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Regulations on Ballast Water & Invasive Species – a Comparative Approach

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Summary

Harmful aquatic species are today invading foreign habitats at an unprecedented pace. They have had a large negative impact on many fragile ecosystems of the world and ballast water has been identified as one the major culprits behind their fast spread. Today, the most common remedy used to combat the problem is exchanging ballast water in the open ocean to get rid of any organisms with the potential to survive in the coastal areas of ports. This method is now proving to be much less efficient than what was first thought and scientists are forced to find new solutions. The new solution is the installment of onboard ballast water treatment systems and most of the regulations on ballast water seem to be moving in the same direction by establishing performance standards for such systems, which dictate the amounts of viable organisms allowed in ballast water discharges.

The contents of most regulations on ballast water have shown to be very similar. The general requirement is that vessels exchange their ballast water at least 200 nautical miles from shore before entering into the exclusive economic zones of states. Alternatively, discharges may be but only if accepted onboard treatment systems have been used or if discharges can be made to land-based reception facilities. Discharging untreated ballast water can only be accepted in emergency situations when the vessel, its crew or passengers are threatened.

Internationally, there are several legally binding regulations which concern invasive species such as the Convention on biological diversity, but up until today any ballast water regulations have been voluntary. The tables are about to turn since the International maritime organization has developed its Ballast water convention. However, the convention requires the signing of 30 states, representing at least 35 % of the gross tonnage of the world's shipping to enter into force and there is no saying when it finally will become ratified.

In the mean time, multinational and national measures have been taken to reduce introductions. In the United States, President Clinton's executive order has been important in setting the target for regulations on invasive species. Mandated by important federal legislations such as the National invasive species act, legally binding provisions which are enforced by the U.S. coast guard are in place and several individual states have established regulations on their own.

Europe has several directives affecting ballast water management such as the Marine strategy framework directive, the Biocides directive and the Habitats directive but to date there is no directive specifically targeting ballast water. EU member states are recommended to sign the Ballast water management convention and in the meantime, regional cooperations with voluntary guidelines have been and are currently being developed.
Sammanfattning

Skadliga marina arter invaderar idag främmande habitat och ekosystem med en extrem hastighet. Dessa arter har haft en mycket stor negativ inverkan på många sårbara ekosystem runt om i världen och barlastvatten har identifierats som en av de största faktorerna bakom den snabba spridningen. Idag är den vanligaste åtgärden för att lösa problemet att byta barlastvatten ute till havs för att göra sig av med organismer som skulle kunna överleva i hamnars kustområden. Denna metod har nu visat sig mycket mindre effektiv än vad man först trott och forskare tvingas hitta nya lösningar. En ny sådan lösning består i att installera behandlingssystem för barlastvatten ombord och de flesta lagar och regleringar verkar röra sig i samma riktning genom att etablera prestanda standarder för sådana system som anger högsta tillåtna antal levande organismer i utsläpp av barlastvatten.

De flesta regleringar angående barlastvatten är väldigt lika i sina krav. Det generella kravet är vanligtvis att fartyg skall byta sin ballast åtminstone 200 nautiska mil från land innan de går in i staters exklusiva ekonomiska zoner. Alternativt kan behandlingssystem användas eller tömning utföras på speciella inrättningar i hamnar som är avsedda för att ta emot denna typ av substanser. Utsläpp av obehandlat barlastvatten kan endast tillåtas i nödfall då fartygets, besättningens eller passagerares säkerhet är hotad.

Internationellt sett finns det flera juridiskt bindande regleringar som rör invaderande arter, varav ett exempel är FN:s konvention om biologisk mångfald. Hittills har dock regleringar angående barlastvatten tillämpats på frivillig basis men efter att the International maritime organization har presenterat sin Barlastvattenkonvention verkar läget vara på väg att ändras. Emellertid krävs det att 30 stater som tillsammans representerar åtminstone 35 % av den globala marina speditionens totala tonnage undertecknar för att konventionen skall träda i kraft och det är i nuläget svårt att säga när så kommer att ske.

I väntan på ett juridiskt bindande instrument har många multinationella och nationella åtgärder vidtagits. I USA har President Clintons exekutiva order varit mycket viktig för att sätta mål för regleringar angående invaderande arter. Genom mandat från viktiga federala lagstiftningar som the National invasive species act har juridiskt bindande föreskrifter som upprätthålls av kustbevakningen införts. Dessutom har flera delstater infört egna bindande regleringar angående barlastvatten.

I Europa har EU infört ett flertal direktiv som påverkar barlastvatten varav några exempel är Ramdirektivet om en marin strategi, Biociddirektivet och Habitatdirektivet, men hittills finns inget direktiv som riktar sig specifikt mot barlastvatten och dess hantering. EU:s medlemsstater rekommenderas att underteckna Barlastvattenkonventionen och under tiden har och håller regionala samarbeten med frivilliga riktlinjer på att utvecklas.
Preface

I would like to extend my deepest gratitude to my supervisor, Annika Nilsson, not just for her invaluable advice and help but also for being a great inspiration.

I would also like to thank my family and friends for their constant support and encouragement.

<table>
<thead>
<tr>
<th>Abbreviation</th>
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<tr>
<td>ANS task force</td>
<td>Aquatic nuisance species task force</td>
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<td>AOT</td>
<td>Advanced oxidation technology</td>
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<tr>
<td>Barcelona convention</td>
<td>Convention for the protection of the marine environment and the coastal region of the Mediterranean</td>
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<td>Bern convention</td>
<td>Convention on the conservation of European wildlife and natural habitats</td>
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<td>Bucharest convention</td>
<td>Convention on the protection of the Black Sea against pollution</td>
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<td>BWM convention</td>
<td>The International convention for the control and management of ships' ballast water and sediments</td>
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<td>CBD</td>
<td>United Nations convention on biological diversity</td>
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<td>cfu</td>
<td>Colony forming unit</td>
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<td>COP</td>
<td>Conférence of the parties</td>
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<td>COTP</td>
<td>Captain of the port</td>
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<td>CWA</td>
<td>Clean water act</td>
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<td>E.Coli</td>
<td>Escherichia coli</td>
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<td>EEZ</td>
<td>Exclusive economic zone</td>
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<td>EMSA</td>
<td>European maritime safety agency</td>
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<td>EO</td>
<td>Executive order</td>
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<td>EPA</td>
<td>Environmental protection agency</td>
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<td>FN</td>
<td>Förenta nationerna</td>
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<td>HELCOM</td>
<td>The Helsinki Commission</td>
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<td>Helsinki Convention</td>
<td>Convention on the protection of the marine environment of the Baltic Sea area</td>
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<td>IMO</td>
<td>International maritime organization</td>
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<td>MDEQ</td>
<td>Michigan department of environmental quality</td>
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<td>MED</td>
<td>Marine equipment directive</td>
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<td>MEPC</td>
<td>Marine environment protection committee</td>
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<td>MISA</td>
<td>Marine invasive species act</td>
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<td>NAISA</td>
<td>National aquatic invasive species act</td>
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<td>Acronym</td>
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<tr>
<td>NANPCA</td>
<td>Nonindigenous aquatic nuisance prevention and control act</td>
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<td>NISA</td>
<td>National invasive species act</td>
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<tr>
<td>NM</td>
<td>Nautical miles</td>
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<td>NPDES</td>
<td>National pollutant discharge elimination system</td>
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<tr>
<td>Oslo convention</td>
<td>Convention on the prevention of marine pollution by dumping from ships and aircraft</td>
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<td>OSPAR convention</td>
<td>Convention for the protection of the marine environment of the North-East Atlantic</td>
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<td>Paris convention</td>
<td>Convention for the prevention of marine pollution from land-based sources</td>
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<tr>
<td>REMPEC</td>
<td>Regional pollution and emergency response centre for the Mediterranean Sea</td>
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<td>UN</td>
<td>United Nations</td>
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<tr>
<td>UNCLOS</td>
<td>United Nations convention on the law of the sea</td>
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<td>UNEP</td>
<td>United Nations environment programme</td>
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<td>U.S.</td>
<td>United States of America</td>
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<td>USA</td>
<td>United States of America</td>
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<tr>
<td>USCG</td>
<td>United States coast guard</td>
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1 Introduction

“The biggest problem in the world could have been solved when it was small.”
– Lao Tzu

1.1 Background

The issue of alien introductions by invasive species, especially through ballast water, has quickly become one of the biggest environmental concerns of today and due to increasing trade and seaborne traffic, the problem keeps growing.1

Although companies, through new inventions and techniques, may hold interesting solutions, merging them with politics and regulations makes developments slow. The issue is complicated further by the fact that international cooperation is an essential part of the process which often causes entry into force of any regulation to be very prolonged. Seas and shorelines most often include several different countries and a lack of harmonization may sometimes cause compliance to be too difficult for ships operating under many different jurisdictions.

Adding insult to injury, the method of ballast water management most in use today, open ocean exchange, is widely coming to be considered as insufficient and potentially dangerous to the safety of vessels and their crew. Thus, ballast water management and alien invasive species are complex issues, creating challenges that among other things are legal, political, technical, economical and ecological.

1.2 Aim

Law and biology are two disciplines which meet more and more often in our modern society. Many of today's environmental problems require both lawyers, biologists and other scientists to work together to find solutions. Ballast water and the invasive species caught within it is a perfect example of one such problem.

Different parts of the world, different countries and even different states have found different legal strategies to tackle this primarily biological and ecological issue. Since seaborne traffic usually stretches across national boundaries and even continents, complying with all of the different regulations becomes a difficulty. The main aim of this thesis is to identify and investigate the different regulations which concern ballast water and invasive species, to discuss differences between their demands and their

effectiveness. It will be discussed how regulations on invasive species and biodiversity can be said to force action on ballast water management measures. Different approaches on international, multinational and national levels will be analyzed and compared.

1.3 Delimitations

The subject of ballast water regulations cannot be discussed without also discussing the issue of aquatic invasive species, neither can some of the more technical aspects of the problem such as ship construction and water treatment technologies, be left out. However, due to the limited scope of this thesis, the introduction to the subject is kept short but thorough enough as to give the reader the necessary general understanding of the issue.

For the comparative aspect, international as well as American and European regulations have been studied. Regarding ballast water management regulations the presentation is as complete as possible but the area of invasive species is much vaster and thus the most relevant regulations have been selected. Also, hull fouling and other such vectors which contribute to the spread of invasive species have not been considered.

The United States has both federal and state laws on ballast water and invasive species. Presenting the laws and regulations on this subject of every state is of course beyond the scope of this thesis but in order to illustrate this dual legislation, three states have been selected as representative of all, namely Washington, California and Michigan.

1.4 Disposition

As mentioned above a certain background knowledge is required to fully comprehend the different regulations discussed in this thesis as well as their purpose. A non-legal presentation of the issues regarding ballast water and invasive species is given in chapter two. In addition to an explanation of the concept and purpose of ballast water, ballast water management and marine life in ballast water are discussed.

In chapter three, international instruments are presented with a main focus on the IMO ballast water convention. Following the international regulations, the different legal instruments and strategies found in Europe and in the United States are discussed in chapters four and five. At the end of each of these chapters are paragraphs of discussion which are brought together in the final comparing analysis of chapter six and the conclusions of chapter seven.
1.5 Method and material

Seeing how it is difficult to find updated material regarding international regulations and legislations of foreign countries in books, most of the material, upon which this thesis is based, originates from governmental websites and online databases. International organizations as well as national authorities have been found to provide the most current, accurate and complete sources of information.

This thesis is to an extent based on a comparative method, with the comparison being between international, American and European legislations on ballast water and invasive species. The legal frameworks are presented and evaluated from an environmental protection perspective.
2 Ballast water

2.1 Introduction

Already in the early 1900s, scientists suspected that shipping might be a considerable contributor to the introductions of alien invasive species and still it would take decades before any ballast water sampling studies were carried out (the first one in 1975). The results from the first studies showed large amounts of different kinds of organisms in ballast water and one of the biggest factors behind the spread of alien invasive species had been discovered. Later studies have estimated the number of species found in ballast water to be at least over 1,000 and ranging from small single cell algae to actual fishes.²

Today, the introductions of non-native marine species are considered one of the four greatest threats to the oceans of the world along with land-based sources of pollution, over-exploitation of living marine resources and physical alterations or destructions of marine habitats. Taking into account that over 80% of the world's commodities are transported through shipping and that between three to five billion tons of ballast water is being transferred in the process, it is not hard to imagine the immense impact of this problem.

It is also important to keep in mind that this is by no means solely an ecological problem. The ramifications of the invasive species are also, to a very large extent, economical and pose a serious threat to public health.³

2.2 What is ballast water?

"Ballast is defined as any solid or liquid that is brought on board a vessel to increase the draft, change the trim, regulate the stability or to maintain stress loads within acceptable limits."⁴

During the process of loading or unloading cargo and during voyages with empty or partly filled cargo holds, modern ships are depending on ballast water for stability and balance. The ballast ensures that the vessel is heavy enough to keep the propeller and rudder operations under water as well as keeping the bow from emerging above water level.⁵ Although the high-tech shipping vessels of today use water for ballast, for centuries ships carried

solid ballast in the form of rocks, sand or metal. Despite the problems that we now know of linked to ballast water, it still has some convincing advantages over solid ballast, not only is it safer to load and unload and easy to adapt to the amount of cargo on the ships but it is also much cheaper.  

