Experience	3	3	14	15	12	13	
Background	1	2	3	4	5	6	7

Note: Prepared by the author.

As Ecuador has not yet ratified the Ballast Water Convention, the panelists provided important information on the stage of the ratification process and the importance of this IMO Convention. Likewise, in case of ratification what modifications should be made in its implementation and control phase in the inspections of the international fleet that arrives at the ports of the jurisdiction in Ecuador (PSC).

The data obtained is synthesized in the following tables regarding the themes of the research topic:

Table 9

Data Collection of the Policy Sector

THEMES (POLICY DECISION-MAKING)							
Barriers to the ratification of the convention				Benefits of the Convention in case of adoption			
DATA	**Policy maker 1**	**Policy maker2**	**Policymaker3**	**Policymaker4**	**Policy maker 5**	**Policymaker6**	**Policymaker7**
The current state of BWMC	The request is stuck at the political level	In hands at the political level	A pause at the political level.	Is in the political stage	Process stopped for political issues	Paused in the national assembly	Approval of the political level stage.
Ratification Barriers	Lack of competent personnel	Ignorance of the subject, National Budget	Lack of knowledge at the political level.	It is just a matter of time.	Lack of knowledge of political authorities	Just a matter of time	No attention on the political level, or technological.
Ratification Benefits	Economic activities, reduction of marine affection	Avoid the impact of invasive species.	Incorporate the instrument at the national level.	Help to accelerate instruments to prevent invasive species	Prevention of marine ecosystems	Protection of the marine environment	Tourism, marine ecosystems prevention.
Adoption Challenges	Nation laws modification	Get the budget	Development of capacities	Change on mentality	Get the budget	Implementation, get the budget	Convince the politicians

Importance of BWMC	Yes, very important	Yes, very important.	Yes, very important	Yes, very important	Yes, very important	Yes, very important	Of course yes!
Actions to be taken	Insist with the process	Training surveyors, awareness program.	Operationalize the convention at the national level.	Insist to get the final ratification approval	To gather all stakeholders involved in the maritime sector	Establish some agreements amount all stakeholders.	Training of the personnel involved
Ratification steps required	All levels report to the political level	Technical report to the political level.	Technical motivational reports.	Technical reports to the political level	To address a complete report to politicians	The request for ratification through a technical report	Insist the importance on the political level
Regional Cooperation	ROCRAM, IMO Cooperative Committee	IMO Cooperation Committee, ROCRAM	No Directly in BW but in general through Argentina	With Peru especially	ROCRAM	No cooperation agreement	Regional Virtual meetings and sharing experiences
New PSC role	Issue national regulations in detail	Going deeper into the application	Develop competent personnel.	Resolutions, guidelines, and compliance	Training and capacity-building program	Improve the PSC Surveyor background	Comply with the BWMC effectively
PSC benefits	Greater authority and legal support	Greater support in the inspections	Mainly to avoid the impact of IS	Country reputation improvement	Appropriate instruments	Achieve the compliance with UN SDGs	Effective control

Note: Prepared by the author.

Table 10

Data collection of the Port State Control

THEMES (Port State Control)						
New roles in case of BWMC ratification				Improvement in the control and marine protection ecosystems		
DATA	**Surveyor1**	**Surveyor2**	**Surveyor3**	**Surveyor4**	**Surveyor 5**	**Surveyor6**
Deficiencies	YES	YES		YES	YES, No part of the convention	YES, Convention Not ratified
Ratification need	YES	YES		YES	YES	YES, completely sure
Potential Benefits	YES	YES, Especially in the marine protected areas		YES, huge biodiversity to protect.	YES, prevent marine reserves areas against invasive species	YES, marines ecosystems would be protected
Challenges	Improving the inspections	YES, qualified Surveyors need		YES, control and prevention at sea.	YES, issue the specific regulation of this matter	YES, effective control with application
PSC modifications	Updating national laws and regulations	Checklist, guidelines of PSC		Inform the ratification to MOU Viña del Mar	Modify the PSC forms documents at the National level in BWM	Perform a new regulation and training
Efficient BMC System in ports	NO	NO		NO	NO	NO
Current Training	NO	NO,2019 was the last training		NO, just basic PSC general	YES, through Argentina and some class societies	YES, but very little.
International Cooperation	NO Directly	NO, few trainings		YES, trough IMO Cooperation Committee	YES, through Viña del Mar MOU	YES, but specifically about this topic not enough
Marine Reserve contribution	YES	YES		YES, one part only	YES	YES, totally agree
Sufficient Surveyors	NO	NO		NO, more training is necessary.	YES, but surveyors are also doing other activities	NO, it is not enough.