2.3 Ballast water management

2.3.1 Ballasting operations

In short, when cargo is unloaded at port, ballast water is loaded so that the ballast tanks are filled during voyages without cargo, giving a vessel the needed stability. Reversed, when cargo is loaded onto a vessel, ballast water is discharged and the ballast tanks are empty during voyages with cargo since stability is achieved by the weight of the cargo.

To minimize the amount of possibly harmful aquatic organisms discharged with the ballast, there are some different options of ballast water management, involving a range of mechanical, physical, chemical or biological processes, some of which will be presented below.

2.3.2 Ballast water exchange

The principle behind ballast water exchange, often also referred to as mid-ocean exchange or open ocean exchange, is simply that organisms taken up from the coastal waters of a port will not have the ability to survive in the high salinity of mid-ocean waters (35 parts or more per thousand). Likewise it is assumed that mid-ocean organisms lack the capabilities needed for survival in coastal areas.

The process of exchange usually takes place at least 200 nautical miles (NM) from shore and in waters that are at least 200 meters deep. During ballasting and deballasting operations, either gravity or pumps are used to empty the tanks.

The two most common strategies utilized are sequential exchange and flow-through exchange. Sequential exchange involves complete emptying of the tank before refilling it, which might endanger the safety of the ship since it is temporarily destabilized and not as maneuverable. Also, the water left in a partially emptied tank could constitute a safety hazard since it can move around and cause further instability to a vessel.

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Flow-through exchange takes on a different approach. This technique requires the vessel to have an entry and an exit for the water so that it can be pumped through at least three times the volume of the ballast tank during one voyage. One great advantage over sequential exchange is that the tanks never have to be completely empty, which means that the stability of the ship never is compromised during the exchange.

Due to its relatively high degree of efficiency and low cost in comparison with installing expensive onboard treatment systems, ballast water exchange has for quite some time generally been considered the best option when it comes to decreasing the amount of potentially harmful aquatic species in ballast water. However, this technique is not without disadvantages and the previously mentioned loss in stability during an exchange may pose a serious threat to the safety of a ship and its crew. Moreover, the theory behind this method, coastal organisms not being able to survive in the open ocean, is by no means an absolute truth. Scientists have for quite some time been growing increasingly concerned that certain freshwater organisms and salinity tolerant species may be able to survive at the sites of exchange or release where they pose a threat to local ecosystems. There is also the question of what to do when the ballast water is loaded in high-salinity ports. Organisms taken on at such ports will very likely have little or no problems surviving for quite some time in an open ocean environment and if they manage to stay alive long enough, they might have an opportunity to follow currents and travel to nearby islands where they could establish themselves. Another concern is the potential threat posed by organisms remaining in residual water and sediments left in tanks after the exchange.9

The uncertainties regarding ballast water exchange has led independent companies to invest large amounts of financial resources into the development of onboard treatment systems designed to kill any marine organisms, bacteria and viruses lingering in the tanks.

### 2.3.3 Treatment technologies

Treating ballast water on board vessels can be very effective in reducing the amounts of living organisms in the tanks. However, the systems are very expensive to install and many regulations require them to be approved by different authorities in order for them to be accepted as a sufficiently efficient ballast water management. Since these systems all use their own patented techniques and differ widely, a short presentation of just a few examples will follow in order to illustrate how they might work.

OceanSaver AS and their OceanSaver system marked an important milestone in January 2010 when they announced that they had signed the world’s first major ballast water management system contract for large

ships, often referred to as very large crude carriers or VLCCs. The system has been developed by a Norwegian company and consists of three different mechanisms to kill off organisms. First water is pre-filtrated after which nitrogen is used to supersaturate the water.\textsuperscript{10} Supersaturation with nitrogen and other gases has been known to cause problems to marine organisms due to something called “gas bubble trauma”. The supersaturation causes changes in pressure which sometimes lead to internal bubble formation and disruption in neurological, cardiovascular, respiratory, osmoregulatory (\textit{i.e.} the control over waters tendency to move in and out of a marine organism) functions.\textsuperscript{11} Nitrogen also has the ability to displace oxygen that is dissolved in water and the efficient removal of oxygen will kill any organisms depending on the gas to breathe.\textsuperscript{12} The final step of this system consists of a hydrodynamic cavitation unit used to send pulsed shock waves. The shock wave, like the supersaturation, has the potential of producing bubbles in marine organisms and if the bubble collapses, it will result in locally high pressures and temperatures, causing cellular damage.\textsuperscript{13}

The Advanced oxidation technology (AOT) is developed by Alfa Laval and the Swedish company Benrad. This technology utilizes UV light of special wavelengths to create hydroxyl radicals which have the ability to destroy microorganisms through degrading their cell membranes.

Balpure ballast water treatment system is somewhat similar to the AOT but instead of UV light it utilizes an electrolyzer to generate oxidants. Oxidants disinfect the ballast water through reacting with bacteria, organic and inorganic matter.\textsuperscript{14}

Ecochlor\textsuperscript{®} ballast water treatment system is one of the oldest systems in the field and, using chlorine dioxide, it efficiently eliminates invasive species. Some of the advantages to this technique are that it is approved for direct contact with food, it is non-corrosive to ship metal and coatings and it is environmentally acceptable for discharge into the ocean immediately after treatment.\textsuperscript{15}

\section*{2.4 Marine life in ballast water}

It was previously mentioned that early estimations have shown that the number of species carried in ballast tanks were over 1,000 but today scientists estimate the figure to be at least 7,000 different species.

\begin{thebibliography}{9}
\bibitem{12} http://www.oceansaver.com/ (2010-04-24).
\bibitem{14} http://www.tc.gc.ca/marinesafety/oep/environment/ballastwater/rd.htm (2010-01-07).
\bibitem{15} http://www.ecochlor.com/technology.htm (2010-01-07).
\end{thebibliography}
The only thing standing in the way of the organisms entering the water tanks are the ballast water intake ports and pumps. Even though many of the marine species are too big to get through these holes or never come close to them because they spend almost their entire lives anchored to the seabed, they still somehow manage to enter the water tanks. This is due to the fact that most marine species have similar life cycles, which almost always include planktonic stages and as eggs, larvae or cysts, these organisms will have no trouble passing through the intake pumps. Of course, a voyage in the ballast tanks of a ship is harsh and a lot of the organisms caught in them do not survive. Moreover, the organisms that do survive the long confinement and make it back out into the ocean still have to face the hardships of a new environment and the competition for space and resources with local species but in cases where organisms make it this far, they are clearly extremely resilient and there is a great risk of them irreversibly invading the new habitat and outcompeting the native species.

The ocean is by no means some compartmentalized and clearly marked off underwater world of separate ecological communities, species have always travelled through the vast sea and entered new ecosystems, perhaps attached to something floating in the water like a log or simply carried by currents but their dispersal has always been limited by natural barriers. These natural barriers may consist of such obvious things as land masses but could also be differences in water temperature, salinity and so on. For example, the cold waters of the northern and southern parts of the earth are separated by the tropical waters in the middle and as a result their ecosystems have not come into contact with each other and as a consequence they are widely different. Whenever organisms originating from similar but separate habitats have been introduced into each other’s territories, the effects have been especially serious and difficult to manage. Not having to adapt in any large extent to a new environment makes an invasion considerably easier.

Out of all the thousands of invasions that already have occurred, one example has in a way been the “pioneer” in the eye of the public, namely the Zebra mussel and its invasion of the Great Lakes area in North America. In the United States (U.S) over 40% of the internal waterways have been infested by this mussel and it is costing the government millions of dollars to control. The catastrophic effects of this invasion have lead to a great increase in public awareness of species introductions and invasions.\footnote{http://globallast.imo.org/index.asp?page=problem.htm&menu=true (2010-01-07)}

Zebra mussels, or \textit{Dreissena polymorpha}, are native to eastern Europe and the Black and Caspian seas, they are quite small and have the ability to attach themselves to both hard and soft surfaces. With their fast reproduction cycles these mussels have a long history of invading new habitats, for example it reached Great Britain in 1824, Sweden in 1920, the Great Lakes in 1988 and California in 2008 and it is considered fairly certain that ballast water from transoceanic ships is the culpable party in the matter. Since these organisms have the ability to survive for three to five
days out of the water, it is also possible that they spread through attaching themselves to hulls, chains, anchors or other such structures on vessels.

The invasions affect land based facilities as well as ships. Through clogging pipes and screens, the mussels significantly increase maintenance costs of facilities such as power plants and on boat hulls they may clog engines, affect steering and cause overheating and malfunctioning. Estimates say that controlling the Zebra mussels is costing the U.S. government over $500 million per year.\(^\text{17}\) When considering all of the different invasive species that have managed to gain foothold in the U.S. and worldwide, the figures are gigantic.

\(^{17}\)http://cisr.ucr.edu/quagga_zebra_mussels.html (2010-01-07).
3 International regulations

3.1 Background

In 1992, the United Nations (UN) held a conference in Rio de Janeiro called the United Nations conference on environment and development, with one of the issues on the agenda being the threat posed by marine invasive species. The International maritime organization (IMO), which is specialized in the regulation of ship safety and prevention of marine pollution, was called upon to take action and its response was to adopt voluntary guidelines. The increased magnitude of the problem has since promoted the IMO to develop a legally binding instrument, the Ballast water management convention. Several other regulations have since been developed and the work toward finding measures to further prevent the spread of invasive species is continuously carried out by the IMO Marine environment protection committee (MEPC) Ballast water working group in close contact with the shipping industry and organizations such as the International chamber of shipping and the International association of independent tanker owners, also known as INTERTANKO.18

3.2 Guidelines for the control and management of ships’ ballast water to minimize the transfer of harmful aquatic organisms and pathogens

The Guidelines for preventing the introduction of unwanted organisms and pathogens from ships' ballast water and sediment discharges were adopted by the MEPC in 1991 after several countries having raised the issue of alien invasive species and ballast water. It was soon realized that preventing the spread of such species completely was setting the bar too high and yet it was clear that more needed to be done. The work continued and a new set of guidelines, replacing the previous ones, was adopted in 1997 called Guidelines for the control and management of ships' ballast water to minimize the transfer of harmful aquatic organisms and pathogens.19

As revealed by their title, these voluntary guidelines are meant as a risk minimizing tool and an aid in states' efforts to conform their regulations.20 The guidelines are directed to all member states but their application is left

20 Chapter 1.3, Guidelines for the control and management of ships' ballast water to minimize the transfer of harmful aquatic organisms and pathogens, Resolution A.868(20).
to be determined by the port state.\textsuperscript{21} States are allowed to exempt ships under their jurisdiction from provisions they do not find relevant but in general when applying restrictions to ballast water operations they should follow the guidelines.\textsuperscript{22} In order to promote a continuous flow of information related to the provisions, states are encouraged to share and provide the IMO with information on e.g. outbreaks, relevant regulations, research, technical advances and alternative exchange zones.\textsuperscript{23}

In accordance with the guidelines all ports should be equipped with reception and treatment facilities for safe disposal of ballast water and sediments.\textsuperscript{24} Each ship should carry an individual ballast water management plan containing information on location of ballast tanks as well as access points for sampling. Further, ships should keep a log over ballasting and deballasting operations, which is to be made available to port state authorities upon arrival. The log should, at a minimum, contain dates, geographical locations of exchanges, ships' ballast tanks and cargo holds, ballast water temperatures and salinity as well as the amounts of water taken on and discharged.\textsuperscript{25} When conditions such as weather, high sea or operational impracticality prevents a ship from complying with the recommended procedures it should be reported to the port state authority prior to entering into waters under its jurisdiction.\textsuperscript{26}

The precautionary principle of the guidelines states that during loading of ballast every effort should be made to avoid uptake of potentially harmful organisms. This entails avoiding uptakes in areas with known outbreaks, near sewage outfalls or dredging operations, when a tidal stream is more turbid and in areas with poor tidal flushing. It is also advised against uptake in darkness when bottom-dwelling organisms rise up in the water column, in very shallow waters or where propellers may stir up sediment.\textsuperscript{27}

Ballast water exchange should be conducted in the deep waters of the open ocean and as far away from shore as possible. During discharges the operations should be continued until suction is lost and when utilizing the flow-through method the tank volume should be pumped through at least three times. If exchange cannot be conducted, discharge may be accepted in certain areas designated by the port state.\textsuperscript{28} When neither ballast water exchange or treatment options are possible, the ballast may be retained on board or, as a last resort, the absolute minimum amount needed may be discharged.\textsuperscript{29}

\begin{flushright}
\textsuperscript{21}\textit{Ibid.}, chapter 3.  \\
\textsuperscript{22}\textit{Ibid.}, chapter 4.2.  \\
\textsuperscript{23}\textit{Ibid.}, chapter 5.1.  \\
\textsuperscript{24}\textit{Ibid.}, chapter 7.2.  \\
\textsuperscript{25}\textit{Ibid.}, chapters 7.1.1 and 8.1.2-8.1.4.  \\
\textsuperscript{26}\textit{Ibid.}, chapter 8.1.1.  \\
\textsuperscript{27}\textit{Ibid.}, chapter 9.1.  \\
\textsuperscript{28}\textit{Ibid.}, chapter 9.2.1.  \\
\textsuperscript{29}\textit{Ibid.}, chapter 9.2.2.
\end{flushright}
Port state authorities may sample ballast water and sediment before permitting it to be discharged in sensitive areas and if harmful organisms are found to be present, a stricter contingency strategy may be applied.\(^{30}\) Among factors for port states to take into account when assessing risks in relation to ballast water are the degree of similarity between the uptake and discharge sites, the period of time the ballast water has been retained in the tanks (if more than 100 days it could be used as a consideration for estimating a lower number of surviving organisms in the water) and the presence of target organisms that are known to be invasive.\(^{31}\)

### 3.3 The International convention for the control and management of ships’ ballast water and sediments

Recalling in its preamble obligations under international regulations such as the United Nations Convention on the law of the sea and the Convention on biological diversity, the International convention for the control and management of ships' ballast water and sediments (BWM convention) of 2004 is the first attempt to provide an international legally binding regulation on ballast water.\(^{32}\) In addition to the convention itself, guidelines have been added to aid a uniform application through technical assistance.

Parties to the BWM convention are obligated to prevent, minimize and ultimately eliminate transfers of harmful aquatic organisms and pathogens through the control and management of ships' ballast water and sediments.\(^{33}\) They are encouraged to cooperate to promote effective implementation, compliance and enforcement of the convention and, consistent with international law, they may prescribe more stringent measures than those set out in the convention.\(^{34}\)

The convention is applicable to all ships equipped with ballast water (unless it is permanently sealed in the tanks) and flying the flag of a party or operating under the authority of one. Ships which are only operating under the jurisdiction of one party or one party and the high seas are excluded.\(^{35}\)

Parties are to develop national policies, strategies and programs for ballast water management in their ports and waters and they shall ensure that their ports have adequate reception facilities for sediments.\(^{36}\) Scientific and technical research shall be promoted and effects of ballast water

\(^{30}\)Ibid., chapter 11.14.  
\(^{31}\)Ibid., chapter 10.  
\(^{32}\)The International convention for the control and management of ships' ballast water and sediments, introductory annex, pp. 1-2.  
\(^{33}\)Ibid., article 2.1.  
\(^{34}\)Ibid., articles 2.3 and 2.4.  
\(^{35}\)Ibid., articles 3.1 and 3.2.  
\(^{36}\)Ibid., articles 4.2 and 5.1.
management shall be monitored. It is further the obligation of each party to survey and certify its ships as well as develop adequately severe sanctions for any violation of the requirements of the convention.

When arriving in a port of a party, ships may be subjected to inspections by authorized officers but the inspections are limited to verifying that there is a valid certificate on board, inspection of the ballast water record book and sampling the ballast water. If a ship is lacking a valid certificate or if the crew is unfamiliar with the ballast water management procedures, a detailed inspection may be carried out and discharges may be prevented until it is made certain that it can be done without threatening the environment, human health, property or resources. If a ship is found to be in violation of the convention, the state whose flag it is flying or in whose port it is operating, may warn, detain or exclude the ship. When carrying out these procedures, all possible efforts shall be made as to not unduly detain ships, in which case they are entitled to compensation for any loss or damage.

The convention will enter into force twelve months after the date when it has been signed by thirty states and constitute at least 35 % of the gross tonnage of the world's merchant shipping.

Detailed regulations on ballast water management and control are found in the annex to the convention. Here it is stated that ballast water discharges always shall be conducted in accordance with the provisions of the annex unless it is to ensure the safety of the ship in an emergency situation, minimizing pollution or the result of accidental damage to a ship. The exception also excludes discharge of ballast water originating from the high seas or from the exact same location where it is to be released, from the demands.

The provisions of the annexes require that each ship has a ballast water management plan, containing e.g. detailed safety procedures, procedures for disposal of sediments and reporting requirements. Each vessel is further obligated to have a ballast water record book containing information on every ballast water operation conducted.

The ballast water exchange itself shall, whenever possible, be conducted at least 200 nautical miles (NM) from nearest shore and in waters at least 200 meters deep. When unable to discharge in accordance with this requirement, exchange shall be conducted as far away from land as possible but always at least 50 NM from nearest land and still in waters at least 200 meters deep.

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37 Ibid., article 6.1.
38 Ibid., articles 7.1, 8.1 and 8.3.
39 Ibid., articles 9.1-9.3.
40 Ibid., article 10.2.
41 Ibid., article 12.
42 Ibid., article 18.
43 Ibid., regulations A-2 and A-3.
44 Ibid., regulations B-1, B-2 and B-3.
45 Ibid., regulation B-4.1(1).
meters deep.\textsuperscript{46} In areas where no such places exist, the port state may designate areas where ships can conduct their exchange.\textsuperscript{47} Ships are not required to deviate from their intended voyage in order to comply with these requirements, nor are they required to comply if the safety or stability of the ship, its crew, or its passengers is threatened because of adverse weather, ship design or stress, equipment failure, or any other extraordinary condition.\textsuperscript{48}

Parties are responsible for warning vessels within their jurisdiction of areas where ballast water uptake is unsuitable due to factors like known infestations or close proximity to sewage outfalls.\textsuperscript{49} Additional measures necessary to prevent, reduce, or eliminate the transfer of harmful aquatic organisms may be determined as long as they are in accordance with international law. Though, except in emergency or epidemic situations, the intention to establish additional measures and their details shall be communicated to the IMO and adjacent parties and states that could be affected by the new standards or requirements at least six months prior to the date of implementation.\textsuperscript{50}

The convention's ballast water exchange standard, D-1 standard, require the volumetric exchange to be at least 95\% or for the flow-through method, three times the entire volume of the tanks.\textsuperscript{51} Another standard, the ballast water performance standard or D-2 standard, states that discharges of ballast water must contain less than 10 viable organisms that are greater than or equal to 50 micrometers in minimum dimension per cubic meter and less than 10 viable organisms per milliliter that are less than 50 micrometers and equal to or greater than 10 micrometers in minimum dimension, in order to meet the standards of the convention. Also, certain limits regarding colony forming units (cfu) are set for indicator microbes such as \textit{Escherichia Coli} (E.Coli).\textsuperscript{52}

Applying demands such as the D-2 standard over night would of course be impossible and for that reason the requirements are to be phased in, meaning that different ships will have to abide by the standards at different times depending on their size and capacity. For example, ships constructed before 2009 and with a ballast water capacity between 1,500 and 5,000 cubic meters may choose between the D-1 and D-2 standards until 2014, when they have to meet the D-2 standards. If the ballast water capacity on the other hand is less than 1,500 or greater than 5,000 cubic meters they have until 2016 to meet the D-2 standard.\textsuperscript{53}

\textsuperscript{46}Ibid., regulation B-4.1(2).  
\textsuperscript{47}Ibid., regulation B-4.2.  
\textsuperscript{48}Ibid., regulations B-4.3 and B-4.4.  
\textsuperscript{49}Ibid., regulation C-2.  
\textsuperscript{50}Ibid., regulation C-1.  
\textsuperscript{51}Ibid., regulation D-1.  
\textsuperscript{52}Ibid., regulation D-2.  
\textsuperscript{53}Ibid., regulation B-3.
3.4 Other relevant international agreements

3.4.1 Convention on biological diversity

Ballast water regulations have often come to be as a result or consequence of other regulations forcing measures against alien invasive species to be taken and as a consequence there is a myriad of conventions and other legislations influencing ballast water and invasive species regulations. The most important is likely the United Nations Convention on biological diversity (CBD) of 1992, the only global treaty addressing introductions of alien species across all vectors, groups and continents.\(^{54}\) Having entered into force in 1993, this legally binding document covers both intentional and unintentional introductions of alien species, focusing on prevention, control and eradication as control methods.\(^{55}\) Contracting parties are required to, as far as possible and appropriate, prevent the introduction of, control or eradicate alien species which threaten ecosystems, habitats or species.\(^{56}\)

Biological diversity under the CBD is defined as “the variability among living organisms from all sources, \textit{inter alia}, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems”.\(^{57}\) Although there is no article specifically and solely dealing with marine biodiversity, this issue was addressed at the second Conference of the parties (COP). Known as the Jakarta mandate on the conservation and sustainable use of marine and coastal biological diversity, this first policy decision contains principles and thematic areas to be implemented through a program described in a second decision at COP 4.\(^{58}\) Alien species in marine waters are mentioned as one of the program's five key elements.\(^{59}\)

The relevance of the BWM convention and specifically its relevance to the CBD was discussed during the preparations for COP 7. Ballast water was pointed out as a significant mechanism for transfer of organisms into habitats where they may be harmful and invasive and it was therefore established that the effective implementation of the BWM convention constitutes an important feature of the work towards reaching the objectives of the CBD and the Jakarta mandate.\(^{60}\)

\(^{55}\text{Ibid., p. 127.}\)
\(^{56}\text{Article 8(h), Convention on biological diversity.}\)
\(^{57}\text{Ibid., article 2.}\)
\(^{58}\text{http://www.cfr.org/publication/20653/jakarta_mandate_on_marine_and_coastal_biological_diversity.html (2010-03-19).}\)
\(^{59}\text{UNEP/CBD/COP/4/27, Report of the fourth meeting of the conference of the parties to the Convention on biological diversity, decision IV/5.}\)
\(^{60}\text{UNEP/CBD/COP/7/INF/24, The proposed ballast water convention and its relevance to the Convention on biological diversity, note by Executive Secretary, p. 1.}\)
3.4.2 United Nations Conventions on the law of the sea

As the basic legal framework governing the uses of the oceans and seas, the 1982 United Nations Convention on the law of the sea (UNCLOS) holds provisions for the protection and preservation of marine ecosystems together with the Convention on biological diversity.61

In accordance with UNCLOS, states “have the obligation to protect and preserve the marine environment” and are directed to take all measures “necessary to prevent, reduce and control pollution of the marine environment from any source”.62 Pollution is defined as an introduction of substances or energy into the marine environment which results or is likely to result in “deleterious effects such as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and any other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities”.63

Alien species are expressively mentioned in article 196 which requires states to “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”.64

In order to prevent, reduce and control pollution from vessels, international organizations shall develop rules and standards.65 Further, states shall adopt laws and regulations regarding vessels flying their flag which have at least the same effect as corresponding generally accepted international rules and standards.66 Whenever a state finds that international rules are inadequate in meeting special circumstances of a defined area within its exclusive economic zone (EEZ), the state may direct a communication to the relevant international organization, which then shall determine if the state may adopt laws and regulations for that special area.67

3.4.3 Convention on the conservation of European wildlife and natural habitats

Celebrating its 30th anniversary in 2009, the 1979 Convention on the conservation of European wildlife and natural habitats (the Bern

63Ibid., article 1(4).
64Ibid., article 196(1).
65Ibid., article 211(1).
66Ibid., article 211(2).
67Ibid., article 211(6(a)).
convention) was the first international treaty to protect plants, animals and their habitats as well as promoting cooperation between its parties. This convention is now part of the framework for Europe’s implementation of the CBD but, in spite of its name, in no longer concerns only Europe and states in Africa such as Morocco, Senegal and Tunisia have been invited to become contracting parties.68

As the pioneer amongst agreements on environmental protection this convention established principles such as precaution, integration, participation and co-operation long before the rest of the world caught on.69 Even invasive species are expressly mentioned and each contracting party has undertaken to strictly control the introduction of non-native species.70

3.4.4 Agenda 21

The United Nations defines its Agenda 21 of 1992 as a comprehensive plan of action to be taken globally and locally by organizations of the United Nations system, governments and major groups in every area in which human activities impact the environment.71 The legal basis for pursuing and protecting the marine and coastal environment and its resources comes from international law, in particular UNCLOS.72 Under the section on marine environmental protection, states commit themselves, in accordance with their policies, priorities and resources, to prevent, reduce and control degradation of the marine environment so as to maintain and improve its life-support and productive capacities.73

Regarding sea-based activities, states should assess the need for additional measures to address degradation of the marine environment by, for example, supporting wider ratification and implementation of relevant shipping conventions and protocols and consider the adoption of appropriate rules on ballast water discharge to prevent the spread of nonindigenous organisms.74

3.5 Discussion

As with most global issues, there are many overlaps and gaps in the regulations on ballast water and invasive species. The IMO has been

69Questions and answers on the Bern convention No.9, p. 5.
71Chapter 17.1, section II, Agenda 21.
72Ibid., chapter 17.22.
73Ibid., chapter 17.30 A) i. and vi).
working toward a solution to these issues since the early nineties when they were urged to take action by the UN. The first guidelines on ballast water discharges were introduced in 1991 with a goal to prevent introduction of unwanted organisms. A complete prevention proved too difficult a task and new guidelines aiming to minimize introductions were adopted in 1997. In spite of the lowered ambitions, the guidelines have been of great importance due to the fact that they constitute the first international agreement on management practices and indicate intentions to take further uniform action. However, due to their voluntary and non-binding nature, the effectiveness of the guidelines has been limited. Another shortage is that the emphasis is put on the less effective practice of ballast water exchange and the incentives toward ballast water treatment systems, with a higher degree of efficiency, are limited.

The CBD is to date the only global treaty addressing introductions of alien species in an exhaustive manner, requiring prevention of introductions and control or eradication of already established invasive species. The Jakarta mandate points out alien species as one of the CBD program's thematic areas. Ballast water was recognized as a significant measure of transfer which makes the effective implementation of an international binding legal instrument an important feature in reaching the objectives of the CBD and its Jakarta mandate.

The task of developing an international legally binding instrument, of course, fell on the IMO and lead to the development of the BWM convention, which to a large degree is based upon the previously adopted guidelines. Parties to this convention have undertaken to prevent, minimize and ultimately eliminate the risks associated with ballast water transfers of harmful aquatic organisms. Just like the guidelines, a large part of the focus of this convention lies on ballast water exchange and the assumption that organisms from the open ocean are unlikely to survive in a coastal environment. This assumption, and therefore also the convention, has often been criticized as too uncertain and it is becoming more and more recognized that more stringent measures in the form of ballast water treatment systems are required in order to really prevent introductions.