Note: Prepared by the author.

Table 11

Policy and Port State Control Summary

THEMES POLICIES	RESEARCH FINDINGS	THEMES PSC	RESEARCH FINDINGS
Barriers to the ratification of the convention.	- Political Issues. - Lack of Knowledge. - Lack of resources. - Lack of technology - In general, the pause for ratification is in the political stage	**New PSC role in case of BWMC ratification**	- Update the forms and documents including Ballast Water Management Control. - Training of the Surveyor Staff - New regulations at the national level. - Guidelines and clear Policies - Inform the BWMC ratification to the MOU Viña del Mar.
Benefits of the Convention in case of adoption.	- Prevention and Protection of Marine Ecosystems. - Increase in tourism. - Increase fishing activities and aquaculture. - Accelerate the elaboration of new domestic regulations. - Improvement of the PSC control in Ballast Water Management.	**Improvement in the control and marine protection ecosystems**	- The prevention of the marine ecosystems against non-indigenous aquatic species is the most relevant achievement with BWMC ratification

Note: Prepared by the author.

3.2 Data analyses in the Policy sector.

3.2.1 The current situation, barriers, and benefits of BWMC

This item corresponds to the first question about the current situation of the BWMC ratification and it is observable in table 9 that six out of six policymaker experts in Ecuador agreed the ratification process of BWMC is stuck at the political stage for the last approval and policymaker 5 mentioned:

"the process was stopped in the national assembly for five years due political issues but now is starting again and with the advice of the maritime authority I believe the ratification can be achieved in a short time"

According to the barriers for the ratification of the convention that addressed the next question, three out of six policy experts replied the main reason is the lack of knowledge about this subject, on the other hand, one policy maker aimed there is a technological barrier and two more express that is about economic resources (budget) for example Policymaker 7 states:

"There are many barriers first of all the political view that doesn't get attention to this topic but there are also educational barriers and technological barriers in this ratification process".

In the next question, it is established what benefits could be achieved in case of ratification of the convention, for which the majority of the panelists answered that the main benefit is to prevent a negative impact on the marine ecosystem against invasive species from ballast water then this action would provide protection to marine areas. Likewise, two panelists highlighted other benefits such as the increase in tourism activities and the benefit to the economy due to sustainable fishing and aquaculture.

3.2.2 Challenges, importance, and actions to be taken.

According to the policy expert panelists, the next questions about some challenges that Ecuador would face at the time of ratifying this convention are detailed as follows: get the budget, change of mentality, development of capacities and domestic law modification. For example, policymaker2 states:

"The first challenge is the budget part, again in this case in the public ports, because the public ports will be understood to depend on the State budget, and water and sediment receptions or the well-known PRF port reception facilities must be implemented. Likewise, another great challenge is to have the technology that the country does not exist and will have to be imported. Without a doubt, the challenge is purely budgetary."

Furthermore, in the question about the BWMC is considered important for the adoption in Ecuador all the panelists totally agreed with affirmative data and policymaker 5 elaborates more by expressing:

"the answer is very easy and is yes! because as you know the shipping is international so the marine environment needs to be protected in order to avoid any kind of issues like invasive species which negatively affect the production of the country" this data provides important support for the process ratification in the research.

The actions to be taken in case of ratification that address the next question are very important because Ecuador must be prepared for the huge change and for that reason, two out of seven policymakers established the need for training regarding this subject, in contrast two more surveyors believe that keep insisting at the political level shall be the initiative in the maritime sector, other two said that is better to gather all the stakeholders in the maritime sector and get and compliance agreement about Ballast Water Control, and at the end, one surveyor thinks that operationalize the convention at a national level is a prior action in this process. These differing criteria can indicate the relevance of the actions and even the policymaker 6 clarified:

"it is very important that the maritime administration establish some agreements with the stakeholders in this sector in order to improve cooperation and achieve the goals aimed for compliance with the convention and finally receive the benefits of it. Work together with all institutions in the maritime sector and get the appropriate legal framework at the national level." Cooperation and teamwork are the keys in the national maritime sector.