Another criticism against the BWM convention is the requirement of a volumetric exchange of 95 %. When considering if this is sufficient, it must be taken into account that organisms in ballast water tanks might not be evenly distributed, which could lead to a lower degree of organism removal than expected.

The regulations of the BWM convention are also complicated by the fact that a large part of the marine traffic, especially in Europe, is conducted in areas where the depth (200 meters) and distance to shore (200 NM) requirements cannot be met and in which case the exchange should be conducted at least 50 NM from shore. In waters where neither of the requirements of the convention can be met the port state may, as a risk reducing measure, designate areas where discharges can be conducted. This
must be considered a high risk alternative and it is by no means optional. Still, it is of course preferred that vessels discharge their ballast water in identified areas where risks are lower compared to scattered discharges over entire regions where sufficient monitoring most likely would be impossible. It should also be noted that the gain from forcing a vessel to deviate from its route to such areas will have to be considered against the caused delay. When a delay is found to be undue a vessel has the right to compensation. In most cases biological monitoring is not as frequent as it should be and it is desirable that it be further specified how the tradeoff between loss of time and risks of alien species invasions shall be evaluated.

In comparison to the ballast water exchange requirements, the provisions on performance standards are much more ambitious. The BWM convention allows sampling of ballast water in order to determine compliance which, when systematically conducted, should promote and increase the observance of the regulations significantly. As the D-2 standard eventually becomes phased in, demands can be put on the number of viable organisms left in ballast water at discharge. The samples can be used as evidence when taking legal actions due to noncompliance and they are therefore of great importance. Even though the allowed number of target organisms is detailed in the convention, other factors such as sampling volumes and number of replicates to assure accurate results are not. Technical guidelines for ballast water sampling has been developed by the MEPC but it is still up for debate whether or not even these are detailed enough to ensure legal security. Another factor further complicating the matter is that the development of approved and tested ballast water management systems, able to meet the performance standards, still have a long way to go before they are available and ready to be installed on vessels to any greater extent. States hesitant to sign the BWM convention often, and in my opinion quite justifiably so, use this as a principle argument against it.

The extent to which ballast water and invasive species are covered by the provisions of UNCLOS is a topic of discussion. It can be assumed that prevention of alien invasions is covered by the duty to “protect and preserve the marine environment” and that ballast water discharges are covered by “pollution from any source”. However, pollution under UNCLOS is defined as introductions of substances or energy which are likely to have deleterious effects. If organisms released through ballast water discharges are found to fall under this definition, i.e. are considered as substances or energy, it would mean that parties are required to take all measures necessary to ensure that activities under their jurisdiction or control not cause damage by pollution to the environment of other states or that pollution from incidents under their jurisdiction not spread beyond the area where they exercise sovereign rights. Accordingly, parties to UNCLOS would be forced to prohibit vessels flying their flag from discharging ballast water containing harmful aquatic organisms into foreign waters. It should be noted that if this is the case, also states which have not signed the BWM convention would

\(^{75}\text{For more information, see Guidelines for ballast water sampling (G2), Resolution MEPC. 173(58), adopted on 10 October 2008.}\)
be covered by this obligation. Whatever the outcome of a more penetrative analysis into the scope and legal definitions of UNCLOS would be, it might seem premature and unreasonable to demand the *complete* elimination of living organisms in ballast water discharges but it should be noted that, for example California, has implemented such a standard that is to enter into force in 2020. It remains to be seen whether the technology will be able to live up to such demands by then and if other ballast water management regulations will follow.
4 Europe

4.1 Background

Whenever Europe is concerned, the European Union (EU) plays an essential role. More than 90% of foreign trade and approximately 40% of domestic trade within the EU is conducted through waterborne traffic. The introduction and consequent spread of an invasive species into the waters of one European country could quickly spread throughout the whole of the EU. The close link between trade and the spread of invasive species demonstrates the importance of a uniform, coordinated and not to mention exhaustive legal response involving all of the European marine states. Policies and legislations existing today do address part of the problem but are sometimes neither harmonized nor consistent for neighboring countries or regions and the lack of enforcement make them appear quite weak. There is need for a uniform system to monitor and control invasive species and their effects, as well as including accidental or negligent introductions, today mainly unregulated, under the regulations.

The EU has had a goal from 2001 to halt the decline of biodiversity by 2010. In order to do so, several instruments have been adopted on habitat change, climate change, over-exploitation and pollution. Invasive species play a big role in the decline of biodiversity and yet there is still no comprehensive legal instrument addressing their release through ballast water discharges at EU level. Further, the problem is increasingly causing economic concern and estimations say damages and necessary control measures cost at least 12,000 million euros every year. Among the ones having voiced their concerns and stressed the need for a common strategy and an effective early warning system and response mechanisms, are the Environment Council and the European Parliament.

The work within the EU is progressing slowly and while the Commission strongly recommends its member states to ratify the BWM convention, interim measures for ballast water discharges under public international law have, in the meantime, been developed for the four regional seas of Europe.

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4.2 EU policies affecting ballast water management and invasive species

4.2.1 The Marine strategy framework directive

Being the primary environmental component of the EU integrated policy, the Marine strategy framework directive is the natural starting point when discussing the marine policies of the EU. Adopted in 2008, this directive aims to protect the precious heritage that is the marine environment of Europe, to preserve and, if possible, restore it while ultimately providing clean, healthy and productive seas and oceans.80 Necessary measures shall be taken to achieve or maintain good environmental status by 2020 at the latest.81 The term “good environmental status” is defined as “environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy, and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations” and it is further specified as a state where “human-induced decline of biodiversity is prevented and diverse biological components function in balance”.82 Among the mentioned qualitative descriptors for determining good environmental status in Annex I is keeping the introduction of nonindigenous species by human activities at levels that do not alter the ecosystems.83 Introductions and translocations of nonindigenous species are also listed as forms of biological disturbance in Annex III.84 When determining good environmental status it should be done at the level of marine regions or subregions covered by the sovereignty of the member states, i.e. the Baltic Sea, the North-east Atlantic ocean, the Mediterranean sea and the Black sea.85

Applying an ecosystem-based approach, marine strategies are to be developed in order to protect and preserve the marine environment as well as prevent and reduce inputs with a view of phasing out pollution.86 Pollution here means “direct or indirect introduction into the marine environment, as a result of human activity, of substances or energy, including human-induced marine underwater noise, which results or is likely to result in deleterious effects such as harm to living resources and marine ecosystems, including loss of biodiversity, hazards to human health, the hindering of marine activities, including fishing, tourism, and recreation and other legitimate uses of the sea, impairment of the quality for use of sea water and reduction of amenities or, in general, impairment of the

80Preamble (3), directive 2008/56/EC.
81Ibid., article 1(1).
82Ibid., article 3(5).
83Ibid., annex I, (2).
84Ibid., annex III, table 2.
85Ibid., article 4(1).
86Ibid., articles 1(2) and 1(3).
sustainable use of marine goods and services”. Taking factors like predominant pressures and impacts as well as cumulative and synergistic effects into account, member states are to make preparations for the marine strategies by conducting initial assessments to determine the current status of their marine environment as well as establishing environmental targets and monitoring programs by 2012. The Commission will assess whether the efforts of each member state are considered sufficient and appropriate to meet the requirements of the directive, after which programs of measures to achieve and maintain good environmental status are to be developed by 2015 at the latest.

Exceptions from the requirements of this directive include modifications and alterations of the physical characteristics of the marine waters that are brought about by actions taken for reasons of overriding public interest which outweigh the negative impact on the environment. Member states are however obligated to ensure that reaching good environmental status in not permanently precluded or compromised.

The Marine strategy framework directive very clearly addresses the existing lack of cooperation and harmonization existing within the EU today. It is stated that member states should cooperate not only with each other but also invite third countries that they share their marine regions with. Whenever possible they should also use existing institutional structures such as the regional seas conventions and contribute to their fulfillment.

### 4.2.2 The Marine equipment directive

Ballast water exchange is today known to have a very limited degree of efficiency on organism removal and yet it is the method most commonly required by different provisions which is evident when considering instruments such as the BWM convention. Efforts toward finding suitable alternatives and developing ballast water treatment systems are extremely important.

A directive which will come to be of great importance for the development of treatment systems is the Marine equipment directive (MED) of 1996. This directive aims to enhance safety at sea and prevent pollution through the uniform application of relevant international instruments regarding marine equipment, while ensuring free movement of such equipment within the EU.

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87 Ibid., article 4(8).
88 Ibid., articles 5(2) and 8(1).
89 Ibid., articles 5(2), 12 and 13(1).
90 Ibid., articles 14(1) and 14(2).
91 Ibid., preamble (13).
92 Article 1, directive 96/98/EC.
International instruments are referred to as “relevant international conventions, the relevant resolutions and circulars of the International Maritime Organization (IMO), and the relevant international testing standards”. 93

Currently, only equipment belonging to lifesaving appliances, marine pollution prevention, fire protection, navigation and radio communication are covered by the MED. 94 Since the BWM convention has yet to enter into force, ballast water treatment systems are not covered by the current directive and when the convention does enter into force, the European maritime safety agency (EMSA) has informed that there will be a new MED directive in place to cover such equipment. 95

4.2.3 The Biocides directive

During the 49th Marine environment protection committee (MEPC) meeting, the Netherlands raised concerns regarding the use of chemicals for biocidal ballast water treatment. The concerns regarded the possible effects on the environment relating to selection of chemicals, their appropriate dosage in a constantly changing marine environments as well as the limited knowledge of the possible consequences of large volumes of ballast water being treated with chemicals. The Netherlands stressed that the usage of chemicals and biocides in ballast water treatment systems should be strictly regulated, suggesting an approval mechanism to ensure that there are no unfavorable effects or negative impacts on the marine environment. 96

The control of biocidal products within the EU is conducted through the Biocides directive of 1998, which aims to harmonize the European market for biocidal products and their active substances, while protecting humans, animals and the environment. 97 Biocidal products are products which contain active substances or preparations containing active substances that are intended to destroy, deter, render harmless, prevent the action of, or otherwise exert a controlling effect, on any harmful organism by chemical or biological means. 98 Biocidal products may not be placed on the market or used within the territory of a member state unless they have been authorized in accordance with this directive. 99

The provisions of this directive state that any ballast water treatment system using biocides would have to be approved under the Biocides directive. This

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93Ibid., article 2(e).
94Ibid., annex A.
95 As informed through e-mail correspondence with Jad Mouawad, Det Norske Veritas AS Cargo handling, Piping systems & Gas carriers (2009-12-18).
96BWM/CONF/19, Consideration of the draft international convention for the control and management of ships' ballast water and sediments, pp.1-2.
98Article 2.1(a), directive 98/8/EC.
99Ibid., article 3.1.
issue has been given attention in the adopted proposal of a new regulation to repeal and replace the current directive, entering into force January 1, 2013.\textsuperscript{100} Article 2 of the proposal states that biocidal products which have been approved under the BWM convention shall be considered as authorized under the Biocides directive.\textsuperscript{101} This is motivated by the fact that the BWM convention “provides for an effective assessment of the risks posed by ballast water management systems, the final approval and subsequent type approval of such systems should be considered equivalent to the product authorization required under this regulation”.\textsuperscript{102}

In spite of the automatic approval, holders of authorizations who become aware of any new information that may affect the authorization are still obligated to notify competent authorities.\textsuperscript{103} Also, producers, importers and professional users of biocidal products must keep records of the biocidal products they produce, place on the market or use for at least three years.\textsuperscript{104}

\subsection*{4.2.4 The Port state control directive}

The new Port state control directive is part of the new inspection regime which was adopted at the Paris memorandum of understanding in May 2009.\textsuperscript{105} The objective of the directive is to help drastically reduce substandard shipping in the waters under the jurisdiction of EU member states through increased compliance with international and relevant community legislation on maritime safety, maritime security, protection of the marine environment and on board living and working conditions of ships of all flags. Common criteria for control of ships and the frequency of inspections are to be developed based on risk profiles.\textsuperscript{106}

Ballast water and the spread of invasive species are not mentioned specifically in the Port state control directive, though it is stated that deficiencies that are clearly hazardous to safety, health or the environment, warrant the competent authority of port states to detains ships until the hazard has been removed.\textsuperscript{107}

\begin{thebibliography}{99}
\item \textsuperscript{100} http://ec.europa.eu/environment/biocides/revision.htm (2010-04-07).
\item \textsuperscript{102} Ibid., preamble (21).
\item \textsuperscript{103} Ibid., article 38.
\item \textsuperscript{104} Ibid., article 57.
\item \textsuperscript{105} http://www.emsa.europa.eu/end185d007d002d001d002.html (2010-04-08).
\item \textsuperscript{106} Article 1, directive 2009/16/EC.
\item \textsuperscript{107} Ibid., article 19.2.
\end{thebibliography}
4.2.5 The Port waste reception facilities directive

“Reception facilities” is a term mentioned several times in the BWM convention and in the ballast water discussion in general. The Port waste reception facilities directive of 2000 aims to reduce the discharges of ship-generated waste and cargo residues into the sea from ships using ports in the community by improving the availability and use of port reception facilities.108

Ship-generated waste is strictly defined as “all waste, including sewage, and residues other than cargo residues, which are generated during the service of a ship and fall under the scope of Annexes I, IV and V to Marpol 73/78”. Ballast water is not covered by any of the annexes to the International convention for the prevention of pollution from ships (Marpol 73/78) and should then not be covered by this directive. It is however further stated that ship-generated waste, without prejudice to the previous definition, shall be considered to be waste within the meaning of Article 1(a) of Council Directive 75/442/EEC on waste.109 The definition of waste under this directive is very wide and refers to categories in its annex I where category Q16 reads “Any materials, substances or products which are not contained in the above categories”.110 If ballast water is considered as covered by the scope of this directive, member states would be required to ensure the availability of port reception facilities for ballast water adequate to meet the needs of ships normally using the port, without causing undue delay.111

The preamble to the directive also states that “consistency with existing regional agreements, such as the 1974/1992 Convention on the Protection of the Marine Environment in the Baltic Sea Area, should be ensured”.112 These regional agreements within Europe all have taken actions regarding ballast water management and will be discussed further below.

4.2.6 The Habitats directive

The 1992 Habitats directive is the result of the duties of the European Community under the Bern convention and aims to ensure biodiversity through the conservation of natural habitats and of wild fauna and flora in the European territory.113 Measures shall be taken to maintain or restore natural habitats and species of the wild.114 States are required to ”ensure that the deliberate introduction into the wild of any species which is not native to their territory is regulated so as not to prejudice natural habitats within their

108 Article 1, directive 2000/59/EC.
109 Ibid., article 2.
110 Ibid., article 2(c) and article 1(a) with annex 1 (Q16), directive 75/442/EEC.
111 Article 4(1), directive 2000/59/EC.
112 Ibid., preamble (8).
113 Article 2.1, directive 92/43/EEC and http://www.jncc.gov.uk/page-1374 (2010-04-27).
114 Article 2.2, directive 92/43/EEC.
natural range or the wild native fauna and flora and, if they consider it necessary, prohibit such introduction”.

Open sea and tidal areas are listed as one of the natural habitat types that are of Community interest and whose conservation requires the designation of special areas of conservation.

4.3 Regional seas conventions

4.3.1 Background

The Regional seas programme was launched in 1974 and is one of the most significant achievements of the United Nations environment programme (UNEP). With the aim of providing neighboring countries with the means to protect the marine environment that they share, these effort address the accelerating degradation of oceans and coastal areas. In general, the programs are based on “action plans” which in turn are backed up by legal frameworks through regional conventions and protocols, targeting specific problems. Out of the 13 programs existing today, four concern waters within the EU (although it should be noted, not exclusively waters within the EU) and they will be the focus of the following subchapter.

4.3.2 The Convention for the protection of the marine environment of the North-East Atlantic

The Convention for the protection of the marine environment of the North-East Atlantic (OSPAR convention) with its Commission today consists of 15 governments and the EU. The North-East Atlantic area covered by the convention is vast, stretching from the coast of Greenland to the North Sea and from the North Pole to the straits of Gibraltar. The OSPAR that we know today is the result of a merge between two separate conventions in 1992, the 1972 Convention on the prevention of marine pollution by dumping from ships and aircraft (Oslo convention) and the 1974 Convention for the prevention of marine pollution from land-based sources (Paris convention). Since its entering into force in 1998, the OSPAR convention reinforces legal principles such as the precautionary principle, the polluter pays principle, best available technique and best environmental practice for the marine environment.

\[\text{Ibid.}, \text{article 22(b).}\]
\[\text{Ibid.}, \text{annex 1.}\]
\[\text{http://www.unep.org/regionalseas/about/default.asp} (2010-04-08).\]
\[\text{http://www.ospar.org/content/content.asp?menu=00380108110000_000000_000000} (2010-04-09).\]
\[\text{http://www.unep.org/regionalseas/programmes/independent/neatlantic/default.asp} (2010-04-08).\]
\[\text{http://www.ospar.org/content/content.asp?menu=00350108080000_000000_000000} (2010-04-09).\]
\[\text{http://www.unep.org/regionalseas/programmes/independent/neatlantic/default.asp} (2010-04-09).\]
In seeking to regulate all sources of marine pollution in one single instrument, the OSPAR convention has represented a new approach to the protection of the marine environment.\textsuperscript{122} From a ballast water and invasive species point of view, the most interesting part of this regional cooperation is not the convention itself but the joint initiatives taken together by the OSPAR and Helsinki Commissions to safeguard the marine environment from invasive species, called the General guidance on the voluntary interim application of the D1 ballast water exchange standard in the North-East Atlantic and the Baltic Sea.\textsuperscript{123} The initiatives are directly in line with article 13(3) of the BWM convention stating that “Parties with common interests to protect the environment, human health, property and resources in a given geographical area, in particular, those Parties bordering enclosed and semi-enclosed seas, shall endeavor, taking into account characteristic regional features, to enhance regional co-operation, including through the conclusion of regional agreements consistent with this Convention”.\textsuperscript{124}

The voluntary guidelines are addressed to ships flying the flag or operating under the authority of a party and are applicable until the point where a ship is in a position to apply the D-2 Standard of the BWM convention or until the BWM convention enters into force and there is a mandatory obligation to apply the D-2 Standard.\textsuperscript{125}

Vessels are recommended to have a ballast water management plan and they should keep records of all their ballast water operations.\textsuperscript{126} The guidelines ask that ships exchange their ballast tanks after the D-1 Standard of the BWM convention, at least 200 nautical miles from the nearest land and in waters at least 200 meters deep, before entering the North-East Atlantic (this does not apply to vessels entering the area from the Mediterranean Sea).\textsuperscript{127} If the exchange takes place within the North-East Atlantic, vessels are still expected to conduct it at least 200 NM from nearest land and at a depth of at least 200 meters. If not possible, exchange should be conducted as far away from land as possible but never closer to land than 50 NM and still in waters at least 200 meters deep.\textsuperscript{128}

\textsuperscript{122}Sands, Philippe, Principles of international environmental law, 2003, p. 409.
\textsuperscript{123}\url{http://www.ospar.org/content/news_detail.asp?menu=00600725000000_000004_000000} (2010-04-09).
\textsuperscript{124}Article 13(3), International convention for the control and management of ships' ballast water and sediments.
\textsuperscript{125}Section (1.), General guidance on the voluntary interim application of the D1 Ballast water exchange standard in the North-East Atlantic and the Baltic Sea, as informed in the IMO circular BWM.2/Circ.14.
\textsuperscript{126}Ibid., sections (4.) and (5.).
\textsuperscript{127}Ibid., section (6.).
\textsuperscript{128}Ibid., section (7.).
4.3.3 Convention on the protection of the marine environment of the Baltic Sea area

The work of protecting the marine environment of the Baltic Sea from all sources of pollution is carried out under the 1992 Convention on the protection of the marine environment of the Baltic Sea area (Helsinki convention) by the Helsinki Commission (HELCOM). HELCOM is an intergovernmental co-operation between Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden and the EU. Just like the OSPAR convention, the Helsinki convention is founded on the fundamental principles of precaution, prevention, polluter-pays, best environmental practice and best available technology. \(^{129}\)

Regarding ballast water, HELCOM has taken measures to facilitate the ratification of the BWM convention through the implementation of a Ballast water road map as part of its Baltic Sea action plan. The road map contains important measures such as the compilation of data on invasive species already in the Baltic Sea, agreeing on target species, deciding on high versus acceptable low risk scenarios and providing adequate reception facilities in the ports of the contracting parties. \(^{130}\)

As previously mentioned, the Helsinki and OSPAR Commissions have taken joint initiatives to help reduce the environmental risks caused by ballast water while awaiting the BWM convention's entering into force. For more information on the guidelines please refer to the previous section.

4.3.4 Convention for the protection of the marine environment and the coastal region of the Mediterranean

Initially the sole aim of the 1976 Convention for the protection of the marine environment and the coastal region of the Mediterranean (the Barcelona convention) was to reduce pollution. Today, through the addition of protocols, the Barcelona convention has been updated and its scope has been expanded. \(^{131}\) One of those protocols is the Mediterranean's main tool for implementing the Convention on biological diversity, the Protocol concerning specially protected areas and biological diversity in the Mediterranean. \(^{132}\) Here it is stated that “Parties shall take all appropriate measures to regulate the intentional or accidental introduction of non-indigenous or genetically modified species to the wild and prohibit those

\(^{129}\) Article 3, Convention on the protection of the marine environment of the Baltic Sea area.  
\(^{131}\) UNEP/MAP-RAC/SPA. 2008. Guidelines for controlling the vectors of introduction into the Mediterranean of non-indigenous species and invasive marine species, Ed. RAC/SPA, Tunis. p.6  
that may have harmful impacts on the ecosystems, habitats or species in the area”. As a consequence, the United Nations environment programme's Mediterranean action plan adopted the Action plan concerning species introductions and invasive species in the Mediterranean Sea. The main objective of this action plan is to promote the development of coordinated measures and efforts in the Mediterranean region to prevent, control and monitor the effects of species introductions. This is to be done through a general strengthened capacity to deal with the issue of invasive species as well as strengthened institutional and legislative frameworks, mechanisms for cooperation, information exchange and lastly the elaboration of guidelines. It is strongly recommended that a regional program be developed to overcome gaps and strengthen the capacities of the countries around the Mediterranean to reduce the transfer of organisms via ships' ballast water and sediments. At a national level, contracting parties which have yet to express the provisions of the international treaties and guidelines regarding invasive species in their national legislations are urged to do so as quickly as possible.

The hierarchical structure of the different organs working with the marine environment of the Mediterranean is not always self-evident. Globallast, a program party funded by the IMO, cooperates with the region as a whole through the UNEP's Mediterranean action plan and with two relevant centers, the Regional pollution and emergency response centre for the Mediterranean Sea (REMPEC), administered by the IMO, and the Regional activity centre for specially protected areas. These organs all work toward the development of a regional strategy addressing ballast water management and an important step was taken during a meeting organized by REMPEC in Dubrovnik in 2008. At the meeting, 18 Mediterranean coastal states and the European Commission decided on the formation of a regional task force to develop a strategy on ballast water and promote bringing the BWM convention into effect.

### 4.3.5 Convention on the protection of the Black Sea against pollution

Out of all the regional seas in Europe, the Black Sea is the most isolated since it is only linked to the Mediterranean, the Sea of Marmara and the Dardanelles. The isolation of this sea is causing its “immunity” to invasive species.

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133 Article 13, Protocol concerning specially protected areas and biological diversity in the Mediterranean.


135 Ibid., section 23.

136 Ibid., section 17.


species to be particularly low. The coastal area is densely populated and a large amount of people are depending on the sea for their survival, which makes preventing introduction of harmful aquatic species of outmost importance.\textsuperscript{139}

In all essential, the basic objective of the 1992 Convention on the protection of the Black Sea against pollution (the Bucharest convention) is the same as for the previously discussed conventions; to prevent, reduce and control pollution in the Black Sea and to provide the legal framework for cooperation and joint actions.\textsuperscript{140} The convention does not discuss ballast water in the actual text, but the issue is still on the agenda and a task force to minimize the transfer of invasive species was created after a series of Black Sea conferences on ballast water control.\textsuperscript{141} Promoting cooperation in the Black Sea in line with the principles and recommendations of the BWM convention, as well as harmonizing ballast water procedures using IMO guidelines have been listed as short-term targets with high priority in a revised strategic action plan from 2009.\textsuperscript{142}

At a national level, the existing requirements regarding ballast water management vary among the parties of the Bucharest convention. Today only Bulgaria, Georgia, Ukraine and the Russian Federation require ballast water exchange from vessels carrying ballast water from outside the Black Sea. The countries around the Black Sea are planning to harmonize their regulations but differences of opinion on how to regulate the issue and a shortage of financial resources and funding slow down the process.\textsuperscript{143}

4.4 Discussion

The environmental policy of the European Union is often distinguished as one of its most post positive aspects by the general population and it has since its inception helped make European waters and air cleaner. Yet, the environment is not the only area which concerns the EU and other aspects such as free trade also needs to be taken into consideration. An increasing number of invasions and increasing costs to control them should however soon constitute the needed incentives to push for stronger action on ballast water management at an EU-level.

\textsuperscript{139}Bashtanyy, R., Webster, L. & Raaymakers, S., 1\textsuperscript{st} Black Sea conference on ballast water control and management, Ukraine, 10-12 October 2001: Conference Report, Globallast Monograph Series No. 3, IMO London, 2002. p. 4.
\textsuperscript{140}\url{http://www.blacksea-commission.org/convention.asp} (2010-04-14).
\textsuperscript{142}Annex 3(26) and 3(27), Strategic action plan for the environmental protection and rehabilitation of the Black Sea, Sofia, Bulgaria, 17 April 2009.
In the meantime, the European Commission is urging member states to implement the BWM convention at a national level and regional cooperations are developing measures on their own. The regional efforts are faced with very different challenges that go beyond ballast water management. The cooperation regarding the Black Sea for example has to overcome diplomatic and financial issues before any measures can harmonized. HELCOM and OSPAR have undeniably gotten far and already established voluntary guidelines but still suffer from their implementation being too limited and from their lack of enforcement capabilities.

The situations in the regional seas are further complicated by the fact that they are semi-enclosed seas. Their intake and outlet of water are of varying volumes and a smaller flux of water means that invasive species are more likely to be able to establish themselves in the new environment. Other factors such as overfishing could also contribute to augmenting the problem. When the pressure put on the local populations of fish is too hard and their numbers start to decline, the ecosystems are left with empty niches which easily can be exploited by opportunistic invasive species. If even just one or a few species such as the Zebra mussel were able to establish themselves in the regional seas of Europe, stricter regulations might come too late and it should therefore be questioned if the measures taken so far within the EU are sufficient.