3.2.3 Steps for ratification, Regional Cooperation, and PSC benefits.

The question about the steps required for ratification at the national level is very well connected to the current situation of the BWMC in Ecuador because a hundred percent of the panelist addressed that everything has been done and it is at the political level the power to complete the ratification process. But there is still more within this important investigation because the measures that would be adopted for the ratification would have an immediate impact on the implementation and enforcement measures in the field of Port State Control, the role of the country and so the final questions were derived towards international cooperation in the region of the state, the new roles to be fulfilled by the PSC in case of ratification and what benefits would be obtained in the inspections with the implementation of the measures governed by this international instrument.

After interrogating the participants about the international cooperation in the region, the largest number of participants were able to agree that it is received through the IMO Cooperation Committee of the Latin American department and ROCRAM, however, two policymakers were able to indicate that on several occasions training has been received directly through the maritime administration of Peru and Argentina. In addition, in what corresponds to new PSC roles to be fulfilled in case of adoption of the convention, it resulted in the incorporation of new formats and checklists for inspections and that is why Policymaker 4 mentioned:

"through the Harbor Masters in each port has a leading role in demanding companies with the regulation establishing the resolutions and guidelines in this

important instrument and an effective control then they have to demand the compliance."

Last but not least in this legal field regarding the benefits that would be achieved in PSC after BWMC ratification most of the Participants consider a great benefit in the area of port state control for Ecuador and this expression of the Policymaker5 can be highlighted, which indicates:

"As I said before the benefit is clear to prevent any other case of damage to the environment and through this ratification, the PSC Surveyor will have the appropriate instrument to achieve it." in the previous question was enunciated for the same participant "The strongest part of this convention is the role of the Port State Control and for that reason the training and capacity-building programs of our surveyors are mandatory."

Through the data collection provided by experts in the field of policy decision-making, it is verifiable that there is a close relationship between the ratification of the BWMC and the role of the PSC in Ecuador, and the implementation factor is delivered in the second section of the interview with the expert PSC Surveyor.

3.3 Data analysis in the Port State Control Sector

3.3.1 Deficiencies and the need for BWMC ratification

In the summary of the PSC sector (table 11), first of all, the question of the current deficiencies regarding the control of ballast waters was formulated, for which a large part of the information could add in its content that the main deficiency is that Ecuador has not yet ratified the BWMC and, on the other hand, the lack of training of the surveyor staff is also found as an evident deficiency, Surveyor6 in his answer expressed as follows:

"First, the country has not ratified the convention and for this reason, the second one is the lack of training of surveyors in this subject".

The next question was strongly connected to the previous one and the need for BWMC ratification is a priority consideration for six out of six surveyor experts, for example, a relevant statement from Surveyor5 supported in his words:

"This ratification is very necessary for the country, in Ecuador we have many continental marine reserves and also in the Galapagos islands and therefore it is important that the ships that enter our waters of jurisdiction carry out correct management of ballast water and also control their compliance with port state inspections. Therefore, your ratification is required."

3.3.2 Potential Benefits, challenges, surveys modification, and facilities

The following question was formulated in order to obtain the current situation of the potential benefits of PSC inspections through the ratification of BWMC and all panelists expressed that the protection of marine ecosystems would be their main benefit through effective control applying the regulations of this agreement once ratified and immediately two more interrogates about challenges and modifications in consequent to the ratification were connected to this data delivered. The main ones are detailed below:

Some challenges are involved in the improvement of the control, training of the surveyors, effective control with BWMC application, and after that modifications are connected to the update of national laws and regulations, change the PSC Guidelines, checklist, and informing the ratification to the Vina del Mar Agreement MOU. As a consequence of this data Surveyor6 highlighted:

"As PSC officers, the challenge will be to do an effective control with the application of the convention and verify its compliance by the vessels."

There is a big controversy on one point regarding the fulfillment of the agreement then in case of ratification. The state must guarantee compliance with the regulations and articles of the agreement and for which regarding the reception and port facilities in Ecuador, according to the interview panelists, a total of 6 out of six

indicated that there are no port facilities in Ecuador, no port in Ecuador is capable of providing ballast water and sediment management services for ships arriving at jurisdictional waters and docks. In an expression, Surveyor6 emphasizes:

"No there are not any efficient systems at the ports of Ecuador so far and the maritime administration in cooperation and coordination with all stakeholders needs to implement these systems after ratification or in advance."