The suggestion that Europe needs stricter mandatory ballast water regulations for its seas is further supported by the fact that the areas around these seas are incredibly densely populated. Many communities in these areas rely on fishing for their livelihood and invasive species have the potential of severely threatening any such activities by outcompeting local economically important marine species. When faced with the big risks and what is at stake, are voluntary interim measures really enough? And can the EU be said to live up to its precautionary principle without stronger regulations? It would in my opinion require mandatory regulations with strong enforcement capabilities for that to be the case.

With that said, other EU directives which are relevant to ballast water management and which play an important role when it comes to safeguarding the marine environment of Europe are of course not insignificant. Some of these directives even refer to the regional strategies and aim to cooperate with them.

The marine environmental legislation of the EU gives a somewhat sectoral impression and it is sometimes hard to overview. The new Marine strategy framework directive is definitely a step in the right direction toward overcoming the gaps found in the legal patchwork of today. The directive is still new and it will be interesting to follow the effects of its environmental assessments and programs to reach good environmental status on invasive species and ballast water management regulations.
Directives of more technical character, such as the Marine equipment directive and the Biocides directive, will become increasingly important to the issue of ballast water as the development of treatment systems expands further. The proposal of the new Biocides directive considered the lack of clarity that sometimes is found between these directives and other regulations such as the BWM convention. In this case it was stated that assessments and approvals under the BWM convention will be considered as equal to the ones conducted under the Biocides directive. One issue that however not was addressed in the proposal was what will happen if the BWM convention still has not entered into force by the time the new Biocides directive does, in 2013. Supposedly, an approval can be obtained from the EU until one can be obtained under the BWM convention but considering that one of the issues addressed by the new proposal was the lack of clarity between the Biocides directive and the BWM convention, it would have been desirable to have anticipated this issue and addressed it in advance.

While awaiting the development of adequate onboard treatment systems, a safe alternative could be to discharge ballast water into land-based port waste reception facilities. The Waste reception facilities directive requires member states to provide adequate such facilities. Seeing as this practice, hypothetically, could provide an opportunity to completely eliminate ballast water discharges into coastal areas, it seems only logical to wonder why this presently is not taken advantage of to any great extent, especially since vessels are exempted from ballast water regulations when discharging at land-based facilities. The problem here, it seems, does not lie with the reception facilities but with the actual vessels themselves. Ships are today lacking the standardized pipe-work which would enable them to connect and discharge ballast water into those facilities.144

The measures taken in Europe which concern invasive species introductions and ballast water management are scattered. In order to avoid differences and complications, especially for the shipping industry and the trade, the best solution would in my opinion be to address ballast water management at EU-level with one single legal instrument. Such a solution would make it possible to incorporate the provisions of the regional seas conventions and the community legislation into one instrument. Any uncertainties regarding the relationships of different directives and conventions could be addressed and it would be possible to designate an EU body as responsible for its enforcement which could ensure an effective implementation of its provisions.

5 The United States

5.1 Background

The severe consequences of the marine invasions of the Great Lakes have forced the United States to be in the forefront of ballast water regulations. There is no one instrument exhaustively covering the whole of the country, instead the issue is dealt with through a mix of federal and state laws, regulations and guidelines and the main responsibility of their enforcements have been left largely to the Environmental protection agency (EPA) and the United States coast guard (USCG).

5.2 Federal laws

5.2.1 Clean water act

With a national goal to eliminate discharges of pollutants into the navigable waters, the Federal water pollution control amendments of 1972, more commonly known as the Clean water act (CWA) after the 1977 amendment, is the principal federal law regarding water pollution in the U.S.\footnote{33 United States Code, §1251(1), Federal water pollution control act.}

The CWA prohibits the discharge of any pollutant unless lawful according to an exemption. The term “pollutant” is defined broadly, including for example solid wastes, sewage, discharged equipment, biological materials and even rocks and sand, it does however not include “sewage from vessels or a discharge incidental to the normal operation of a vessel of the Armed Forces”.\footnote{Ibid., § 1311(a) and § 1362(6).}

For the purpose of meeting the goals of the CWA and controlling pollution, the development and implementation of national programs is required.\footnote{Ibid., § 1251(a)(7).} Since the CWA is administered by the EPA, they are the ones to develop such programs and regulations. One of the regulations issued by the EPA has been the cause of some controversy regarding this act and ballast water.\footnote{Ibid., § 1251(d).} The CWA states that the administrator of the EPA shall issue permits for the discharge of pollutants into the navigable waters of the U.S.\footnote{Ibid., § 1251(d).} Any discharge of pollutants is therefore prohibited unless beforehand having obtained a National pollutant discharge elimination system (NPDES) permit from the EPA. The controversy here is found in a regulation from the EPA exempting any “discharge of sewage from vessels, effluent from properly functioning marine engines, laundry, shower, and

\footnote{Ibid., § 1342(a)(1).}
galley sink wastes, or any other discharge incidental to the normal operation of a vessel” (not only for vessels of the Armed Forces) from such requirements.\textsuperscript{150} Since the EPA considered ballast water discharges to be incidental to the normal operation of a vessel, such discharges did not require a permit.

Several environmental groups petitioned the EPA to repeal this provision and include ballast water in the permitting requirements under the CWA. The petition was denied by the EPA and a lawsuit was filed under the U.S. district court for the northern district of California.\textsuperscript{151} The plaintiffs claimed the EPA exemption to be in conflict with the CWA, which itself does not exempt “discharges incidental to the normal operation of a vessel” from NPDES requirements and that the EPA had overstepped its statutory authority under the CWA which would make the promulgation unlawful.\textsuperscript{152}

The court found in favor of the plaintiffs, stating that congress had “directly spoken” in the CWA and specifically required NPDES permits for vessels discharging pollutants into U.S. waters and the EPA had therefore acted in excess of its statutory authority and was ordered to repeal the regulation which exempts discharges incidental to the normal operation of a vessel from permit requirements.\textsuperscript{153}

The exemptions were to be vacated as of February 6, 2009, requiring compliance after this date.\textsuperscript{154} A two year moratorium, valid from July 31 2008, was however also created for “covered vessels”, which are fishing vessels or vessels less than 79 feet. During this period NPDES permits can not be required for discharges incidental to the normal operation of covered vessels.\textsuperscript{155}

5.2.2 A presidential order in response to invasive species

Although executive orders (EOs) cannot create governmental powers, they are still important as they direct policy directions of the federal agencies.\textsuperscript{156} Executive order 13112, signed by President Clinton in 1999, was issued to improve the federal coordination and response to the growing problem of invasive species.\textsuperscript{157}

\textsuperscript{150}40 Code of Federal Regulations, § 122.3 (a).
\textsuperscript{151}http://www.epa.gov/owow/invasive_species/ballast_water.html (2010-04-23).
\textsuperscript{152}Northwest Environmental Advocates et al. v. EPA, No C 03-05760 SI, p. 3.
\textsuperscript{153}Ibid., p. 17-18.
\textsuperscript{154}http://cfpub.epa.gov/npdes/home.cfm?program_id=350 (2010-04-23).
\textsuperscript{155}Senate bill No. 3298, section 1-2.
EO 13112 aims to prevent the introduction of invasive species, provide for their control and minimize the economic, ecological and human health impacts that they cause. Introductions are defined as any intentional or unintentional escape, release, dissemination or placement into an ecosystem as a result of human activity.

Any federal agency whose actions might affect the status of invasive species is required to identify such actions and establish relevant programs and authorities in order to prevent introductions, detect and rapidly respond in a cost-effective and environmentally sound manner, as well as monitor and provide for restoration of ecosystem conditions. Actions that are likely to cause or promote introductions may not be authorized unless the relevant agency has determined that the benefits of those actions clearly outweigh the potential harm and measures to minimize the risk of harm will be taken.

The EO also establishes the Invasive species council to provide national leadership regarding invasive species. More specifically, the council shall oversee the implementation of the order and make sure the activities conducted by the agencies are coordinated, complementary, cost-efficient and effective. Additional duties include the development of recommendations for international cooperation and the preparation and issuance of a National invasive species management plan. The management plan shall “detail and recommend performance-oriented goals and objectives and specific measures of success for Federal agency efforts concerning invasive species”.

5.2.3 The Nonindigenous aquatic nuisance prevention and control act as amended by the National invasive species act

The 1990 Nonindigenous aquatic nuisance prevention and control act (NANPCA) was for long the United States' main protection against invasive species in general and in particular those arriving through the aid of ballast water. Recognizing that the discharge of untreated ballast water has resulted in the establishment of nonindigenous species in U.S. waters (particularly the Great Lakes) and lead to severe economical and ecological consequences, the act aims to prevent unintentional introductions and dispersal of such species through ballast water management and other

\[^{158}\text{Preamble to Executive order 13112.}\]
\[^{159}\text{Ibid., section 1.(e).}\]
\[^{160}\text{Ibid., section 2.(2).}\]
\[^{161}\text{Ibid., section 2.(3).}\]
\[^{162}\text{Ibid., section 4.}\]
\[^{163}\text{Ibid., section 4.(a).}\]
\[^{164}\text{Ibid., sections 4.(c) and (g).}\]
\[^{165}\text{Ibid., section 5.(a).}\]
\[^{166}\text{http://www.invasivespeciesinfo.gov/laws/publiclaws.shtml (2010-04-17).}\]
requirements.\textsuperscript{167} Research, prevention control, information dissemination and other related activities are to be coordinated, conducted and authorized at federal level.\textsuperscript{168}

The issuance of voluntary guidelines, ensuring to the maximum extent practicable that ballast water containing aquatic nuisance species would not be discharged into the Great Lakes, were to be developed within six months of the enactment.\textsuperscript{169} Further it was required that the guidelines would be replaced by binding regulations to be issued within two years from the enactment. The regulations, applicable to all vessels equipped with ballast water tanks entering a United States port on the Great Lakes after operating on the waters beyond the exclusive economic zone (EEZ), require vessels to either carry out exchange beyond the EEZ prior to entry, exchange the ballast water in other waters where the exchange does not pose a threat of infestation or spread of aquatic nuisance species or use environmentally sound alternative ballast water management methods found to be as effective as ballast water exchange in preventing infestations.\textsuperscript{170}

NANPCA also established an intergovernmental organization called the Aquatic nuisance species task force (ANS task force) of which, among others, the administrator of the EPA and the commandant of the USCG are members.\textsuperscript{171} The main function of the ANS task force is the development and implementation of a program to prevent introductions and dispersals of aquatic nuisance species, to monitor, control and study such species and to disseminate related information.\textsuperscript{172} The program is to identify goals, priorities and approaches for aquatic nuisance prevention, monitoring, control, education and research.\textsuperscript{173} Also, it is to direct the USCG to issue further regulations to prevent introductions and spread of aquatic nuisance species into the Great Lakes through ballast water.\textsuperscript{174}

Violations of the regulations may lead to civil and criminal penalties. The penalties are however subjected to exceptions and the liability does not apply when the safety or stability of the vessel, its crew or passengers, is threatened or the record-keeping and reporting requirements are complied with.\textsuperscript{175}

Another important aspect of the NANPCA is the encouragement of the development of regional panels to conduct activities such as identifying priorities, make recommendations to the task force, provide advice to the

\textsuperscript{167}Sections 1002(a) and 1002(b)(1), Nonindigenous aquatic nuisance prevention and control act of 1990.
\textsuperscript{168}Ibid., section 1002(b)(2).
\textsuperscript{169}Ibid., section 1101(a).
\textsuperscript{170}Ibid., sections 1101(b)(1) and 1101(b)(2).
\textsuperscript{171}Ibid., sections 1201(a) and 1201(b).
\textsuperscript{172}Ibid., section 1202(a).
\textsuperscript{173}Ibid., section 1202(b)(1).
\textsuperscript{175}Section 1101(g), Nonindigenous aquatic nuisance prevention and control act of 1990.
public and encourage state or interstate invasive species management plans to identify areas or activities for which funds or technology is needed.\textsuperscript{176}

Since the provisions under NANPCA were of a voluntary nature, except in the Great Lakes, they were criticized and deemed inadequate.\textsuperscript{177} In 1996 the act was reauthorized and amended by the National invasive species act (NISA) which slightly expanded it.\textsuperscript{178} After NISA the scope has been widened to cover all of the U.S. waters and the focus is now less on the Zebra mussel and more on aquatic nuisance species in general.\textsuperscript{179}

Currently, a new bill named the National aquatic invasive species act (NAISA) has been referred to the Senate committee. If passed, it will reauthorize and amend NANPCA, as amended by NISA. Amongst the novelties of this bill are requirements applicable to all ships operating in waters of the United States, both coastal and transoceanic.\textsuperscript{180} Practically all ships operating within the U.S. would be required to have an Aquatic invasive species management plan, carry out best management practices, record all ballast operations and abide by any applicable ballast water treatment requirements if the bill is passed.\textsuperscript{181} NAISA would also introduce performance standard requirements, preventing discharges of ballast water not able to meet the standards of less than one living organism bigger than 50 micrometers per 10 cubic meters or less than one living organism per 10 milliliters that is less than 50 and more than 10 micrometers in dimension.\textsuperscript{182}

\subsection*{5.2.4 The United States coast guard’s ballast water management program}

The USCG was directed by NISA to establish national voluntary ballast water management guidelines, which if deemed inadequate were to be transformed into a mandatory national program. Since the rate of compliance was found to be too low and vessel operators often failed to submit the mandatory ballast water reports, the program was converted into mandatory regulations in 2004.\textsuperscript{183} The regulations consist of two subparts implementing the provisions of NANPCA/NISA, subpart C on Ballast water management for control of nonindigenous species in the Great Lakes and Hudson River and subpart D on Ballast water management for control of nonindigenous species in waters of the United States.

\begin{itemize}
  \item \textsuperscript{176}Ibid., sections 1203(a), 1203(c) and 1204(a).
  \item \textsuperscript{177}http://ncseonline.org/NLE/CRSreports/Biodiversity/biodv-26c.cfm (2010-04-17).
  \item \textsuperscript{178}http://www.invasivespeciesinfo.gov/laws/publiclaws.shtml (2010-04-17).
  \item \textsuperscript{179}Whitney, Sarah, An evaluation of the National invasive species act to support its reauthorization, 2002, p. 7.
  \item \textsuperscript{180}http://levin.senate.gov/newsroom/release.cfm?id=269930 (2010-04-17).
  \item \textsuperscript{181}Section 101, National aquatic invasive species act of 2007, as proposed through Senate bill 725 (110\textsuperscript{th}) to amend section 1101(a) of the Nonindigenous aquatic nuisance prevention and control act of 1990.
  \item \textsuperscript{182}Ibid., section 101 as to amend section 1101(b)(3).
  \item \textsuperscript{183}http://www.uscg.mil/hq/cg5/cg522/cg5224/bwm.asp (2010-04-17).
\end{itemize}
Subpart D applies to all vessels equipped with ballast tanks that operate in waters of the U.S. and which are bound for ports or places in the U.S. It is stated that discharge or uptake of ballast water must be avoided in areas where they might directly affect marine sanctuaries, marine preserves, marine parks or coral reefs. Uptake must also be minimized or avoided in areas with known infestations, near sewage outfalls, areas near dredging operations, where tidal flushing is poor, in darkness (when bottom-dwelling organisms may rise in the water column), where propellers may stir up sediment and finally in areas with pods of whales, convergence zones and boundaries of major currents. Ballast tanks must only be cleaned at mid-ocean or under controlled arrangements in port and while in the waters of the U.S. only the minimal amount of ballast water essential for vessel operations may be discharged. Every vessel is to have a specifically adopted ballast water management plan which helps the responsible crew to understand and follow its management strategy.

Whenever a vessel is carrying ballast water that was taken on less than 200 NM from any shore, ballast water management must be conducted prior to discharge. The accepted options are performing ballast water exchange at least 200 NM from any shore, retaining ballast water on board the vessel or use an alternative environmentally sound method of ballast water management, approved by the coast guard, prior to entering U.S. waters.

Ballast water management is not required if the master of the vessel decides that it would threaten the safety of the vessel, its crew or its passengers, because of adverse weather, vessel design limitations, equipment failure or any other extraordinary conditions. In those cases, still only the amount of ballast water needed to ensure the safety of the vessel for cargo operations may be discharged and ballast water records must be made available to the local Captain of the port (COTP) upon request. If the vessel on the other hand is subjected to subpart C, i.e. operating in the Great Lakes or Hudson River, it must employ another method of ballast water management or request permission from the COTP to exchange the vessel's ballast water within a designated area.

The mandatory record-keeping requirements include general information about the vessel, voyage information, total ballast water information, ballast water management as well as information on the ballast water itself, such as origin, date of uptake, location, volume, temperature and salinity. The COTP may sample the ballast water, examine document and pose general inquiries in order to assess compliance with the regulations.

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185Ibid., § 151.2035 (a).
186Ibid., § 151.2035 (b).
187Ibid., § 151.2030 (b).
188Ibid., § 151.2037(a).
189Ibid., § 151.1514.
190Ibid., § 151.2045.
191Ibid., § 151.2050 (a).
The legislative mandate in NISA requires the coast guard to approve alternative methods of ballast water management and the alternatives must be at least as effective as ballast water exchange when it comes to preventing or reducing the introduction of invasive species. In order to have methods for evaluating ballast water treatment systems’ effectiveness, the coast guard has proposed amendments to the current regulations through the establishment of standards for allowable concentrations of living organisms in ballast water discharges. The proposal consists of three suggestions ranging between less than 10 to 0.1 living organisms larger than 50 µm per cubic meter and less than 10 to 0.1 living organisms smaller than 50 and larger than 10 µm per milliliter. A second aspect of the proposal is the addition of an approval program for ballast water management systems, containing requirements for designing, installing, operating and testing these systems to ensure that they meet the safety and performance standards. The approval program is based partly on information from the IMO G8 guidelines under the BWM convention.

5.3 State regulations

5.3.1 Washington

The state of Washington department of fish and wildlife is the organ implementing the state law on ballast water management in Washington. The law is applicable to all vessels weighing at least 300 gross tons and transiting into the waters of the state. Discharge of ballast water is not permitted unless there has been an open sea exchange or if the ballast water has been treated to meet standards set by state and federal laws. Open sea exchange under this regulation means an exchange that occurs at least 50 miles offshore unless the USCG requires the exchange to take place further offshore, in which case that is the required distance for compliance.

Reporting and sampling requirements include the submission of ballast water management information, using USCG-forms, as well as nonindigenous species ballast water monitoring data, both for which details are further specified by rules. Taking into consideration what is practically and technologically feasible, standards for the discharge of treated ballast water shall be set and sampling and testing protocols shall be adopted.

192Federal Register/Vol. 74, No. 166/Friday, August 28, 2009/Proposed rulemaking, pp. 44632-44633 and 44636.
193Ibid., p. 44640.
194Sections 77.120.010(11) and 77.120.020(1), Revised Code of Washington.
195Ibid., sections 77.120.030(1) and (2).
196Ibid., section 77.120.030(9).
197Ibid., sections 77.120.040(1) and (2).
198Ibid., section 77.120.040(5).
When an open ocean exchange or other such treatments would threaten the safety of a vessel, they need not be conducted and the vessel may discharge the minimal amount of water operationally necessary. Whenever the safety exemption is utilized, documentation regarding the incident must be submitted and the vessel may be subjected to fees of no more than $5,000.199

5.3.2 California

The Marine invasive species program of California was initiated in 1999 after California's ballast water management for control of nonindigenous species act was passed and in 2003 the scope of the act was expanded through the Marine invasive species act (MISA).200 The purpose of the legislation is to move the state toward elimination of discharge of nonindigenous species into the water of the state or waters that may impact the waters of the state, using the best available technology economically achievable.201 The requirements for ballasting operations under MISA are structured around actions to minimize the uptake and release of nonindigenous species. Minimal amounts of ballast water essential for vessel operations may be discharged in waters of the state, uptake or discharge shall be minimized within marine sanctuaries, marine preserves, marine parks or coral reefs and uptakes shall also be minimized when the risks of taking on big amounts of organisms are high (such as near sewage outfalls, in darkness and in disturbed sediments).202

Each vessel shall have a ballast water management plan, at least sufficiently detailed to let the ship's crew understand and follow the ballast water management strategy and upon request, the State lands commission shall be allowed to sample ballast intake and discharge.203 Members of the crew with responsibilities under the ballast water management plan shall be trained on management and treatment procedures.204 Vessels arriving from outside of the EEZ have the choice of either conducting mid-ocean exchange before entering the waters of California, retain all ballast water on board the vessel, discharge the ballast water at the same location from which it originated, use approved ballast water management techniques or discharge into approved reception facilities.205 Only under extraordinary circumstances can exchange in areas agreed to by the States land commission and the USCG be accepted.206

199 Ibid., section 77.120.030(4).
201 Section 71201.(d), Marine invasive species act.
202 Ibid., section 71204.(a)-(c).
203 Ibid., sections 71204.(g) and (h).
204 Ibid., section 71204.(i).
205 Ibid., sections 71204.2.(a)-(e).
206 Ibid., section 71204.2.(f).
The MISA has, since its adoption, been amended several times and its scope has been broadened. One of those amendments is the Coastal ecosystem protection act of 2006, which authorizes the State lands commission to implement performance standards for ballast water discharge.

Following an implementation schedule of performance standards, limits are set to no detectable living organisms that are greater than 50 micrometers in dimension, less than 0.01 living organisms per milliliter that are less than 50 and more than 10 micrometers in dimension. For organisms less than 10 micrometers in dimension the limits are less than 1000 bacteria per 100 milliliter and less than 10 000 viruses per 100 milliliter and the regulations also include cfu limits for microbes such as E.Coli. In the year of 2020 these standards are turned into a final performance standard for ballast water discharges, zero detectable for all organism size classes.

5.3.3 Michigan

Being situated in the Great Lakes Region of the United States and boasting more than 11,000 inland lakes as well as 36, 000 miles of rivers and streams, protecting the waters of the state is of the outmost importance. Michigan's environmental acts have to a large degree been consolidated into the Natural resources and environmental protection act of 1994. In 2005, an important amendment under the name of Senate bill 332, regarding ballast water and invasive species was added. This bill introduced regulations stating that, as of January 1, 2007, “all oceangoing vessels engaging in port operations in this state shall obtain a permit from the department” and by “the department” was referred to the Michigan department of environmental quality (MDEQ). Permits may only be issued if the applicant can demonstrate that the vessel will not discharge any aquatic nuisance species. Alternatively, if the vessel wishes to discharge ballast water, the operator has to demonstrate that environmentally sound technology and methods, as determined by the department, will be used to prevent the discharge of aquatic invasive species. MDEQ has, through the promulgation of rules, approved four such methods for a general permit and those are hypochlorite, chlorine dioxide, ultra violet light radiation preceded by suspended solids removal and deoxygenation. If a vessel wishes to use an alternative method, it must apply for a more expensive individual permit.

207Section 2293, California Code of Regulations (title 2, division 3, chapter 1, article 4.7, Performance standards for the discharge of ballast water for vessels operating in California waters).

208Section 3, as amending section 71205.3. of the Marine invasive species act, Senate bill No. 497, Coastal ecosystem protection act.


211Sections 3112(6) and 3301(c), Natural resources and environmental protection act, as amended by Senate bill No. 332.

The department also has to cooperate with other Great Lakes basin states and related organizations, such as the Great Lakes panel on aquatic nuisance species, to ensure the development of standards for the control of aquatic nuisance species that are broadly protective of the states waters and natural resources. 213

The purpose behind the Michigan regulation was to implement more effective treatment methods than enforced by the USCG. It was not intended to accept mid-ocean exchange and instead Michigan opted for treatments which have yet to be approved by the USCG. This was not taken well by the shipping industry and led to nine shipping companies seeking a declaratory judgment that Michigan's ballast water statute was invalid. 214

Among the arguments raised by the plaintiffs were that the statute placed unreasonable burdens on interstate commerce, it was excessive in relation to the local benefits gained, it had a discriminatory effect on ships not registered in the state of Michigan and that it was in conflict with the USCG regulations on ballast water. 215 The motion was denied after the court found that the U.S. congress never intended to be the sole legislator in this field. NISA puts upon the USCG to create regulations pursuant its goals and the USCG has made it clear through its regulations that states have the right to enact laws such as the one in question. 216

5.4 Discussion

The invasion of Zebra mussels in the late 1980s and the extreme costs associated with its control, acted as a catalyst on invasive species control in the U.S. Although the initial response put emphasis on the Great Lakes area and the invasion by Zebra mussels, the government chose to target the wider issue. Instead of passing an act solely on Zebra mussels, it was recognized that the problem was and most likely was to become much larger and legislations were formulated accordingly.

Today, the problem is regulated both at federal and state level and different agencies, the most significant ones being the EPA and the USCG, are entrusted with the task of implementing and enforcing the regulations. Considering the size of the U.S., it has been found that federal solutions might not always provide the most efficient and suitable solutions and states have been given the authority to implement their own regulations on ballast water management. The state regulations are quite varied and not at all uniform, which, if they were, of course would have somewhat defeated their purpose. However, a quite logical pattern can be made out; the more

213 Section 3112(6), Natural resources and environmental protection act, as amended by Senate bill No. 322.
215 Ibid., p. 10.
216 Ibid., p. 21.
severely affected a state has been by past invasions, the stricter its ballast water regulations today.

The shipping industry is finding it hard to comply with the different regulations existing at state level, e.g. claiming that it disfavors ships depending on where they are registered. Even the USCG has tended to agree and as a result, several of the regulations and their provisions have been tried, without success, in court. The tendency in U.S. courts has been to recognize the rather large degree of freedom left to the states to formulate their own provisions after their individual needs with little restraint so far. Michigan has even gone so far as to exclude ballast water exchange from its list of acceptable methods of ballast water management needing to be conducted in order to obtain a discharge permit. Only certain approved treatment systems are now accepted.

Washington has not yet excluded ballast water exchange from the acceptable management methods and while in the waters of the state, vessels have the choice of conducting an exchange in the open ocean or using ballast water treatment systems. An interesting aspect of the Washington regulation that has not been seen in any of the other regulations studied in this thesis is that any exemption to the rules may lead to an obligation to pay fees.

California, like Washington, has not taken its regulations quite as far as Michigan and acceptable methods of ballast water management are mid-ocean exchange, retaining the ballast on board, discharge at the same location where it was loaded, utilize ballast water treatment systems or discharge at approved reception facilities. However, steps toward implementing performance standards have been initiated and a very ambitious target, perhaps the most ambitious yet, of zero detectable organisms of all size classes has been set to be reached by the year of 2020. If California manages to reach this target still remains to be seen.

Already the first national voluntary guidelines in the U.S. were equipped with a provision threatening to make them mandatory if compliance was too low. The guidelines were made into mandatory requirements and reinforced with civil penalties as strong incentives for compliance. This approach is both proactive and decisive and can be said to be characteristic for way the U.S. has chosen to regulate ballast water and invasive species. The CWA is a perfect example of this, not allowing permits unless measures have been taken to prevent introductions.