This current reality in the country shows the problems in the port infrastructure that connects with the block of barriers mentioned above for the ratification of the agreement and its need to have a sufficient budget with either public or private investment. it is the responsibility of the state to find the appropriate mechanism to implement the demands of the BWMC in order to comply with its normative.

3.3.3 Training situation and International Cooperation

In this part, one of the most important items in the PSC sector is the performance of the personnel, and the next question was addressed about the type of international or national training that the surveyors staff receive in Ecuador regarding Ballast Water Management Control then the answers by the total of panelist were ambiguous because three out six said that there is no any training in this subject, on the other hand, three more indicated there is some kind of training but very general however as far as some of them know, the last training was in 2019 by the Argentina Maritime Administration. In one-part Surveyor2 said:

"I remember that in 2019 there was an instruction to port state inspectors, by the prefecture of Argentina. And since that moment we have not received any other instruction by a ratified Maritime Authority with the experience in the Ballast Water Convention."

In the international instruments within the implementation process of a state, it is relevant to work on it not in isolation but in cooperation and coordination with more states and organizations both in the region and globally. Based on this reason, the next

question to the experts was to find out if Ecuador receives any kind of cooperation and the answers by two out of six surveyors were negative about any kind of cooperation, in contrast, four more said that international cooperation is received by the IMO Cooperation Committee, ROCRAM and MOU Viña del Mar PSC regional Agreement that involves a neighboring ratified country like Peru.

3.3.4 Marine reserve protection and Personnel

The penultimate question in the interview research for the inspector's experts was related to the contribution of the PSC to the marine reserve areas in Ecuador implementing the BWMC. In this stage, most of the statements were affirmative with enough support because six out of six surveyors said that the BWMC totally contributes to the marine environment however Surveyor4 added that PSC contributes only in one part and the Vessel Traffic System does the other one. The system for effective environmental protection is complemented by vessel monitoring and surveillance.

Finally, the critical finding was about a sensitive factor in any area, the personnel. Regarding enough numbers of PSC surveyors to apply the PSC BWMC aboard the ships, the panelist expressed in consensus the lack of personnel on this subject not because of the quantity but the permanence and even some reasons were different in their statement, for example, Surveyor1 said:

"I am very sincere and I give my personal opinion, we as a maritime authority have enough personnel, however as naval officers, we have to fulfill other tasks and they do not allow us to be in this activity permanently and this subject needs to keep personnel who are always in the sector and let there be permanence. There is enough quantity but a little more stability is needed for these activities to be carried out effectively. Currently, we have completed the training of twelve more PSC inspectors that will be added to the nineteen that we already have and the positive thing is that as naval officers we are always in constant training to fulfill the functions of port state

control, however, since there is no permanence would be a deficiency". On the other hand, Surveyor6 said:

"I think that the number of inspectors we need is not the number we have to be and also the complete knowledge of this subject is not enough for that reason it is necessary to move forward in this area to be ready for the ratification, implementation, and compliance." The need for training is always a factor to improve the performance of Port State Control.

4.0 Discussion

The possible Ballast Water Management Convention ratification in Ecuador is being currently addressed. The benefits that would be achieved for stakeholders in case of ratification directly influence two main areas: Policy Decision making and Port State Control. The direct connection between this two sectors relates to the challenges and opportunities for PSC surveyors in order to have a new legal instrument that allows them to apply the BWMC regulations and comply with them during the entry of international flag vessels into ports. The challenges that Ecuador would face in the adoption of this convention would correspond to some modifications of existing national regulations and in turn the preparation and training of surveyor personnel to efficiently carry out the work assigned by the articles of this legal basis. However, the ratification process in the country has been blocked for some years at the political level due to the lack of attention to its final approval in the national assembly and subsequently the IMO.

There are some barriers that have been disabling the finalization of the process. The first barrier or limitation found in this process was the lack of political awareness of the state regarding this topic and its impacts on the marine environment. At the political level, there is little information of interest on the agenda. Other limitations investigated were the lack of technology and budget for the BWMC implementation in the country.

Addressing these constraints with capacity-building programs in compliance with the convention would increase the effective control regarding the prevention of marine protected areas and the reduction of environmental, social, and economic impacts against invasive aquatic species. With ratification, Ecuadorian Ports would receive a huge quantity of international fleet transporting ballast water from other environments that shall be inspected by Port State Control surveyors supported in a legal instrument recognized by many countries around the world.

The issue of ballast water management is quite complex, and it poses the challenges of merging international regulations, possible solutions, and environmental preservation (Endresen, et al., 2004). Under this scenario, the approach to the proposal is simple, adoption of the convention as detailed in this contribution.

Minton et al., (2005) demonstrated in their research that ballast water management strategies focus on the vector of individual species. This means that reviewing the data presented, the first aspect to be considered in the respective risk assessment is the verification of the areas from which the water to be de-ballast comes before being exchanged or treated in the ports of arrival. Duty and control of Port State Surveyors.

The scenario that was considered in this document is Ecuador. As mentioned at the beginning of the research, invasive aquatic species are detrimental to the marine environment, which is demonstrated by the impacts these species cause worldwide. Consequently, when compiling information on this issue, it was identified that those affected not only the marine environment but the society as well. Even more, Ecuador as an IMO member state is a nation where the majority of commercial activities are transported by sea through national and international vessels, therefore BWMC ratification should take action in order to comply with the rules governed by the convention, implemented in the national law in order to obtain economic, environmental, and sanitary benefits.

Referring to the economic aspect, it is understood that cargo ships would reach international waters and would be inspected without major inconvenience, it would also be required that the entry of these transports is in optimal conditions in accordance with the requirements of the convention, one of them is that the reforms to the ships can be carried out for at least 5 years; such as a certificate of operation after approval of the necessary filters of revision.

In the environmental field, the entry of invasive species that harm the national ecosystem will be controlled, as long as projects for the natural conservation of species in danger of extinction or that require reinsertion into their ecosystems of origin are crystallized. Although this will take a few years, it is not impossible.

Finally, as far as human health is concerned, by preventing the entry of these invasive species thanks to the management of ballast water and sediments from ships, individuals will be able to eat healthy food and enjoy their coasts without the fear of any type of contamination or of falling victim to any disease due to the seriousness of this situation, if the necessary corrective measures are not taken.

According to Mallmann & Asmus (2006), the basis of this convention is its applicability. In Ecuador, there is no mention of a complete action plan yet as such, where ballast water management is typified among the stakeholders that have the responsibility to protect the marine environment (DIRNEA, 2021). Ecuador, as a developing nation, should address this ballast water issue from a precautionary perspective, adopting the measures described in this contribution, because it will facilitate efficient control of ballast water replacement. This proposal is considered feasible from a technical and economic point of view, although this last element should be addressed in future research from a financial-administrative framework. This would make it possible to reduce the risks and impacts on Ecuador's marine ecosystems.

5.0 Contribution to the maritime sector and future research

The researched topic is considered technically and economically feasible and applicable. It will be necessary a specialized training of the stakeholder in order to develop the established in this precept.

Efforts should be maintained and more research on invasive species in ports should be encouraged, oriented towards port research and maritime monitoring, in order to achieve greater efficiency of control and optimization of resources related to ballast water and the design of port administrations systems, marine areas of Ecuador and the degrees of the vulnerability of these species.

The effects of invasive species through ballast water are focused on the economic, social, and environmental nature. According to the stakeholder's perception, the BWMC ratification is important in Ecuador and would be important for any member state in order to prevent and protect the marine environment.

Nowadays there are some papers submitted by different countries and organizations to the IMO in order to address this problem and the international level and reach the improvement of the Port State Control performance to reduce the ballast water impacts worldwide.

5.1 Limitation of the Data Collection and Methodology.

During the dissertation, there were some limitations with the data collection phase specifically. The number of participants with sufficient expertise in this area is limited based on the large number of tasks they carry out in their positions; however, the participation of personnel with greater experience in this field within the Ecuadorian maritime administration was accepted, both in the area of policy decision making and PSC surveyors. The spatial area is also considered a limitation since the study was only deepened within Ecuador to determine the importance of the BWMC according to its current status and its implementation. The temporary space is also considered a limitation since the administrative processes for the ratification of a convention are uncertain and its implementation phase is connected to these. Besides

these factors, the investigative work yielded very important results that contribute to the global maritime field.

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Appendices

PART A

The importance of Ballast Water Management Convention: The case of Ecuador.

Introduction

This interview guide has been designed in order to gather information on policies making regarding the Ballast Water Management Convention of the IMO (BWMC).

The aim is to explore:

1. **The situation of the BWMC in Ecuador (Current status and initial actions for ratification).**
2. **The importance for the MEMBER STATE to be part of BWMC.**

The interview is purely for academic purposes being part of the requirement for the award of a Master of Science degree in Maritime Affairs at the World Maritime University.

Participation in this study is voluntary.

1. This will be a recorded interview unless the participant is unwilling to have it recorded they may state so at the beginning of the interview
2. A participant shall be required to provide consent for use of data by signing a consent form
3. A participant has the freedom to exit the study at any time or withdraw the consent
4. All information from the participants will be held with strict confidentiality hence no divulging to third parties

Evaluation of IMO BWMC in Ecuador

1. Which institution do you represent?

_____

2. For how long have you been working with maritime policy issues??

_____

3. What is the current state of the BWMC ratification in Ecuador?

_____

4. In your view, what are the barriers to ratification of BWMC in Ecuador??

_____

5. What are the potential benefits for this ratification?

_____

6. What are the challenges with the adoption of BWMC in Ecuador?

_____

7. Do you think that the ratification of BWMC in Ecuador is important? Why?

_____

8. What actions should The Ecuadorian Maritime Administration be taken in case of BWMC ratification?

_____

9. Which steps are required for the ratification, accession, acceptance and implementation of the BWMC at the national level?

_____

10. What type of cooperation exists between Ecuador and neighboring countries that have already ratified this convention in the region?

_____

11. What should be the role of Port State Control in Ecuador with BWMC after ratification?

_____

12. What benefits do you think would be achieved in the PSC with the application of the BWMC?

_____

PART B

The importance of Ballast Water Management Convention: The case of Ecuador.

Introduction

This interview guide has been designed in order to gather information on Port State Control Surveyors with expertise in the Maritime Administration regarding the Ballast Water Management Convention of the IMO (BWMC).

The aim is to explore:

3. **The current Port State Control (PSC) Inspections in Ecuador.**
4. **The improvement of the performance in PSC measures with the BWMC ratification.**

The interview is purely for academic purposes being part of the requirement for the award of a Master of Science degree in Maritime Affairs at the World Maritime University.

Participation in this study is voluntary.

5. This will be a recorded interview unless the participant is unwilling to have it recorded they may state so at the beginning of the interview
6. A participant shall be required to provide consent for use of data by signing a consent form
7. A participant has the freedom to exit the study at any time or withdraw the consent
8. All information from the participants will be held with strict confidentiality hence no divulging to third parties

Evaluation of PSC inspections regarding BWMC in Ecuador.

1. Which institution do you represent?

_____

2. For how long have you been working with PSC surveyors?

_____

3. In your opinion, are there any deficiencies in the control of ballast water management in Ecuador? Why?

_____

4. Do you think that the ratification of BWMC in Ecuador is necessary? Why?

_____

_____

5. What are the potential benefits of the PSC inspections with the BWMC ratification?

_____

6. What are the challenges for PSC inspections with the BWMC ratification?

_____

____

7. What modifications should be made in the PSC inspections with the BWMC ratification?

_____

_____

8. Are there any efficient systems for the management and treatment of ballast water in the ports of Ecuador?

_____

_____

9. What type of national or international training do PSC surveyors receive regarding Ballast Water Management Control?

_____

____

10. Do PSC Surveyors receive international cooperation from BWMC ratified neighbor countries in the region?

_____

____

11. Do the PSC inspections contribute to the protection of the marine reserves areas in Ecuador? Why?

_____

12. Does Ecuador have a sufficient staff of trained PSC Surveyors to comply effectively with the BWMC?

_____

_____

PART C

INSPECTION REPORT PSC ECUADOR

Form1

AVM ACUERDO DE VIÑA DEL MAR 1992 *Acuerdo Latinoamericano sobre Control de Buques por el Estado Rector*

INFORME DE LA INSPECCIÓN REALIZADA DE CONFORMIDAD CON LOS PROCEDIMIENTOS DE LA OMI PARA LA SUPERVISIÓN POR ESTADO RECTOR DE PUERTO*

FORMULARIO A/1
FORM

Copia a: Capitán
Central de Supervisión
Funcionario supervisor

Copy to: Master
Head office
PSCO

Si el buque es detenido copia a:
Estado de
OMI
Organización reconocida

If ship is detained, copy
Flag State
IMO
Recognized organization, if

INFORME DE INSPECCIÓN
INSPECTION REPORT
Conforme al Acuerdo Latinoamericano sobre Control de Buques por el Estado Rector
Acuerdo de Viña del Mar y resolución OMI A.787(19),
According to the Latin American Agreement on Port State Control – Viña del Mar Agreement & IMO

DETALLE DEL BUQUE/ *SHIP*

.1 **Nombre del buque:**
Name of ship..ANDINO NU.....

.2 **Pabellón del buque:**
Flag of ship:..PANAMA.....

.3 **Tipo del Buque:**
Type of ship...CHEMICAL/PRODUCTS TANKER.....

.4 **Distintivo de llamada:**
Call sign..3EUZ5.....

.5 **Número OMI:**
IMO Numbre..9209996.....

.6 **Arqueo bruto:**
Gross tonnage...7228.....

.7 **Año de construcción:**
Date keel laid /major conversion commenced...1999....

.8 **Peso muerto (cuando proceda):**
Deadweight (where aplicable).....12288.....

Source: Port Captain of Manta-Ecuador
Note: PSC Initial survey.

Form2

AVM ACUERDO DE VIÑA DEL MAR 1992 *Acuerdo Latinoamericano sobre Control de Buques por el Estado Rector*

DOCUMENT OF COMPLIANCE	PANAMA MARITIME DOCUMENTATION SERVICES	08/02/2022	16/11/2026
SAFETY MANAGEMENT CERTIFICATE	PANAMA MARITIME DOCUMENTATION SERVICES	05/05/2022	26/08/2026
MINIMUM SAFE MANNING DOCUMENT	PANAMA	09/12/2021	
INF CERTIFICATE OF FITNESS	REGISTRO ITALIANO NAVALE	10/05/2022	16/12/2026
TONNAGE	REGISTRO ITALIANO NAVALE	10/05/2022	
CIVIL LIABILITY FOR OIL POLLUTION DAMAGE	PANAMA	17/02/2022	20/02/2023
INTERNATIONAL ENERGY EFFICIENCY (IEE)	REGISTRO ITALIANO NAVALE	10/05/2022	
GESTIÓN DEL AGUA DE LASTRE	REGISTRO ITALIANO NAVALE	10/05/2022	16/12/2026

d) **Información del último reconocimiento anual o**
Information on last intermediate or annual survey

Fecha de inspección *Date of survey*	**Autoridad que efectuó el** *Surveying authority*	**Puerto / País** ***Expedición**/ issue*
13/09/2022		MANTA

.20 **Buque Detenido:** *Detained* — Si / *Yes* — **X** No/ *No*

Source: Port Captain of Manta-Ecuador

Note: Ballast Water is an item of the survey but it cannot be enforced because Ecuador is not part of the BWMC.

Form 3

AVM ACUERDO DE VIÑA DEL MAR 1992 *Acuerdo Latinoamericano sobre Control de Buques por el Estado Rector*

CÓDIGOS PARA MEDIDAS
CODES FOR ACTION TAKEN

FORMULARIO
FORM

Código	Descripción/ Description
10	Deficiencias subsanadas / Deficiency rectified.
15	Deficiencias a ser subsanadas en el próxiimo puerto / Rectify deficiencies at the next port.
16	Deficiencias a ser subsanadas en un plazo de 14 días / Rectify deficiencies within 14 days.
17	El capitán instruido para subsanar las deficiencias antes del zarpe / Master instructed torectify deficiencies before departure.
*18	Rectificar incumplimientos dentro de los tres meses / Rectify non compliance within three months. (1
26	Organización de protección reconocida informada / Recognized security organization informed.
27	Denegación al buque de la entrada en el puerto / Ship denied entry in port.
30	Buque retenido / Ship detained.
40	Próximo puerto informado / Next port informed.
45	Próximo puerto informado para re-detención / Next port informed to re-detain.
50	Estado de bandera/ Cónsul informado / Flag State/Consul informed.
55	Estado de bandera consultado / Flag State consulted.
70	Sociedad de clasificación informada / Classification society informed.
85	Investigación de una transgresión a exigencias de descarga (MARPOL 73/78). / Investigation of violations to discharge provisions (MARPOL 73/78).
99	Otros (especificar en un lenguaje claro) / Others (specify in clear text).

Source: Port Captain of Manta-Ecuador

Note: Actions to be taken in case of deficiencies.