Of course, the fact that the U.S. has legally binding instruments in force makes their legislation that much more powerful, however it is suggested that the forcefulness comes, not only from the legislation itself but from its structure and its implementation. A large part of the structure can be said to originate from the executive order issued by President Clinton which, solely through directing the policies to be enforced by federal agencies, has been very important in coordinating invasive species regulations and enabling
strong enforcement through the Invasive species council and its invasive species management plan.
6 Analysis

Steven Wright, an American comedian, once said “I think God’s going to come down and pull civilization over for speeding”. Ever since the early civilizations of the world started traveling to other countries and other parts of the world, humans have, consciously and unconsciously, been taking with them animals and organisms and introduced them into places where they do not belong. For a long time, introductions went by to a large extent unnoticed, but in recent time humans have been “speeding” and not enough attention has been paid to what has been going on in the marine ecosystems. The enormous magnitude of the marine shipping industry has not been without consequences and the effects have needed to become almost catastrophic before action has been taken. Today, there is a global patchwork of regulations regarding invasive species and ballast water but it is debatable if they are really solving the problem.

The most common procedure used today to minimize transfers of harmful aquatic organisms with ballast water is ballast water exchange in the open ocean and several of the regulations presented in this thesis include this provision in their requirements or recommendations. The predecessor to the BWM convention, the IMO guidelines, state that ballast water exchange should be conducted in the deep waters of the open ocean and as far away from shore as possible but does not mention any specific distances. The BWM convention on the other hand requires exchange to take place at least 200 NM from shore and in waters at least 200 meters deep and if not possible, it allows for exchange to be conducted at least 50 NM from shore but still in waters at least 200 meters deep. If an exchange beyond these limits is impossible the BWM convention also allows port states to designate areas within those boundaries where exchanges may take place. The limits of the OSPAR/HELCOM guidelines are the same as for the BWM convention but with the additional primary recommendation that the exchange takes place before entering the North East Atlantic. In the U.S. the NANPCA/NISA and the regulations issued by the coast guard set out similar requirements forcing vessels to exchange their ballast at least 200 NM from shore after arriving from outside of the EEZ of the U.S. but here any depth requirements have been left out. Further studies are needed to determine if any consequences come from a lack of depth requirements in form of increased numbers of invasions in the U.S.

The most deviant of the regulations covered by this thesis regarding ballast water exchange is the one issued by the state of Michigan. All vessels operating in the waters of Michigan must obtain a permit and permits may only be issued if the applicant can demonstrate that the vessel in question will not discharge any aquatic nuisance species. Ballast water exchange in the open ocean is not regarded as a sufficient method of treatment in that aspect and therefore only approved treatment methods are accepted. In applying stricter measures at state level than what has been implemented
federally, Michigan is an exception but although the need for stricter measures on ballast water regulations are needed, it must be recognized that a certain level of conformity is necessary to uphold in order to give the shipping industry and its vessels a chance at complying with regulations on a global scale.

The effectiveness of ballast water exchange varies greatly, depending on factors such as vessel design, exchange method and location and yet, the method has been very important as an interim measure. It has however been shown that invasions keep occurring at alarming rates in spite of these efforts and it is called for regulations with more stringent requirements. A trend toward such requirements can be seen in several regulations which implement or plan to implement ballast water performance standards. These standards set limits for the allowable concentrations of viable organisms in ballast water discharges and will greatly simplify the approval procedures for ballast water management systems.

The standards of the BWM convention state that ballast water discharges must contain less then 10 viable large organisms (greater than 50 μm) per cubic meter and less than 10 viable small organisms (smaller than 50 μm) per milliliter. In the U.S. the suggested amendment to NANPCA/NISA utilize the same limits as the BWM convention while the proposed rule making of the USCG has several alternatives and it remains to be seen which one will be implemented in the final legislation. The most lenient of the alternatives is identical to demands of the BWM convention and the stricter ones range from less than one living large organism per cubic meter and less than one small organism per milliliter to less than 0.1 large organisms per cubic meter and less than 0.1 small organism per milliliter. Still, the proposed USCG standards are not the strictest. The performance standards implemented by the State lands commission in California set the limits to no detectable large organisms and less than 0.01 living small organisms per milliliter, limits which in 2020 are to be transformed into a final performance standard on ballast water discharges requiring zero detectable living organisms for all size classes. Lastly, it should be noted that the BWM convention uses the term viable organisms while other regulations use the term living organisms. In my opinion, viable is a wider term which encompasses stages in marine life-cycles such as eggs or cysts, while living does not.

The safety exemptions found in ballast water management regulations are for the most part very similar, usually stating that vessels are not required to comply if the stability of the ship or safety of crew and passengers are threatened due to factors such as adverse weather, high sea, ship design, equipment failure or other extraordinary conditions. However, even under such extraordinary conditions ballast water discharges may not be conducted in the Great Lakes according to the USCG provisions unless permission has been requested by the Captain of the port or another method of treatment has been employed.
An interesting element of the IMO guidelines, the BWM convention, the regulations by the USCG and the Marine invasive species act of California is that they all contain risk minimizing measures, stating that discharges or uptakes should be avoided in certain areas such as marine sanctuaries, near coral reefs, where tidal flushing is poor, near sewage outfalls, in areas with pods of whales or during times of darkness and when propellers have stirred up sediments. Under the IMO regulations the responsibility is on the port state to notify vessels of such areas while under the American regulations it is the responsibility of the master, owner, operator or person in charge of a vessel to avoid and minimize such uptakes. Some of these areas can easily be distinguished from nautical charts but seeing as others might not, giving the port state the obligation to inform vessels of such sites seems a better solution since the state itself most likely has better knowledge of the area and therefore is more competent in identifying sensitive sights.

A common feature in ballast water regulations worldwide is the requirement to keep a ballast water management plan and a log and the regulations studied for this thesis all have equivalents. The plan has an operational purpose and is essential in detailing safety and disposal procedures as well as reporting requirements and, as such, it is a useful tool for the ongoing ballast water management and a way of letting the crew understand the procedures. The log or record book is not aimed at the crew but the competent authority determining compliance. The log shall contain information on ballasting operations such as dates, geographical locations and volumes of uptakes or discharges, salinity and temperatures. The requirements on the information to be submitted in the plan and the log are in most cases very similar, the only difference being the actions brought about by non-compliance to them. The voluntary provisions, of course, will not result in any legal actions while non-compliance with the record keeping requirements of the BWM convention warrants detailed inspections which may give the port state authority the right to prevent discharges until they are considered safe. Under NANPCA/NISA the record keeping requirements are listed under voluntary national guidelines stating that records shall be maintained on board each vessel and made available for inspection as well as submitted to the secretary of the army for determination of compliance with the guidelines. It is also stated that a vessel is exempted from any sanctions if the record keeping and reporting requirements are complied with. If the proposed NAISA amendment is accepted, maintaining records of all ballast operations becomes mandatory but noncompliance is still excluded from civil and criminal penalties. The USCG regulations differ in that they have no such exception. Failure to comply with their record keeping and reporting requirements may lead to

217 33 CFR 151, subpart D, § 151.2035(a).
218 Section 1101(c)(F), Nonindigenous aquatic nuisance prevention and control act of 1990.
219 Section 101, National aquatic invasive species act of 2007, as proposed through Senate bill 725 (110th) to amend section 1101(e)(4)(b) of the Nonindigenous aquatic nuisance prevention and control act of 1990.
civil and criminal charges, only vessels engaged in innocent passage or coastwise trade, are exempted.\textsuperscript{220}

Ballast water regulations can be viewed as a subcategory to regulations on invasive species introductions and biodiversity and as such it is also affected by those regulations, as for example UNCLOS and the CBD. The purpose and scope of these conventions and regulations differ in too many aspects to make a comparison meaningful but one element that is recurring in the working majority is the demand put on states to prevent, control and eradicate invasive species and the obligation to take appropriate measures nationally. An interesting question that deserves further attention is to what extent the current measures on ballast water management measure up to such requirements.

\textsuperscript{220}33 CFR 151, subpart D, § 151.2010 and § 151.2015.
7 Conclusions

Current regulations on invasive species and biodiversity are quite general in their wording and in the shape of their requirements. Invasions are still common and perhaps the provisions of these regulations are too universal to have any real effect on specific issues such as ballast water introductions. A targeted and forceful approach has for long been missing and the voluntary measures suffer greatly from a lack of enforcement.

As the first global legally binding instrument on ballast water management, the BWM convention marks an important step toward efficiently regulating ballast water discharges and the subsequent spread of invasive species. However, the main focus of the convention initially lies on ballast water exchange, a method that already is coming to be considered as inadequate. In addition to this shortcoming, the ratification is progressing slower than expected which somewhat diminishes the expectations put on this instrument as the solution to the problem.

In the U.S., progress in regulating these issues is advancing much faster than in most other parts of the world. Like the BWM convention, the U.S. regulations open up for states to take more stringent actions on a national level. The difference being that in the U.S., states are using this mandate, which has yet to be seen in Europe. One of the factors behind this lack of individual action to any great extent in Europe might be due to the lacking of a common instrument at EU-level. The federal legislations on ballast water in the U.S. give states a starting-point from which they can evaluate any need for stricter measures. Further, the federal regulations of the U.S. allow for a strong enforcement through national organizations such as the USCG and the EPA, which is further aided by the provisions being associated with civil penalties and criminal charges. In Europe, the regional seas conventions are falling short and the recommendation to implement the BWM convention is the only additional action taken to date toward a more effective control.

This thesis suggests that stronger efforts should be made worldwide to gain enough signatories to the BWM convention as to ensure its entering into force as soon as possible. A global instrument guiding national measures is of great importance. It is further suggested that a common binding instrument for the whole of the EU be developed at community level and that an organization such as EMSA be put in charge of its enforcement. Requirements on standardized pipe-work to facilitate discharges at reception facilities is recommended as a way of avoiding discharges that result from non-compliance due to safety hazard exemptions.
Bibliography

International instruments


EC Legislation


Regional seas instruments


Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention), 1976.


The United States

Federal regulations

Ballast water management for control of nonindigenous species in waters of the United States, 33 Code of Federal Regulations 151, subpart D.

EPA administered permit programs: the National pollution discharge elimination system, 40 Code of Federal Regulations § 122.3.


Senate bill 3298, 110th Congress, 2nd Session, To clarify the circumstances during which the Administrator of the Environmental protection agency and applicable States may require permits for discharges from certain vessels, and to require the Administrator to conduct a study of discharges incidental to the normal operation of vessels. Accessed at: http://www.govtrack.us/congress/billtext.xpd?bill=s110-3298

State regulations


California Code of Regulations, Title 2, Division 3, Chapter 1, *Article 4.7 Performance standards for the discharge of ballast water for vessels operating in California waters.*

*Natural resources and environmental protection act 451* of 1994, as amended by Enrolled Senate Bill No. 332, Part 33, Aquatic Nuisance Control. 

Revised Code of Washington, Title 77, Chapter 120, *Ballast water management.* 
Accessed at: http://apps.leg.wa.gov/RCW/default.aspx?cite=77.120&full=true

Senate Bill No. 497, Chapter 292, *Coastal ecosystem protection act*

Articles and books


Gollasch, Stephan; David, Matej; Voigt, Matthias; Dragsund, Egil; Hewitt, Chad and Fukuyo, Yasuwo, *Critical review of the IMO international convention on the management of ships’ ballast water and sediments*, Harmful Algae 6, pages 585-600, 2007.


**Other**


BWMM/CONF/19, *Consideration on the draft international convention for the control and management of ships' ballast water and sediments, Responsible use of chemicals for biocidal ballast water treatment*, submitted by the Netherlands, 21 January 2004.


**Internet**

All websites were last accessed and controlled 2010-04-24.

The Black Sea Commission  
www.blacksea-commission.org

Center for Invasive Species Research  
http://cisr.ucr.edu

Convention on Migratory Species  
www.cms.int

Council on Foreign Relations  
www.cfr.org

Ecochlor Inc.  
www.ecochlor.com

Environmental Protection Agency  
www.epa.gov

European Commission  
http://ec.europa.eu

European Maritime Safety Agency  
www.emsa.europa.eu

GloBallast Partnerships  
http://goballast.imo.org

Government of British Columbia  
www.gov.bc.ca

Government of Canada  
www.tc.gc.ca

Helsinki Commission  
www.helcom.fi
International Maritime Organization
www.imo.org

Joint Nature Conservation Committee
www.jncc.gov.uk

National Council for Science and the Environment
http://ncseonline.org

National Invasive Species Information Center
www.invasivespeciesinfo.gov

OceanSaver
www.oceansaver.com

OSPAR Commission
www.ospar.org

Regional Activity Centre for Specially Protected Areas
www.rac-spa.org

State Lands Commission, California
www.slc.ca.gov

State of Michigan, official web site
www.michigan.gov

United Nations, Department of Economic and Social Affairs, Division for Sustainable Development
www.un.org/esa/dsd/

United Nations Environment Programme
www.unep.org

United States Coast Guard
www.usecg.mil

United States Senator Carl Levin, Michigan
http://levin.senate.gov
Table of Cases

Northwest environmental advocates et al.
v. United States Environmental Protection Agency,
No. C 03-05760 SI
Found at:
http://www.epa.gov/owow/invasive_species/033005NDCal_sumjudgorder.pdf

v. Steven E. Chester, Director of the Michigan Department of Environmental Quality and Michael Cox, Attorney General for the State of Michigan
Civil No. 07-11116
Found at: