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Ballast Water: Extremely Convenient for the Shipping Industry but Disastrous for Coastal Waters and the Environment: A Study on the Effect of Ballast Water on Various Coasts and the Laws and Regulations in Place Regarding Ballast Water

by

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I hereby declare that I have read and understood the regulations governing the submission of LLM Degree in Shipping Law dissertations, including those relating to length and plagiarism, as contained in the rules of this University, and that this dissertation conforms to those regulations.

Signature……..JL…Duncan……Date……15..April..2007……..

'It is a curious situation that the sea, from which life first arose, should now be threatened by the activities of one form of that life. But the sea, though changed in a sinister way, will continue to exist: the threat is rather to life itself…'

-Rachel Carson

'The more clearly we can focus our attention on the wonders and realities of the universe about us, the less taste we shall have for destruction…'

-Rachel Carson

'The tradition of freedom of the high seas has its roots in an era when there were too few people to seriously violate the oceans –but in hindsight that era ended some 150 years ago…'

-James Carlton

Contents

Introduction

The Shipping Industry plays an important role in various sectors such as the economy of the world, transportation of goods and passengers and so forth. Though it has brought along many benefits it also has a few negative impacts such as oil pollution. Just as we thought we have most of the negative impacts under control a new threat shows its appearance. A threat in the form of ballast water. This paper will look at the effect of ballast water on various coasts and the how the world is dealing with this new threat. The paper is divided into four parts, Part A, Part B, Part C and Part D. Part A explains what ballast water is and the problem it poses, Part B looks at the various countries affected by this threat and the laws they have set out, Part C looks at what the International Arena is doing about this threat and Part D sets out a few solutions to the threat and looks at some reactions from the shipping industry to the new ballast water rules.

Part A: The definition of ballast water and the threat it poses

1. What is ballast water?

Ballast water is either freshwater or seawater taken from ports of discharge and is kept in the ballast tanks or even cargo holds of a ship.[1] It is used to provide the ship with better balance, stability, trim and manoeuvrability during a voyage when a ship is not carrying cargo or when the ship is not carrying cargo that is heavy enough.[2] It is also used to add weight to the ship in order for the ship to sink low enough to pass under bridges.[3] In the olden days solid materials such as sand, gravel and shale were used as ballast.[4] These types of ballast were used until the twentieth century during which time there was a sudden boost in the growth of the shipping industry and the use of solid ballast became a burden instead of a benefit.[5] The reason it became a burden is because it took longer load and unload this type of ballast.[6] As a result an alternative

[1] 'Marine Bioinvasions Fact Sheet: Ballast Water' published by the MIT Sea Grant Center for Coastal Resources (MITSG-CCR) available at *http://massbay.mit.edu/exoticspecies/ballast/fact.html* [accessed 21 November 2006].
[2] Ibid.
[3] Ibid.
[4] 'The National Ballast Survey' published by the MIT Sea Grant Center for Coastal Resources (MITSG-CCR) available at *http://massbay.mit.edu/resources/pdf/NABSdatasheet.pdf* [accessed 21 November 2006].
[5] Ibid.
[6] Ibid.

was needed and the shipping industry turned to water, which takes considerably less time to load and unload and is therefore more efficient and economical to use.[7]

Ballast water is pumped into ballast tanks after the ship has discharged cargo and is leaving the port without new cargo.[8] The ballast water is then released at the next port where the ship loads cargo.[9] If the ship loads and unloads cargo at various ports it may take on or release ballast water at each port, which means that the ship's ballast water is a mixture of all these waters.[10]

Thus it is clear that ballast water is a necessary and very important part of shipping. Kevin Collard[11] explained why this is so quite clearly when he said, 'When cargo is unloaded, the ship floats like a high cork. You put 15 to 35 thousand tons [13 to 32 thousand metric tons] of ballast water into it, depending on the size of the ship, to weight the ship to counteract buoyancy, which gives the ship better stability and manoeuvrability.'[12]

2. What are the problems that ballast water creates?

Although it is very convenient to use water as ballast it, unfortunately, has the possibility of extremely negative side effects.[13] The water that is used as ballast is full of organisms such as microbes, plants and animals, eggs, larvae and juveniles of larger organisms and when the water is pumped into the ballast tanks these organisms are pumped along with it.[14] These organisms are referred to as non-native organisms, bioinvaders, exotic species, alien species or nonindigenous species.[15] These organisms

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[7] 'The National Ballast Survey' published by the MIT Sea Grant Center for Coastal Resources (MITSG-CCR) available at *http://massbay.mit.edu/resources/pdf/NABSdatasheet.pdf* [accessed 21 November 2006].
[8] 'Marine Bioinvasions Fact Sheet: Ballast Water' published by the MIT Sea Grant Center for Coastal Resources (MITSG-CCR) available at *http://massbay.mit.edu/exoticspecies/ballast/fact.html* [accessed 21 November 2006].
[9] Ibid.
[10] Ibid.
[11] He is a Director of Operations for the Environment and Safety for Marbulk Shipping, which is an international shipping company, based in Salem, Massachusetts.
[12] 'Ballast water a vehicle for exotic marine species invasions' published by the Gulf of Maine Times available at *http://www.gulfofmaine.org/times/summer98/1a.html* [accessed 21 November 2006].
[13] Ibid.
[14] Ibid.
[15] 'Marine Bioinvasions Fact Sheet: Ballast Water Treatment Options' published by the MIT Sea Grant Center for Coastal Resources (MITSG-CCR) available at *http://massbay.mit.edu/resources/pdf/ballast-treat.pdf* [accessed 21 November 2006].

may or may not survive the voyage but if they do survive they are discharged along with the water into a new environment.[16] The larger organisms usually survive the voyage because they eat the smaller ones and when they are faced with unfavourable conditions they form spores or tough outer coverings to protect themselves.[17] When they form spores they can survive without food for a long time and thus they will only change back into their active form once they are in favourable conditions again, for example, when they are discharged into a port.[18] Usually there are very few bioinvaders that survive in their new environment due to the fact that the food, temperature and salinity are not what they are used to.[19] However, what counts in their favour is that there are most often no predators or diseases to limit their population growth and they will thus outcompete the native species by preying on them or taking over their habitat space and food sources and thereby eliminating the native species entirely.[20] This can have a disastrous effect on both the environment and the economy especially if the economy is dependant on these native species to provide food or when the bioinvaders damage structures[21]. It may also have an affect on human life through the spreading of diseases such as cholera, which is known for its ability to survive voyages between various ports.[22]
However, not all bioinvaders cause negative effects, they may become economically profitable if they are used for food or commercial goods but this rarely happens.[23]

The following are few examples of bioinvaders that can be found:

- **Mnemiopsis leidyi**

  This is a comb jelly and is very similar to the jellyfish.[24] It will eat anything smaller than itself that becomes stuck to the sticky lobes near its mouth.[25]

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[16] 'Marine Bioinvasions Fact Sheet: Ballast Water' published by the MIT Sea Grant Center for Coastal Resources (MITSG-CCR) available at *http://massbay.mit.edu/exoticspecies/ballast/fact.html* [accessed 21 November 2006].
[17] Ibid.
[18] Ibid.
[19] Ibid.
[20] Ibid.
[21] 'The National Ballast Survey' published by the MIT Sea Grant Center for Coastal Resources (MITSG-CCR) available at *http://massbay.mit.edu/resources/pdf/NABSdatasheet.pdf* [accessed 21 November 2006].
[22] Ibid.
[23] Ibid.
[24] 'Marine Bioinvasions Fact Sheet: Ballast Water' published by the MIT Sea Grant Center for Coastal Resources (MITSG-CCR) available at *http://massbay.mit.edu/exoticspecies/ballast/fact.html* [accessed 21 November 2006].
[25] Ibid.

This type of bioinvader has no known natural predator and will thus almost always survive in new environments.[26]

- **Zebra mussels (Driessena polymorpha)**

  This type of bioinvader can grow on any structure and they form large groups of mussels, which cause water intake pipes to block and also considerable damage to other structures.[27] They have to be removed from these structures, which then requires time, money and special equipment, thus placing an unnecessary burden on the economy.[28] They also consume large amounts of microscopic plants and animals thereby lessening the amount of food available for other species.[29]

- **Teredo navilis**

  This is a shipworm, which is a relative of clams, commonly known as termites of the sea.[30] They usually bore holes into wood and thus they damage wooden docks, piers and seawalls.[31] They have tried to stop these shipworms by treating the wood with certain chemicals but were unsuccessful because these chemicals pollute the surrounding water.[32]

These are but a few of the types of bioinvaders that can be found, there are countless more such as the periwinkle, the sputnik weed and the grey and orange sea squirts.[33] What is clear, however, is that something quite clearly has to be done to stop these organisms from travelling to new environments.

Perhaps we should look at a few countries and see what they have done so far.

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[26] 'Marine Bioinvasions Fact Sheet: Ballast Water' published by the MIT Sea Grant Center for Coastal Resources (MITSG-CCR) available at *http://massbay.mit.edu/exoticspecies/ballast/fact.html* [accessed 21 November 2006].
[27] Ibid.
[28] Ibid.
[29] Ibid
[30] Ibid.
[31] Ibid.
[32] Ibid.
[33] Ibid.

Part B: The Countries

3. United States of America (USA)

3.1 The effect ballast water has on USA coastal waters

The amount of ballast water that is released into US ports currently exceeds twenty one billion gallons per year.[34] This means that that there are more or less ten thousand marine species travelling to and from various ports along with the ballast water.[35]

The most common bioinvader found in USA coastal waters, is the zebra mussel.[36] The zebra mussel was first introduced in the waters of Lake St. Clair in 1986 when a ship, on its way to the Great Lakes, discharged its ballast water there.[37] The zebra mussel is the native species of the Caspian Sea but has spread all over the rivers and lakes of Europe and has now found its way across the ocean into the USA.[38]
Zebra mussels grow in colonies and they live on smooth surfaces such as buoys, pilings and boat hulls.[39] They are called zebra mussels because of the dark and light stripes across its shell.[40] They are about two inches long and can live up to five years.[41] The female mussel lays about thirty thousand eggs per year, which then becomes larvae, and it is during this stage of life that they spread most easily.[42] A zebra mussel can only be detected in the second year of their life and that is why it is almost impossible to destroy them at birth.[43]

These mussels have a few benefits such as filtering out green-brown algae's, which discolours water.[44]

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[34] Northwest Environmental Advocates v Environmental Protection Agency 2005 WL 756614 (N.D.Cal. 2005).
[35] Ibid.
[36] 'Sea Ballast and Zebra Mussels (Ballast)' available at *http://www.american.edu/TED/ballast.htm* [accessed 30 November 2006].
[37] Ibid.
[38] Ibid.
[39] Ibid.
[40] Ibid.
[41] Ibid.
[42] Ibid.
[43] Ibid.
[44] Ibid.

The water is then clear and provides the necessary habitat needed for snails and crayfish to survive.[45] However, the benefits are far outnumbered by the negative effects.[46]

Zebra mussels are ten to twenty times bigger than native mussels and sometimes they attach themselves to other molluscs' shells, which hamper them from opening to feed and thereby strangling them.[47]
The biggest problem that the zebra mussel is causing is the fact that they attach themselves for their entire five-year lives to structures mentioned above.[48]
As a result their weight causes these structures to submerge or it clogs the water intake pipes, which then causes serious economic costs.[49] An example of this is when during 1990 the city of Monroe, Michigan lost power for two days because these mussels had clogged the water intakes and the power company had to spend about $500 000 to fix the problem.[50] A similar thing happened to Ford Motor Company and they were forced to close down one of their plants.[51] Various industries in the Michigan area said that to control the zebra mussel population they will spend over four billion dollars in a ten-year period.[52]

It is clear that the zebra mussel is causing major problems and the best way to solve this problem is still being discussed. One would think that they could harvest these mussels for food but unfortunately they are unfit for human consumption due to the fact that they are toxic.[53] The most successful idea currently is to compost the mussels, which can then be used for agriculture and horticulture.[54] However, one could argue that the best solution of all is not to allow ballast water to be released in coastal areas at all.

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[45] 'Sea Ballast and Zebra Mussels (Ballast)' available at *http://www.american.edu/TED/ballast.htm* [accessed 30 November 2006].
[46] Ibid.
[47] Ibid.
[48] Ibid.
[49] Ibid.
[50] Ibid.
[51] Ibid.
[52] Ibid.
[53] Ibid.
[54] Ibid.

Other examples of bioinvaders that were introduced in US coastal waters via the release of ballast water are:

- The nutria, which is a semi-aquatic rodent native to South America, has become quite a problem in the southern states because they damage the vegetation in waterways.[55]
- The Asian clam was introduced in San Francisco Bay a few years ago and they are damaging the ecosystem because they lie on the bay floor and suck up all the food sources of salmon and bass.[56]
- The quagga mussel which made its first appearance in 1990 and looks like it will cause an even bigger problem than the zebra mussel.[57] This is because their population growth is much faster and they were introduced to the same area, the Great Lakes.[58]

3.2 Legislation, Regulations and Programmes the USA have in place to combat the problem

The primary legislation that the US has that deals with ballast water is the Nonindigenous Aquatic Nuisance and Prevention and Control Act of 1990 (NANPCA), which has been revised and amended by the National Invasive Species Act of 1996 (NISA).[59] NANPCA dealt with mandatory ballast water management for ships only entering the Great Lakes area whereas NISA deals with voluntary ballast water management guidelines for ships entering all US waters.[60] What does the NISA say?

Section 1002 of NISA discusses the findings and purposes and states that bioinvaders have become established throughout US waters and are causing great economic and

[55] 'Extent of U.S. Aquatic Invaders' published by the Waterencyclopedia available at *http://www.waterencyclopedia.com/Oc-Po/Pollution-by-Invasive-Species.html* [accessed 30 November 2006].
[56] Ibid.
[57] Ibid.
[58] Ibid.
[59] 'Ballast Management: Laws and Regulations' published by the West Coast Ballast Outreach Project available at *http://groups.ucanr.org/Ballast_Outreach/Laws-and-Regulations/* [accessed 30 November 2006].
[60] Ibid.

ecological problems.[61] It also states that if preventative measures are not taken soon this problem will continue do grow until there is nothing to be done.[62]

Section 1101 then states that the primary means of preventing this problem is by requiring ships to exchange ballast water on the high seas.[63] By doing this ships are flushing out port water into the ocean and pumping in ocean water.[64] Studies have shown that ocean water does not carry as much organisms as coastal waters and ocean organisms cannot survive in the environmental conditions of coastal waters.[65] It has been shown that this reduces the risk of invasion considerably but has not eliminated it completely.[66] This exchange of ballast water on the high seas applies to all ships that is equipped with ballast tanks which expands NANCPA which were only applicable to ships carrying ballast water.[67] This section also requires that records should be kept of procedures and sampling techniques to ensure that ships are in fact complying.[68] However, the section also states that ships are not required to perform a ballast water exchange if the master of the ship is of the opinion that such an exchange will threaten the safety or stability of the ship, its crew and its passengers.[69]

Section 1102 requires ecological and ballast discharge surveys to be done in water that is either highly susceptible to invasion or requires further study.[70] These surveys are to examine the attributes and patterns of bioinvasions and determine the effectiveness of ballast management and guidelines used to prevent invasions.[71] The section also requires that a clearinghouse of national data on ballasting practices, compliance with national ballast management guidelines and other information should be developed and maintained.[72]

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[61] 'The National Invasive Species Act Summary' available at *http://www.nemw.org/nisa_summarry.htm* [accessed 30 November 2006].
[62] Ibid.
[63] Ibid.
[64] Ibid.
[65] Ibid.
[66] Ibid.
[67] Ibid.
[68] Ibid.
[69] Ibid.
[70] Ibid.
[71] Ibid.
[72] Ibid.

Sections 1103 and 1104 requires that a ballast water management programme for seagoing vessels and a demonstration of technologies and practices that will help prevent the introduction and spreading of bioinvaders through ballast water discharge should be implemented.[73]

The remaining sections deal with the establishment of a task force who has to issue guidelines to control the spread of all bioinvaders and the encouragement of regional panels to participate in the activities to control the introduction of bioinvaders.[74] Although this Act has had many successes there are a few setbacks to be found.[75] Most federal agencies have not implemented the provisions or they simply ignore it.[76] Another problem is that these agencies believe that the only solution to the problem is the ballast water exchange in the high seas but it does not always work to eradicate the organisms completely.[77] Even worse is the fact that this Act expired in September 2002 and Congress has to reauthorize the law.[78] The good news, however, is that Congress has been working to do just this and in April 2005 the National Aquatic Invasive Species Act of 2005 was introduced.[79] This Act has not yet been passed but if it should be passed it will reauthorize and strengthen the National Invasive Species Act of 1996.[80]

It contains provisions to 'regulate ballast discharge from commercial vessels; prevent invasive species introductions from other pathways; support state management plans; screen live aquatic organisms entering the United States for the first time commercially; authorize rapid response funds; create education and outreach programs; conduct research on invasive pathways, prevention and control technologies; authorize funds for state and regional grants and strengthen specific

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[73] 'The National Invasive Species Act Summary' available at *http://www.nemw.org/nisa_summarry.htm* [accessed 30 November 2006].
[74] Ibid.
[75] 'The National Aquatic Invasive Species Act' published by the Union of Concerned Scientists available at *http://www.ucsusa.org/invasive_species/the-national-aquatic-invasive-species-act.html* [accessed 30 November 2006].
[76] Ibid.
[77] Ibid.
[78] Ibid.
[79] Ibid.
[80] Ibid.

prevention efforts in the Great Lakes.'[81] This new Act adds considerably to NISA and thus it is clear that this new Act is much needed and as soon as possible.

There are currently three states in the US that have passed mandatory ballast water exchange and management laws.[82] These laws are similar to federal laws and include additional requirements for coastwise traffic.[83] Non-compliance with these laws may result in penalties or fines.[84] These states are:

- **California**

  California passed the Marine Invasive Species Act in 2004 and it requires that all ships that arrive from outside the Exclusive Economic Zone to exchange ballast water in mid-ocean or if they qualify the ships must retain all ballast water on board.[85] In terms of this act ships have two options for ballast water exchange.[86] They can either overflow their ballast tanks until three volumes of water have been changed, which is called Flow Through Exchange, or they can pump out all the water until the tanks are empty or almost empty and then refill the tanks with mid-ocean water, which is called Empty/Refill Exchange.[87]

  The act also requires that all ships coming to a Californian port from another port within the Pacific Coast Region have to follow at least one of the ballast water management practices as set out in the act.[88] These practices include the exchange of ballast water in coastal water that is more that fifty nautical miles from land and two hundred meters deep before they enter the water of the state, the retaining of all ballast water on board the ship or discharging the ballast water in a reception facility that has been approved by the California

[81] 'The National Aquatic Invasive Species Act' published by the Union of Concerned Scientists available at *http://www.ucsusa.org/invasive_species/the-national-aquatic-invasive-species-act.html* [accessed 30 November 2006].
[82] 'Ballast Management: Laws and Regulations' published by the West Coast Ballast Outreach Project available at *http://groups.ucanr.org/Ballast_Outreach/Laws-and-Regulations/* [accessed 30 November 2006].
[83] Ibid.
[84] Ibid.
[85] Ibid.
[86] Ibid.
[87] Ibid.
[88] Ibid.

State Lands Commission.[89]

The act states that all ships have to complete and submit ballast water reports, they have to maintain a ballast water management plan and a ballast water log and they have to pay a mandatory fee at their first port of call in California.[90]

- **Washington**

  Washington State law also require that ships should perform open ocean ballast water exchange if these ships are on their way to a Washington port.[91] Washington law, however, exempts ships from ocean ballast exchange if it is unsafe do to so, if the design of the ship limits it from doing so, if the ships' ballast water is common to the state or if an approved ballast water treatment system is used.[92] A ship that discharges inappropriately or without an exemption will be held liable and be charged with a civil penalty.[93]

  The law also states that from 1 July 2007 ships are prohibited from discharging improperly exchanged or untreated ballast water into Washington waters.[94] Once this is in place the safety exemption will no longer be valid and thus additional ballast management practices has to be implemented since ships can no longer rely on the safety exemption.[95] Vessels are required to file a ballast water report at least 24 hours before entering the state.[96] If these vessels do not intend to discharge ballast water in the port they should indicate so in the report.[97] If vessel operators fail to comply with these requirements they are subject to a $500 fine and if they knowingly falsify a report it may result in a criminal penalty.[98]

[89] 'Ballast Management: Laws and Regulations' published by the West Coast Ballast Outreach Project available at *http://groups.ucanr.org/Ballast_Outreach/Laws-and-Regulations/California.htm* [accessed 30 November 2006].
[90] Ibid.
[91] Ibid.
[92] Ibid.
[93] Ibid.
[94] Ibid.
[95] Ibid.
[96] Ibid.
[97] Ibid.
[98] Ibid.

- **Oregon**

  Oregon passed legislation to prohibit the discharge of ballast water into state water except under specified conditions.[99] Oregon legislature coordinated its legislation with related rules and regulation that was adopted by California and Washington.[100] Thus Oregon law also requires mandatory open ocean ballast water exchange for all ships entering Oregon ports from outside the Exclusive Economic Zone.[101] The conditions under which ships are allowed to discharge ballast water into state water are if the ship discharges water that comes solely from the west coast of North America, if the ship has conducted an ocean exchange, if the ship has conducted a coastal exchange or if the ships ballast water has been treated to remove all the organisms.[102]

  Oregon law also states that ballast water management reports has to be completed and submitted to the appropriate authorities at least 24 hours prior to entering a port.[103] A penalty may be placed on the person who fails to comply with these requirements.[104]

The major solution that the US has, that one can deduce from above, to combat the problem of bioinvaders being introduced in US coastal water via ballast water is to exchange ballast water in the open ocean. There is some talk about having the infested water treated before discharge but these talks are not yet loud enough. Is exchanging water in the open ocean not creating another problem because although there may not be as many organisms living in ocean water than there are in coastal water, what about those few who do live in ocean water. They may not be able to survive in coastal waters now but what if they adapt faster than we think. Then the problem is not solved at all but rather expanded. So perhaps one should look at the different programmes that the USA has in place.

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[99] 'Ballast Management: Laws and Regulations' published by the West Coast Ballast Outreach Project available at *http://groups.ucanr.org/Ballast_Outreach/Laws-and-Regulations/Oregon.htm* [accessed 30 November 2006].
[100] Ibid.
[101] Ibid.
[102] Ibid.
[103] Ibid.
[104] Ibid.

The National Ballast Survey (NABS) was created as a result of NISA, which called for the creation of a clearinghouse for data gathering on ballast water management and alien species invasions.[105] NABS gathers important information about each ship that enters US water such as the name of the ship, the last port of call, the next port of call, the volume of each ballast tank, the method used to treat ballast water, the source of the water and the salinity and temperature of the water.[106] However, not all ship comply with the requirement of providing ballast water management reports and therefore the information gathered by NABS is not always accurate.[107] According to the small amount of information they do have thus far is that the type of ship that discharges the most ballast water in US ports are bulk carriers and that the biggest source of this ballast water is the North East Atlantic Ocean.[108] The information gathered presently shows that ballast water management practices are not going well at all because there are a number of ships that still do not undergo open ocean exchange, which means that there are still a lot of port water being discharged in Us ports.[109]This merely shows that there is still a lot of work to be done to eradicate the problem completely. More research has to be done on ballast water management technology and a higher level of compliancy with the guidelines is necessary before true results may be seen in the prevention of this problem.[110]

NISA also created the mandatory ballast water management programme.[111] At first it was voluntary but the rate of compliance was inadequate and therefore it was made mandatory.[112] The programme is headed by the US Coast Guard, which published regulations that establishes penalties for ships that violate the ballast water management requirements.[113] These regulations require that ships have a ballast

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[105] 'The National Ballast Survey' published by the MIT Sea Grant Center for Coastal Resources (MITSG-CCR) available at *http://massbay.mit.edu/resources/pdf/NABSdatasheet.pdf* [accessed 21 November 2006].
[106] Ibid.
[107] Ibid.
[108] Ibid.
[109] Ibid.
[110] Ibid.
[111] 'Ballast Water Management Program' published by the United States Coast Guard available at *http://www.uscg.mil/hq/g-m/mso/bwm.htm* [accessed 30 November 2006].
[112] Ibid.
[113] Ibid.

water management plan that is specific to that ship and assigns responsibility to the master to implement a ballast water management strategy for the ship.[114]

The US Coast Guard and the National Ballast Information Clearinghouse then came together and launched a new program called the Equivalent Reporting Programme.[115] This programme was designed for ships that operate exclusively in the US Exclusive Economic Zone.[116] The programme offers an alternative to owners of ships to submit the required ballast water management reports once a month instead of on a port-to-port basis.[117] This seems like a good idea because this will make it easier for ships to submit the reports since they only have to submit one report each month.[118]
What does US case law say about the problem?

3.3 Case law

The most important case in the US dealing with ballast water is *Northwest Environmental Advocates v Environmental Protection Agency*[119].

Facts of the case:

The US enacted the Clean Water Act (CWA) in 1972 'to restore and maintain the chemical, physical and biological integrity of the Nation's waters.'[120] The CWA prohibits the discharge of any pollutant into US water without a National Pollutant Discharge Elimination Systems (NPDES) permit.[121] The Environmental Protection Agency (EPA) has the primary authority to implement and enforce the CWA.[122] Subsequent to its gaining such authority the EPA issued a regulation, which excluded from NPDES requirements 'any discharge of sewage from vessels, effluent from properly functioning marine engines, laundry, shower, and galley sink wastes, or any other discharge incidental to the normal operation of a vessel.'[123] The EPA has relied on this regulation to exempt ballast water discharge from requiring a NPDES permit

[114] 'Ballast Water Management Program' published by the United States Coast Guard available at *http://www.uscg.mil/hq/g-m/mso/bwm.htm* [accessed 30 November 2006].
[115] Ibid.
[116] Ibid.
[117] Ibid
[118] Ibid.
[119] 2005 WL 756614 (N.D. Cal. 2005).
[120] Northwest Environmental Advocates v Environmental Protection Agency (note 34 at 2)
[121] Ibid.
[122] Ibid.
[123] Ibid.

because it is 'incidental to the normal operation of a vessel.'[124] The Northwest Environmental Advocates thus challenged this rule by claiming that the rule was not authorised by the CWA because the CWA does not exclude 'discharges incidental to the normal operation of a vessel' and the rule is therefore invalid.[125] The filed a petition requesting that the EPA repeal this rule but the EPA denied the petition.[126] The plaintiffs thus filed a complaint in court against the EPA requesting the court to direct the EPA to repeal the rule.[127] The plaintiffs asserted two claims. They argued that EPA's promulgation of the rule was inconsistent with the CWA and is thus unlawful and also that EPA's denial of the plaintiffs petition was arbitrary and capricious and an abuse of discretion given by the CWA.[128]

Judgement:

The court granted judgement in favour of the plaintiffs.[129] The court said that EPA had acted outside its statutory authority in exempting an entire category of discharges from NPDES permit requirements and denying the plaintiffs petition.[130] The court thus declared that the rule was invalid.[131] The court also found that a permanent injunctive relief was warranted because of the harm caused by bioinvaders introduced via ballast water.[132] The court held that existing regulations were not adequate to address the threat of alien species and thus the court ordered that by 20 September 2008 the existing regulation must be vacated.[133] The court set this time frame to allow the EPA to come up with a solution regarding the regulation of vessel discharges and the response to the threat presented by invasive species.[134]

[124] Northwest Environmental Advocates v Environmental Protection Agency (note 34 at 2)
[125] Ibid.
[126] Ibid.
[127] Ibid.
[128] Ibid at 4.
[129] Ibid at 18
[130] Ibid.
[131] Ibid.
[132] Ibid.
[133] Ibid.
[134] Ibid.

4. Australia & New Zealand

4.1 Effect of ballast water on the Australian and New Zealand coast.

It is estimated that over two hundred non-native species have been introduced to Australian coastal waters via the ballast water of ships and the majority of these species have had major impacts.[135]

The following species have been identified as pests so far:

- 'the toxic dinoflagellate (Gymnodinium catenatum) that closed southern Tasmanian shellfisheries in 1986, 1987 and 1991 for up to six months;
- the Northern Pacific Seastar (Asterias amurensis) that has drastically reduced yields in the Tasmanian scallop industry;
- the Asian kelp (Undaria pinnatifida) is an aggressive, fast growing seaweed that has become established in the waters of southern Australia and New Zealand. It grows a shading canopy that threatens red algae, the food of abalone and sea urchins;
- the Giant Tube Worm (Sabella spallanzanii) has become established in many areas of southern Australia. It grows in dense beds on rocky reefs and man-made structures and can choke out native species. It is a filter feeder removing organisms from the base of the food chain, thus having the ability to have major effects on natural ecosystems; and
- introduced mussels in Cairns and Darwin have resulted in major expenditure in attempts to eradicate them before they could cause major damage.'[136]

Australia certainly has a big problem and if something is not done soon Australia's entire ecosystem might be changed.

In New Zealand over one hundred and fifty invasive marine species have been introduced via ballast in its coastal waters.[137] The two most common invasive species that are found in New Zealand is the Algal bloom and the Undaria pinnatifida.[138]

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[135] 'The Australian Pilot Project for the Treatment of Ships' Ballast Water' published by the Australian Department of the Environment and Heritage available at *http://www.environment.gov.au/coasts/pollution/antifouling/ballast/pubs/ballast.pdf*. [accessed 1 December 2006].

[136] Ibid.

[137] 'Marine Pests already in New Zealand' published by the Ministry of Fisheries available at *http://www.starfish.govt.nz/science/facts/fact-marine-biodiversity.htm* [accessed 2 December 2006].

[138] Ibid.

One example of the Algal bloom is the toxic Gymnodinium catenatum.[139] It can cause paralytic shellfish poisoning in humans, which may cause paralysis or death in severe cases.[140] This particular Algal bloom was first noticed in the Manakau Harbour in May 2000 and has since spread along the west coast of New Zealand into Wairarapa and Hawke Bay.[141] If this Algal bloom is present in an area it will spread close to shellfish gatherings due to the high levels of toxins found in the shellfish, which makes shellfish unsafe to eat in certain instances.[142] It can also damage farm businesses in the area because the farmers are unable to harvest the shellfish.[143]

The Undaria pinnatifida is an exotic seaweed and it grows and spreads very quickly in New Zealand because it can easily adapt to the environmental conditions.[144] It was first discovered in Wellington Harbour in 1987 but it has since spread rapidly around New Zealand and can now be found from Gisborne to Stewart Island.[145] If not controlled the Undaria will keep on spreading and it will and has already changed the natural character of many areas.[146]

4.2 Legislation, Regulations and Programmes Australia and New Zealand have in place to combat the problem

The Australian Government has had requirements for the management of internationally sourced ballast water in place since July 2001.[147] These requirements are implemented through the Quarantine Act of 1908 and is administered by the Australian Quarantine and Inspection Service (AQIS), a federal government agency.[148] These requirements were introduced to reduce the risk of introducing bioinvaders into Australian coastal waters through ship's ballast water.[149]

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[139] 'Marine Pests already in New Zealand' published by the Ministry of Fisheries available at *http://www.starfish.govt.nz/science/facts/fact-marine-biodiversity.htm* [accessed 2 December 2006].
[140] Ibid.
[141] Ibid.
[142] Ibid.
[143] Ibid.
[144] Ibid.
[145] Ibid.
[146] Ibid.
[147] 'Australian ballast water requirements' published by the Australian Quarantine and Inspection Service available at *http://www.affa.gov.au/corporate_docs/publications/* [accessed 1 December 2006].
[148] Ibid.
[149] Ibid.

The AQIS has to ensure that all foreign ballast water has been managed in accordance with these requirements before permitting ships to discharge their ballast water inside Australia's territorial sea.[150]

In terms of these requirements the discharge of high-risk ballast water into Australian ports is strictly prohibited.[151] The AQIS deems all water from outside Australia's territorial sea to present a high-risk of introducing invasive species into Australia.[152]

The AQIS deems the following types of ballast water to be low-risk:

- 'Fresh water from any source;
- Ballast water that has been assessed as low-risk for discharge (at specified ports/locations on specified dates) by the Ballast Water Decision Support System (BWDSS);
- Ballast water that has been exchanged at an approved location (mid-ocean) by an approved method;
- Ballast water taken up in mid-ocean; and
- Ballast water taken up inside Australia's territorial sea.'[153]

In terms of the requirement ships may elect to use any one of the ballast water management options as approved by the AQIS. These management options include the following:

- Ships may receive a tank-by-tank risk assessment from the BDWSS that states that the ballast water on board the ship is low-risk and may thus be discharged.[154]
- If ships do not need to discharge any ballast water into Australian ports they do not have to carry out any management option.[155] However, permission to discharge high-risk ballast water into Australian waters will not be given under any circumstances and therefore ships are encouraged to manage all ballast water on board as if it may need to be discharged.[156]

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[150] 'Australian ballast water requirements' published by the Australian Quarantine and Inspection Service available at *http://www.affa.gov.au/corporate_docs/publications/* [accessed 1 December 2006].
[151] Ibid.
[152] Ibid.
[153] Ibid.
[154] Ibid.
[155] Ibid.
[156] Ibid.

- Vessels are permitted to move high-risk ballast water around from tank to tank within it but the vessels that use this method must ensure that the risk of unauthorised ballast discharge, during ballast transfer operations, is assessed and managed properly.[157]
- Ships are also allowed to conduct a full ballast water exchange at sea by using the empty/refill method or the flow through method or the dilution method.[158] The first two methods has already been explained when we looked at the US, thus only the dilution method will now be discussed.[159] Some vessels are fitted with extra piping or pumping arrangements and on some of these vessels ballast may be pumped in through one side of a tank and pumped out through the other side simultaneously as opposed to simply overflowing out.[160] This is known as the dilution method. If a full ballast water exchange has not been undertaken due to safety considerations the master should report it to the AQIS as soon as possible and prior to entering Australia's territorial sea.[161]
- Ships that wish to use a method other than those above may apply to the AQIS in writing before actually using the method.[162] Vessels that arrive in Australian ports that have not managed their ballast water by any of the approved methods will not be permitted to discharge their ballast water in Australian waters.[163]

The requirements also state that all vessels that arrive in Australia from international waters must submit a Quarantine Pre-Arrival Report (QPAR) to AQIS.[164] In this report details of the vessel such as vessel particulars, human health on board the vessel, pet animals or birds on board and any recent visits by the vessel to places where organisms of concern to Quarantine are known to exist.[165] The QPAR also requires that all ballast water management procedures should be reported.[166] If the

[157] 'Australian ballast water requirements' published by the Australian Quarantine and Inspection Service available at *http://www.affa.gov.au/corporate_docs/publications/* [accessed 1 December 2006].
[158] Ibid.
[159] Ibid.
[160] Ibid.
[161] Ibid.
[162] Ibid.
[163] Ibid.
[164] Ibid.
[165] Ibid.
[166] Ibid.

QPAR is not submitted the vessel will not be permitted to enter the port.[167] In conjunction with the QPAR a AQIS Ballast Water Log with details about the ballast water uptake ports, ocean exchanges and intended Australian discharge locations should be completed.[168]

In terms of the requirements AQIS officers will conduct ballast water verification inspections on board the vessels to ensure that the vessels have complied with Australia's ballast water management requirements.[169] Lastly, sediments from ballast tanks are also not allowed to be discharged in Australian waters and therefore the only acceptable form of sediment stripping pumps are pumps that are permanent fixtures on the vessel.[170]

These requirements are only applicable to international sourced ballast water therefore the Victorian Government in Australia has passed a policy under the Environment Protection Act of 1970 to govern domestic sourced ballast water.[171] The policy is called the Waste Management Policy (Shipsö Ballastwater). This policy introduces ballast water management arrangements to help contain and reduce the spread of bioinvaders that are established in other locations in Australia through domestic ballast water.[172] The Policy thus compliments the requirements for internationally sourced ballast water.[173]

The purpose of the policy is to help protect Victorian State water by minimising the risk of marine pests introductions via domestic ballast water from ships entering Victorian waters and by ensuring that comprehensive risk-based domestic ballast water management arrangements are in place.[174] The policy states that high-risk domestic ballast water may not be discharged into Victorian water and that ballast water must be managed in accordance with the policy.[175] The management of ballast water must be undertaken in a manner that does not compromise the safety of the ship

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[167] 'Australian ballast water requirements' published by the Australian Quarantine and Inspection Service available at *http://www.affa.gov.au/corporate_docs/publications/* [accessed 1 December 2006].
[168] Ibid.
[169] Ibid.
[170] Ibid.
[171] 'Waste Management Policy (Ships' Ballast Water)' published by EPA Victoria available at *http://www.epa.vic.gov.au/about_us/legislation/water.asp#regulationsballast* [accessed 1 December 2006].
[172] Ibid.
[173] Ibid.
[174] Ibid.
[175] Ibid.

and its crew.[176] Shipowners must carry out a risk assessment on a voyage-by-voyage basis to assess whether their ballast water is either high or low-risk.[177] They must also provide accurate and comprehensive information the status of any ballast water and management processes they have undertaken.[178] Shipowners are also required to employ ballast water treatment methods that are approved by the Environment Protection Authority and to cooperate with them in compliance with monitoring programs.[179] If a ship cannot comply with the Policy due to safety or structural limitations the Environment Protection Authority may permit the discharge of high-risk domestic ballast water as a last resort.[180]

The Australian Government in conjunction with other government agencies developed a National System for the Prevention and Management of Marine Pest Incursions (National System) to give effect to the regulations and requirements, which was implemented in October 2006.[181] The National System has the following objectives:

- To 'prevent the introduction to Australia of exotic marine species;
- prevent the translocation within Australia of exotic marine species;
- provide emergency preparedness and response capacity to respond to and where feasible eradicate outbreaks of exotic marine species;
- manage and control exotic marine species where eradication is not feasible.'[182]

The National System has three major components, which are, prevention systems to help reduce the risk of introduction and translocation of invasive marine species, a coordinated emergency response to new introductions and translocations and

[176] 'Waste Management Policy (Ships' Ballast Water)' published by EPA Victoria available at *http://www.epa.vic.gov.au/about_us/legislation/water.asp#regulationsballast* [accessed 1 December 2006].
[177] Ibid.
[178] Ibid
[179] Ibid.
[180] Ibid.
[181] 'National System for the Prevention and Management of Marine Pest Incursions' published by the Australian Department of Agriculture, Fisheries and Forestry available at *http://www.daffa.gov.au/fisheries/invasive/national-system* [accessed 1 December 2006].
[182] Ibid.

managing invasive species already introduced in Australia.[183] It also has several other supporting components such as research and development, communications, monitoring and evaluation and review.[184]

The prevention element focuses on two main things, to minimise the risk of international incursions of bioinvaders into Australia and to minimise the risk of translocation of bioinvaders within Australia.[185] Prevention measures includes all regulations and guidelines or codes of conduct for all marine sectors that are being and have been developed.[186]

The aim of the emergency preparedness and response element is to control or eliminate all and any new marine pest incursions in Australia.[187] The Australian Emergency Marine Pest Plan sets out guidelines for the response to marine pest emergencies and includes the roles, responsibilities and actions that must be taken in the elimination of bioinvaders.[188]

The management and control element aims to control all introduced bioinvaders that have already established populations within Australia.[189]

New Zealand has rules in place that control the discharge of ballast water in its coastal waters to help prevent the introduction of bioinvaders in its water.[190] These rules state that ships should avoid unnecessary discharge unless it is for the safety and stability of the ship.[191] If ballast water was loaded at a port of another country ship are not allowed to discharge such water into New Zealand waters without permission.[192]

Prior to a ships arrival in New Zealand a Quarantine Officer will grant permission for the discharge of ballast water if it is shown that ballast water has or will be exchanged with ocean water, or the officer will grant an exemption if it is shown that an

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[183] 'National System for the Prevention and Management of Marine Pest Incursions' published by the Australian Department of Agriculture, Fisheries and Forestry available at *http://www.daffa.gov.au/fisheries/invasive/national-system* [accessed 1 December 2006].
[184] Ibid.
[185] Ibid.
[186] Ibid.
[187] Ibid.
[188] ibid.
[189] Ibid.
[190] 'Ships-Guide to New Zealand Ballast Water Controls' available at *http://www.biosecurity.govt.nz/node/7598* [accessed 2 December 2006].
[191] Ibid.
[192] Ibid.

exchange of ballast water mid-ocean could not be undertaken.[193] The rules require that ships record the volumes, locations and dates of all ballast water loaded, of ballast water exchanges made in the ocean and of discharges in New Zealand.[194] In terms of the rules sediments from the ballast tanks may under no circumstances be discharged into New Zealand's territorial water.[195] It may only be discharged at a place that has been approved by a New Zealand Quarantine Officer.[196] New Zealand rules also require that ships undertake mid-ocean exchange of ballast water by using either the empty/refill method or the flow through method to minimise the uptake of bioinvaders.[197] The rules sets out other ways in which the uptake of bioinvaders may be minimised such as not loading ballast water in very shallow water or in locations where the propellers may stir up sediment or in locations where diseases such as cholera are known to be present in the water.[198]

No case law could be found in either Australia or New Zealand that deals with ballast water.

5. United Kingdom (UK)

5.1 Effect of ballast water on the United Kingdom coast

It is estimated that half of the invasive species found in the United Kingdom have been introduced in association with shipping, especially via the discharge of ballast water.[199] According to studies undertaken it was found that the effect of bioinvaders was not as detrimental to British waters than elsewhere in the world.[200] However, there are a few bioinvaders that has had a harmful effect on British waters.[201] The following are examples of the harmful invasive species that are found:

- **Spartina alterniflora (Spartina)**

[193] 'Ships-Guide to New Zealand Ballast Water Controls' available at *http://www.biosecurity.govt.nz/node/7598* [accessed 2 December 2006].
[194] Ibid.
[195] Ibid.
[196] Ibid.
[197] Ibid.
[198] Ibid.
[199] 'Non-native marine species in British waters: review' available at *http://www.jncc.gov.uk/pdf/pub02_nonativereviewdirectory.pdf* [accessed 4 December 2006].
[200] Ibid.
[201] Ibid.

This is a type of smooth cord grass and is native to the east coast of North America.[202] It was first introduced to Southampton water in 1870 on mudflats near Hythe. After its introduction the Spartina interbred with native cord grass, which produced the sterile hybrid S. townsendii and the fertile hybrid S. angelica.[203] The S. angelica has a very fast growth rate and a high fecundity and thus it has formed quite a number of colonies on mudflats in England and Wales.[204] It is currently the most common cord grass species found in Britain.[205] The S. angelica is an aggressive pioneer species and it may have contributed to the demise of the native S. maritime and to the decline of sediments on Zostera beds.[206]

- **Sargassum muticum**

  This is known as a wire weed, strangle weed or Japanese weed.[207]

  It was first noticed on Southsea Beach in 1971 and by 1983 it had occupied most of the southern coast of Britain.[208] It is currently found along the entire Channel coast from Kent to Cornwell and it is feared that this species will entirely displace the native eelgrass.[209]

- **Coscinodiscus wailesii**

  This type of bioinvader causes a heavy grey slime that clogs the fishing gear of fishermen and it may also cause dermatitis to fishermen.[210]

5.2 Legislation, Regulations and Programmes the United Kingdom have in place to combat the problem

The United Kingdom does not currently have legislation or regulations that deals directly with the discharge of ballast water.[211] Perhaps it is because it has not had as many problems with the non-native species that are introduced via the discharge of ballast water. The United Kingdom is however, a signatory of various Conventions

[202] 'Non-native marine species in British waters: review' available at *http://www.jncc.gov.uk/pdf/pub02_nonativereviewdirectory.pdf* [accessed 4 December 2006].
[203] Ibid
[204] Ibid.
[205] Ibid.
[206] Ibid.
[207] Ibid.
[208] Ibid.
[209] Ibid.
[210] Ibid.
[211] Ibid.

dealing with the introduction of non-native species via any medium.[212] Conventions such as:

- **Convention on Biological Diversity of 5 June 1992**[213]

  This Convention requires that all contracting parties prevent the introduction of invasive species and to control or eradicate invasive species that threaten ecosystems, habitats and other species.[214] The Convention also addresses liability for damage caused by introductions where insufficient measures were undertaken to eliminate once they are released.[215]

- **Bonn Convention for the Conservation of Migratory Species of Wild Animals**[216]

  This Convention provides that contracting parties should protect the habitat of migratory species and control the introduction of invasive species as well as already introduced species that are detrimental to the migratory species.[217]

- **Berne Convention on the Conservation of European Wildlife and Natural Habitats**[218]

  This Convention states that each contracting party must strictly control the introduction of non-native species.

The UK also has its own Act that deals with non-native species, which is the Wildlife and Countryside Act of 1981.[219] In terms of this Act the release of a non-native species into the wild is an offence except if it is done under licence.[220] In addition, if an introduced species is established in the wild and it is detrimental to the environment, it must be listed on Schedule 9 of the Act.[221] If it is on the list it is illegal to release the species or allow it to escape.[222]

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[212] 'Non-native marine species in British waters: review' available at *http://www.jncc.gov.uk/pdf/pub02_nonativereviewdirectory.pdf* [accessed 4 December 2006].
[213] Ibid.
[214] Ibid.
[215] Ibid.
[216] Ibid.
[217] Ibid.
[218] Ibid.
[219] Ibid.
[220] Ibid.
[221] Ibid.
[222] Ibid.

Although the UK does not have a major problem with ballast water, they are realising that ballast water is one of the most common methods through which invasive species are spread.[223] As a result of this realization the UK has drafted a Ballast Water Management Strategy for North West Europe.[224] The expected date of implementation is September 2007.[225] The purpose of this strategy is to provide certain North West European countries with ballast water management regulations to reduce the introduction of non-native species into these Countries' water.[226] These countries include Netherlands, Germany, Sweden, Belgium, Ireland and Denmark.[227] The strategy is based on the following operational options for ships that uses North West European waters:

Recommendation vi states that ballast water may not be loaded or discharged in areas where toxic non-native species are found.[228]

Recommendation viii states that a risk assessment procedure has to be developed to reduce the risk of introductions of non-native species.[229]

Recommendation xviii states that if a ship is travelling from one freshwater port to another freshwater port the ship should perform a ballast water exchange in a suitable or nominated area.[230]

Recommendation xx states that ships that arrive from outside North West European water should perform ballast water exchange in water that is over two hundred nautical miles from the shoreline and has a depth of two hundred meters.[231]
If it is unsafe for a ship to exchange ballast water in this area it may exchange its ballast water within the two hundred mile limit provided that it is more than fifty nautical miles from the coast and the water still has a depth of two hundred meters.[232]

Recommendation xxi states that if ships arriving from West Africa and the Mediterranean have not performed ballast water exchange in water that is two

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[223] 'The Ballast Water Management Strategy for NW Europe' available at *http://www.seas-at-risk.org* [accessed 4 December 2006].
[224] Ibid
[225] Ibid.
[226] Ibid.
[227] Ibid.
[228] Ibid.
[229] Ibid.
[230] Ibid.
[231] Ibid.
[232] Ibid.

hundred nautical miles from the coast with a depth of two hundred meters, they should perform suitable ballast water management measures.[233]

Recommendation xxii states that all the voyages of ships operating in a bio-province within the North West European area should be subject to a risk assessment.[234] If the risk is low the ships may be allowed to transport ballast water between ports.[235] If the risk is high the ship should be required to perform suitable ballast water management measures.[236]

Lastly **Recommendation xxiii** states that all ships should be required to have suitable management measures if they are operating between bio-provinces within the North West European area.[237]

There has been some debate as to whether this strategy should be mandatory or voluntary.[238] If it is mandatory it will have to have a legal basis in each country. In the UK this strategy will fall under their Merchant Shipping Act.[239] However, due the lack of shipping law in many of the North West European countries the implementation of the strategy will be significantly delayed.[240]

The strategy should thus be voluntary with the option of making it mandatory in the future once more shipping law has been developed in these countries.[241] This decision was not only based on the lack of current shipping law but the advantages and the disadvantages of making the strategy voluntary or mandatory was considered.[242]

The advantages of a voluntary regime are that it is easy to implement and it immediately targets ships that enters the area from outside.[243] There is also an early reduction in the introduction of non-native species.[244] The disadvantages are that not

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[233] 'The Ballast Water Management Strategy for NW Europe' available at *http://www.seas-at-risk.org* [accessed 4 December 2006].
[234] Ibid.
[235] Ibid
[236] Ibid.
[237] Ibid.
[238] Ibid.
[239] Ibid.
[240] Ibid.
[241] Ibid.
[242] Ibid.
[243] Ibid.
[244] Ibid.

all the ships will comply with the guidelines since there is no enforcement possibilities and the risk of introductions may be limited.[245]

The advantages of a mandatory regime are that all ballast water discharges will be controlled and it can be enforced with penalties.[246] The disadvantages are that it will take longer to implement the strategy, it is more costly, there is a longer period where the risk of introductions are not reduced and survey techniques will have to be developed for port inspections.[247]

Thus it is clear that the advantages for a voluntary regime far outweighs the advantages for a mandatory regime and thus the voluntary regime should be adopted.[248]

If this strategy should be implemented it will bring the United Kingdom in line with the rest of the world when it comes to ballast water management regulations. They need to implement it as soon as possible because they are one of the most influential countries in the world. Thus if they implement it fast enough those countries that do not have ballast water management regulations in place will almost certainly follow in their footsteps.

There is currently no case law in the United Kingdom on the subject of ballast water but perhaps this will change in the future.

6. South Africa

6.1 Effect of ballast water on South African coasts

It is estimated that over twenty two million tons of ballast water are discharged into South African waters annually.[249] Thus there is a lot of opportunity for species from other countries to come into South Africa.

However, not many invasive species have been found in SA thus far, perhaps due to insufficient research and exploration of the coast.[250] Only parts of the South African coast has been explored for invasive species and they have found that there are

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[245] 'The Ballast Water Management Strategy for NW Europe' available at *http://www.seas-at-risk.org* [accessed 4 December 2006].
[246] Ibid.
[247] Ibid.
[248] Ibid.
[249] TB Robinson, CL Griffiths, CD McQuaid & M Ruis 'Marine alien species of South Africa – status and impacts' (2005) 27 (1) African Journal of Marine Science 297 at 300.
[250] Ibid.

currently only ten confirmed alien species and twenty-two cryptogenic species living along the coast.[251] Only one of the thirty-two invasive species has spread from its introduction area to further along the coast.[252]

This species is called Mytilus galloprovincialis, or in english, the Mediterranean mussel.[253] It was first noted in Saldanha Bay in 1979 and has since spread so extensively that is now found along the entire west coast of South Africa.[254] The Mediterranean mussel has an extremely fast growth rate, it is very fertile and it shows remarkable endurance in dry areas, which makes it adaptable to almost any environment.[255] As a result most of the native mussel species on the west coast of South Africa have been displaced which means that farmers no longer have any mussels to harvest.[256] The Mediterranean mussel has also had an effect on sandy shores such as the Langebaan Lagoon.[257] It invaded the centre banks of Langebaan Lagoon in 1992 and it 'considerably altered the natural community composition by inducing a replacement of sandbank communities by those more typical of rocky shores…the beds present on the centre banks decreased by eighty eight percent by 2001.'[258]

This mussel has had some positive effects as well.[259] It provides a food source to the African black oystercatcher, which was known as an almost extinct species prior to the arrival of the mussel.[260]

The negative effects still outweigh the positive effects and that is why measures should be undertaken to regulate the introduction of non-native species via ballast water.

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[251] TB Robinson, CL Griffiths, CD McQuaid & M Ruis 'Marine alien species of South Africa – status and impacts' (2005) 27 (1) African Journal of Marine Science 297 at 300.
[252] Ibid.
[253] Ibid.
[254] Ibid.
[255] Ibid.
[256] Ibid.
[257] Ibid.
[258] Ibid.
[259] Ibid.
[260] Ibid.

6.2 Legislation, Regulations or Policies South Africa have to combat the problem

South Africa does not have legislation or regulations that deals directly with the issue of ballast water.[261] However, there are a few International Conventions that deals with ballast water to which South Africa is a signatory and have ratified. Conventions such as the United Nations Convention on the Law of the Sea, which South Africa ratified on 23 December 1997 and the Convention on Biological Diversity, which South Africa ratified on 2 November 1995.[262] The second Convention was discussed in 5.2 above but both will be discussed in 9.1 and 9.2 below.

It also has legislation that deals indirectly with the ballast water issue such as the National Environmental Management Biodiversity Act of 2004.

Chapter 5 of this Act sets out rules regarding 'species and organisms posing potential threats to biodiversity.'

The purpose of the chapter is:

- 'to prevent the unauthorised introduction and spread of alien species and invasive species to ecosystems and habitats where they do not naturally occur;
- to manage and control alien species and invasive species to prevent or minimize harm to the environment and to biodiversity in particular; and
- to eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats…'[263]

Section 65(1) thus states that a person must have a permit to perform any activity that involves alien species. Section 65(2) states that a permit may only be issued if an assessment of the risks and impacts of the alien species on biodiversity has been carried out. Section 69 states that a person who has been issued a permit must ensure that no harm is done to the biodiversity. If the person does not comply with this, such person may be directed to remedy the harm done and if the person fails to do so a competent authority may implement the directive and recover all costs of doing so from the person at fault.

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[261] 'Environmental Management' published by the National Ports Authority available at *http://www.npa.co.za/Environmental/Index.htm* [accessed 17 January 2007].

[262] Jan Glazewski, Emma Witbooi 'Final Report: Recommendations for the Implementation of International Ballast Water Guidelines into South African Law' (October 2001) *University of Cape Town, Institute of Marine and Environmental Law* at 14 & 16.

[263] National Environmental Management: Biodiversity Act 10 of 2004.

One could say that the discharge of ballast water into coastal waters is an activity that involves alien species. Thus ships that discharges ballast water into South African coastal waters, in terms of the act, will be required to have a permit to do so.
South Africa also has a White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity.[264]
It is still in the white paper stage, which means that it does not yet have legislative power but the South African parliament hopes to have this remedied very soon.[265]
Part 2.2 of this white paper addresses the marine and coastal areas of South Africa.[266]
It states that the marine and coastal areas of SA provide very important 'ecosystem services such as climate control' and it is also essential to the economy of SA because of the 'trade and transport opportunities.'[267] The SA Government regards the marine and coastal areas to be an asset that requires the utmost respect and effective management to avoid the threats that it currently faces. These threats include, inter alia, the introduction of invasive species through the discharge of ballast water.[268]
Thus to achieve this objective the Government will:

- 'Ensure that considerations relating to the conservation and sustainable use of marine and coastal biodiversity are effectively incorporated into national policies on integrated pollution control and fisheries; and
- Support the rapid development of a national policy on coastal zone management, and the incorporation of biodiversity considerations therein;
- Require that those using marine resources, receiving services from marine and coastal ecosystems, or those producing waste must bear all environmental, social and economic costs, and the responsibility for any consequential detriment to the environment and to associated biota;
- Prevent inappropriate activities and development along the coast, and that of linear or ribbon development in particular. Ensure that adequate buffer strips are retained to protect the coastal zone.'[269]

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[264] Available at *http://www.environment.gov.za/Po1Leg/WhitePapers/Biodiversity/Chapter3b.htm* [accessed 17 January 2007].
[265] 'White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity' available at *http://www.environment.gov.za/Po1Leg/WhitePaers/Biodiversity/Chapter3b.htm* [accessed 17 January 2007].
[266] Ibid.
[267] Ibid.
[268] Ibid.
[269] Ibid.

In a report by Jan Glazewski[270], one of the legal findings were that any regulatory regime must take consideration of the following two key players when enforcing or implementing ballast water regulations:

- The South African Maritime and Safety Association (SAMSA), 'whose jurisdiction covers internal waters, territorial waters and the Exclusive Economic Zone and whose ship surveyors administer the bulk of the relevant legislation, and
- Port Authorities whose jurisdiction covers only ports, including roadsteads within port limits, but whose officials would play a central role in enforcing any ballast water control measure which may emerge.'[271]

The report also sets out a few legal recommendations to incorporate the ballast water guidelines and the ballast water Convention into South African law, which will be discussed in 8.1 below. The recommendations include the following:

- 'That the guidelines/draft convention be given effect by the enactment of regulations rather than a stand-alone new act as this will be simpler and more expeditious;
- That if SAMSA is going to be the main implementing agency…, the regulations be made under the Marine Pollution (Prevention of pollution from Ships) Act (2 of 1986) by the Minister of Transport. This Act…includes a section which is wide enough to accommodate other marine pollution related regulations (section 3(2)(a));
- Alternatively, if the DEA&T is going to be the main implementing agency, that the regulations be enacted under either NEMA, which specifically provides for giving domestic effect to international conventions, or either the envisaged National Coastal Management Act or Biodiversity Act, provided these include authorisations wide enough to allow the Minister of Environmental Affairs and Tourism to enact such regulations;
- …[I]t is recommended that the regulations be made by the Minister of Transport which will be more practical as SAMSA has the infrastructure in place for their implementation;

[270] Professor at the University of Cape Town, Institute of Marine and Environmental Law.
[271] Jan Glazewski, Emma Witbooi 'Final Report: Recommendations for the Implementation of International Ballast Water Guidelines into South African Law' (October 2001) *University of Cape Town, Institute of Marine and Environmental Law* at 49.

- The regulations will include technical requirements which South African ships will have to comply with in conformity with international Guidelines, and will make for the provision of reception facilities in certain specified South African harbours for sediment.'[272]

The report then goes on to set out draft regulations to be made under the Marine Pollution Act 2 of1986. The objective of the recommendations are, as discussed above, 'to give effect in South African Law to the IMO Guidelines for the control and management of ships' ballast water (and eventually to the International Convention for the Control and Management of Ships Ballast Water and Sediment'.[273]
Section 1 of the Draft Regulations sets out the definitions of all the words used in the regulation, including the definition of ballast water and ballast water management.[274]
In terms of section 1 ballast water means 'water with its suspended matter taken on board a ship to control trim, list, draught, stability or stresses of a ship'.[275]
Ballast Water Management means 'mechanical, physical, chemical, biological or other processes to kill, remove, render infertile, or avoid the uptake or discharge of harmful aquatic organisms and pathogens within ballast water and sediments…'[276]

Section 2 sets out the obligations of masters and owners of South African ships and states that they should have a Ballast Water Record Book, a Ballast Water Management Plan, an International Ballast Water Management Certificate and lastly that an officer must be appointed to ensure that the above are complied with.[277]

Section 3 sets out the general rights and duties of masters and owners of all ships and states that they must, as soon as possible after entry into South African waters:

- 'notify the Administration of the amount, source and composition of any ballast water which it may have on board where the intention of the master is

[272] Jan Glazewski, Emma Witbooi 'Final Report: Recommendations for the Implementation of International Ballast Water Guidelines into South African Law' (October 2001) *University of Cape Town, Institute of Marine and Environmental Law* at 50 & 51.
[273] Ibid at 55.
[274] Ibid.
[275] Ibid.
[276] Ibid.
[277] Ibid at 57.

to treat or dispose of such ballast water in South Africa or in South African waters;

- not discharge ballast water in South African water unless a permit in terms of regulation 4(1)(c) has been issued and except in accordance with such permit and any conditions stipulated therein'.[278]

Section 4(1) sets out the rights and duties of the Administration and states that if the administration receives a request from a ship to discharge ballast water, the administration should:

- 'assess the possible impact of such release on the marine and coastal environment taking cognisance of the criteria set out in [Annexure X] and relevant international standards and local standards;
- observe, measure, sample, analyse and ultimately evaluate the effectiveness of the relevant international and local standards in the particular case;
- furnish the master with any permit issued as soon as practicable after receipt of such request; and
- in issuing a permit under paragraph (c), refer to the relevant international standards and/or local standards'.[279]

Section 5 sets out the areas in which the discharge of ballast water is permitted or prohibited and section 6 states that the administration may board a ship and inspect all documents regarding the ships' ballast water.[280]

Section 7 states that the 'regulations do not apply to any warship, naval auxiliary, or other ship owned and used only in government non-commercial service' and lastly section 8 states that it is a criminal offence if these regulations are not complied with.[281]

This is definitely a good start and perhaps in the near future parliament will sit down and decide to pass these regulations or at least legislation that deals directly with the

[278] Jan Glazewski, Emma Witbooi 'Final Report: Recommendations for the Implementation of International Ballast Water Guidelines into South African Law' (October 2001) *University of Cape Town, Institute of Marine and Environmental Law* at 57.
[279] Ibid.
[280] Ibid at 58.
[281] Ibid.

management of ballast water. There is no case law on this matter in South Africa as yet.

7. Other countries that have ballast water management Rules and Regulations.

7.1 Canada

Canada passed Ballast Water Control and Management Regulations in June 2006 as an annexure to the Canada Shipping Act.[282] These regulations apply to all ships that is designed or constructed to carry ballast water and that sails in water that is under the jurisdiction of Canada.[283] The regulations do not apply to ships that are used for search and rescue operations, pleasure crafts, ships that carry permanent ballast water in sealed tanks or ships that are owned by a state and is used in 'government non-commercial service.'[284]

Section 4(1) of the regulations states that a ship manages its ballast water if it uses one or all of the following management processes:

- 'the exchange of ballast water;
- the treatment of ballast water;
- the discharge of ballast water to a reception facility; and
- the retention of ballast water on board the ship.'[285]

Section 4(2) states that a ship must use these management processes to:

- 'minimize both the uptake of harmful aquatic organisms or pathogens within the ballast water and their discharge with the ballast water into waters under Canadian jurisdiction; or
- remove or render harmless harmful aquatic organisms or pathogens within the ballast water.'[286]

Section 4(5) states that it is not necessary to manage ballast water if the discharge or uptake of ballast water is necessary for the safety of the ship or if it is necessary to avoid or minimise the discharge of a pollutant.[287]

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[282] 'Ballast Water Control and Management Regulations' published by the Minister of Transport, Infrastructure and Communities available at *http://laws.justice.gc.ca/en/S-9/SOR-2006-129/239034.html* [accessed 10 December 2006].
[283] Ibid.
[284] Ibid.
[285] Ibid.
[286] Ibid.
[287] Ibid.

Section 4(6)(3) states that if a ship complies with these requirements the ship must keep a record of its compliance on board the ship for a period of twenty four months.[288]

Section 6(2) of the regulations provide that a ship may not discharge its ballast water if the ballast water was loaded outside Canadian water unless the ship performed a ballast water exchange in water that is two hundred nautical miles from the Canadian shore.[289]

Section 6(4) states that if a ship cannot comply with this because it is impractical or will compromise the safety of the ship, the ship may discharge its ballast water in appropriate designated areas.[290] These areas are specified by the regulations.

Section 8 deals with ballast water exchange standard and section 8(2) states that a ship that exchanges ballast water must attain:

- 'an efficiency of at least 95 percent volumetric exchange; and
- a ballast water salinity of at least 30 parts per thousand, if the exchange of ballast water is conducted in an area not less than 50 nautical miles from shore.'[291]

Section 11 of the regulations provide that a ship must carry a ballast water management plan on board, which sets out safe and effective ballast water management procedures.[292] This management plan must include a description of all ballast water management processes, a description of safety procedures, a description of the ballast water system and a ballast water reporting form detailing its delivery requirements.[293]

Section 14 requires that the master of a ship that is bound for a port in Canada must submit a completed Ballast Water Reporting Form as soon as possible after a management process has been performed.[294]

Canada certainly has very detailed regulations that govern the management of ballast water. They are thus setting an example for the rest of the world, that simply because

[288] 'Ballast Water Control and Management Regulations' published by the Minister of Transport, Infrastructure and Communities available at *http://laws.justice.gc.ca/en/S-9/SOR-2006-129/239034.html* [accessed 10 December 2006].
[289] Ibid.
[290] Ibid.
[291] Ibid.
[292] Ibid.
[293] Ibid.
[294] Ibid.

something is not as damaging in your country does not mean that you should not have appropriate legislation in place. It might become a problem in the future and it is time for certain countries to wake up.

On 28 September 2000, the Shipping Federation of Canada also established the Code of Best Practices for Ballast Water Management (The Code), which only applies to ships that enter into the Great Lakes.[295]

The Code requires that ships should perform ballast water management whenever it is possible even if the ship is not going to a port that does not require such procedures.[296] This will ensure that there are less sediment accumulations in the ballast tanks and if open ocean exchange is used as a management procedure the organisms will constantly be exposed to an environment in which they cannot survive.[297]

The Code states that the management procedure used must be safe and it must be practiced in accordance with safety guidelines.[298]

Ships are required to inspect its ballast tanks on a regular basis and to remove sediments found in the tanks at least as required by the its Classification Society.[299]

Ships must follow the ballast water exchange methods that are provided by United States legislation and United States Coast Guard regulations.[300]

The Code also requires that a record should be kept of all ballast water uptakes and discharges and all inspections and cleaning of ballast tanks and that these records should be submitted according to the US Coast Guard Regulations.[301] Ships are also required to provide information that verifies its compliance with the Code of Best Practices.[302] Ships must apply a precautionary approach when it is loading ballast water by avoiding loading ballast water in the following areas:

- 'In areas identified in connection with toxic algal blooms, outbreaks of known populations of harmful aquatic organisms and pathogens, sewage outfalls and dredging activity;

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[295] 'The Shipping Federation of Canada-Ballast Water Best Practices Protocol' published by the Shipping Federation of Canada available at *http://www.shipfed.ca/eng/library/other_subjects/ballast_water/BallastWaterBestPractices.html* [accessed 11 December 2006].
[296] Ibid.
[297] Ibid.
[298] Ibid.
[299] Ibid.
[300] Ibid.
[301] Ibid.
[302] Ibid.

- In darkness, when bottom dwelling organisms may rise in the water column;
- In very shallow water;
- Where a ship's propellers may stir up sediment;
- In areas with naturally high levels of suspended sediments, e.g. river mouths, and delta areas, or in locations that have been affected significantly by soil erosion from inland drainage;
- In areas where harmful aquatic organisms are known to occur.'[303]

The Code encourages the support and development of scientific research, sampling programmes and analysis.[304] This includes on board sampling and testing of ballast water but without disrupting the operation of the ship or causing unnecessary delays.[305] The code also advises ships to cooperate and participate in the development of standards and treatment methods which includes 'mechanical management and treatment systems, and pesticide management systems as well as improved techniques for ballast water exchange and their scientific assessment.'[306] Lastly the Code urges the shipping community 'to strive toward global, integrated ballast water management strategies in conformity with internationally agreed principles that respect national and regional aquatic ecosystems.[307]

7.2 Brazil

Brazil has implemented ballast water exchange regulations, called NORMAM 20, and it entered into force on 15 October 2005.[308] The regulations require that all ships must exchange its ballast water before it can enter a Brazilian port. The ships may use the sequential method, the flow through method or the dilution method to exchange its ballast water.[309] The exchange of ballast water must take place at least two hundred nautical miles from the shore and in water with a depth of at least two hundred metres.[310] In terms of the regulations a ship does not have to deviate from its course

[303] 'The Shipping Federation of Canada-Ballast Water Best Practices Protocol' published by the Shipping Federation of Canada available at *http://www.shipfed.ca/eng/library/other_subjects/ballast_water/BallastWaterBestPractices.html* [accessed 11 December 2006].
[304] Ibid.
[305] Ibid.
[306] Ibid.
[307] Ibid.
[308] 'Brazil-mandatory ballast water management and reporting' available at *http://www.nepia.com* [accessed 11 December 2006].
[309] Ibid.
[310] Ibid.

in order to perform a ballast water exchange and if the master of the ship is of the opinion that such an exchange will be detrimental to the safety of the ship and its crew, the ship may be exempted from performing the exchange.[311] Such an exchange may be detrimental to the safety of the ship and its crew due to 'adverse weather conditions, excessive stress to the hull, failure of any essential equipment, or any other extraordinary circumstances.'[312]

The regulations require that ships entering the Amazon river and the Para river from international voyages must undertake two ballast water exchanges. The first one is to be as described as above and the second, for those entering the Amazon river is to reduce the salinity of the ballast water between the isobath and Macapá.[313] The second exchange only requires the tanks to be pumped once.[314] The ships that enter the Para river must perform an exchange seventy nautical miles from between Salinópolis and the Light of Ponta do Chapéu Virado (Ilha do Mosqueiro).[315]

In terms of the regulations a ship that does not utilize at least one of these ballast water management practices may receive a penalty unless the ship has been exempted.[316]

All vessels are required to have a ballast water management plan on board and the master of the ship must submit a ballast water report form to the harbour master at least twenty four hours before it arrives at the port.[317]

Warships, offshore support vessel, leisure boats and ships with sealed ballast tanks are exempted from these regulations.[318]

Even Brazil, which is one of those countries that one almost never hears or thinks about, has ballast water regulations in place. It certainly says a lot when the third world countries of the world are starting to take initiative and does so without any directive from first world countries.

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[311] 'Brazil-mandatory ballast water management and reporting' available at *http://www.nepia.com* [accessed 11 December 2006].
[312] Ibid.
[313] Ibid
[314] Ibid.
[315] Ibid.
[316] Ibid.
[317] Ibid.
[318] Ibid.

7.3 Antarctica

Antarctica is one of the coldest, if not the coldest, continents on the earth but even this fact has not allowed the continent to elude the introduction of invasive species.

One example of an invasive species found in the Antarctic Peninsula is the North Atlantic spider crab, Hyas araneus.[319] As a result, 'invasive species and polar warming combined can foster the probability of arrival and colonization by non-indigenous species, with unpredictable consequences for the Antarctic marine biota.'[320] Therefore, Practical Guidelines for Ballast Water Exchange in the Antarctic Treaty Area (The Guidelines) has been adopted.[321]

The Guidelines states that a ship may not conduct a ballast water exchange if the safety of the ship will be compromised and a record must be kept of all ballast water operations.[322] It also states that all ships that have ballast tanks must have a Ballast Water Management Plan prepared, which takes into consideration the difficulty of exchanging ballast water in Antarctic conditions.[323] If a ship has to discharge its ballast water in Antarctic water the ballast water first has to be exchanged at least 200 nautical miles from the nearest land in water with a depth of 200 meters.[324] If the ship is unable to this due to safety reasons the exchange may be undertaken in water that is at least 50 nautical miles from the nearest land and has a depth of at least 200 meters.[325] The Guidelines also states that a ship only needs to perform a ballast water exchange on the tanks that will be discharged in Antarctic waters.[326] However, if a ship has the capacity or potential to load cargo in Antarctica, the ship should perform a ballast water exchange of all its ballast tanks.[327]

The release of sediments during the cleaning of the ballast tanks is not permitted, thus ships are encouraged to discharge all sediments and clean ballast tanks before entering Antarctic waters.[328]

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[319] 'Discovery of the first known benthic invasive species in the Southern Ocean: the North Atlantic spider crab Hyas Araneus found in the Antarctic Peninsula' available at *http://journals.cambridge.org* [accessed 15 January 2007].
[320] Ibid.
[321] 'Practical Guidelines for Ballast Water Exchange in the Antarctic Treaty Area' available at *http://www.cep.aq* [accessed 15 January 2007].
[322] Ibid.
[323] Ibid.
[324] Ibid.
[325] Ibid.
[326] Ibid.
[327] Ibid.
[328] Ibid.

Now that we know where most countries stand on this ballast water issue, perhaps it is time to see what is being done in the international arena.

Part C: The International Arena

8. The International Maritime Organisation (IMO)

8.1 The Ballast Water Convention and the IMO Guidelines

Shipping is an international industry and thus the only effective way to address shipping issues is through a standardised international system.[329]

The IMO is a specialised agency of the United Nations and they are responsible for the international regulations of ship safety and the prevention of marine pollution.[330] Thus the IMO is the most appropriate international body to address the issue of ballast water and its effect.[331] In a World Summit on Sustainable Development (WSSD), which took place in Johannesburg, South Africa from 26 August to 4 September 2004, the WSSD stressed the immediate need for measures to address the issue of invasive species in ballast water.[332] In response IMO member countries agreed to 'develop an international regime to regulate and control blast water' and this in turn led to the adoption of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (Ballast Water Convention).[333] The Ballast Water Convention was adopted at a Diplomatic Conference at IMO in London on 13 February 2004 and it will enter into force twelve months after it has been ratified by thirty states, which represents thirty five percent of world merchant shipping tonnage.[334] At present only eight countries have signed the Ballast Water Convention.[335] These countries are Argentina, Australia, Brazil, Finland, Maldives, The Netherlands, Spain and the Syrian Arab Republic.[336]

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[329] 'Legislation and Regulations' published by the International Maritime Organisation available at *http://globallast.imo.org/index.asp?page=bwlegis.htm&menu=true* [accessed 15 January 2007].
[330] 'The International Response' published by the International Maritime Organisation available at *http://globallast.imo.org/index.asp?page=internat_response.htm&menu=true* [accessed 15 January 2007].
[331] Ibid.
[332] Ibid.
[333] Ibid.
[334] 'International Convention for the Control and Management of Ships' Ballast Water and Sediments' published by the International Maritime Organisation available at *http://www.imo.org/Conventions/mainframe.asp?topic-id=867* [accessed 15 January 2007].
[335] 'International Convention for the Control and Management of Ships' Ballast Water and Sediments adopted in 2004' published by the International Maritime Organisation available at *http://www.imo.org/Environment/mainframe.asp?topic_id=548* [accessed 15 January 2007].
[336] Ibid.

On 22 June 2005 Maldives became the first Contracting Party when it deposited its instrument of ratification.[337]

The Ballast Water Convention has the following provisions:
Article 2 contains the general obligations of all parties and requires that parties give full effect to all the provisions in the Convention to 'prevent, minimize and ultimately eliminate the transfer of harmful aquatic organisms and pathogens through the control and management of ships' ballast water and sediments.[338] This article also provides that parties may enforce measures that are stricter than those provided in the Convention.[339] In doing so the parties must ensure that their ballast water management practices do not cause greater harm than good to their 'environment, human health, property or resources.[340]
Article 5 requires that parties ensure that all ports or terminals where the cleaning of ballast tanks takes place should have adequate reception facilities for the reception of sediment.[341]
Article 6 states that parties should either individually or jointly promote scientific and technical research on ballast water management and also monitor the effects of ballast water management in waters under their jurisdiction.[342]
Articles 7 and 9 requires that ships be surveyed and certified and inspected by port State control officers to verify that the ship has a valid certificate, inspect the Ballast Water Record Book and sample the ballast water.[343] The person that performs the inspection 'shall take such steps as will ensure that the ship shall not discharge Ballast Water until it can do so without presenting a threat of harm to the environment, human health, property or resources.'[344] The ship should not be delayed or detained unnecessarily.[345]

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[337] 'International Convention for the Control and Management of Ships' Ballast Water and Sediments adopted in 2004' published by the International Maritime Organisation available at *http://www.imo.org/Environment/mainframe.asp?topic_id=548* [accessed 15 January 2007].
[338] 'International Convention for the Control and Management of Ships' Ballast Water and Sediments' published by the International Maritime Organisation available at *http://www.imo.org/Conventions/mainframe.asp?topic-id=867* [accessed 15 January 2007].
[339] Ibid.
[340] Ibid.
[341] Ibid.
[342] Ibid.
[343] Ibid.
[344] Ibid.
[345] Ibid.

Article 13 states that parties should undertake 'to provide technical assistance to train personnel, to ensure the availability of relevant technology, equipment and facilities, to initiate joint research and development programmes, and to undertake other action aimed at the effective implementation of this Convention and of guidance developed by the Organization related thereto.'[346]

Section A states that the 'discharge of ballast water shall only be conducted through Ballast Water Management, in accordance with the provisions of this annex.'[347] Section B of the Convention sets out the requirements for the control and management of ballast water.[348] It states that ships must have a Ballast Water Management Plan on board, which includes details such as the measures taken to implement the requirements.[349] Ships are also required to have a Ballast Water Record Book 'to record when ballast water is taken on board; circulated or treated for Ballast Water Management purposes; and discharged into the sea.'[350] Other requirements for control and management of ballast water includes the following:

- 'Ships constructed before 2009 with a ballast water capacity of between 1500 and 5000 cubic metres must conduct ballast water management that at least meets the ballast water exchange standards or the ballast water performance standards until 2014, after which time it shall at least meet the ballast water performance standard;
- Ships constructed before 2009 with a ballast water capacity of less than 1500 or greater than 5000 cubic metres must conduct ballast water management that at least meets the ballast water exchange standards or the ballast water performance standards until 2016, after which time it shall at least meet the ballast water performance standard;
- Ships constructed in or after 2009 with a ballast water capacity of less than 5000 cubic metres must conduct ballast water management that at least meets the ballast water performance standard;

[346] 'International Convention for the Control and Management of Ships' Ballast Water and Sediments' published by the International Maritime Organisation available at *http://www.imo.org/Conventions/mainframe.asp?topic-id=867* [accessed 15 January 2007].
[347] Ibid.
[348] Ibid.
[349] Ibid.
[350] Ibid.

- Ships constructed in or after 2009 but before 2012, with a ballast water capacity of 5000 cubic metres or more shall conduct ballast water management that at least meets the standard described in regulation D-1 or D-2 until 2016 and at least the ballast water performance standard after 2016;
- Ships constructed in or after 2012, with a ballast water capacity of 5000 cubic metres or more shall conduct ballast water management that at least meets the ballast water performance standard.'[351]

The section also requires that ships performing ballast water exchange must do so at least 200 nautical miles from the coast in water with a depth of 200 meters.[352] If the ship is unable to do this it may perform a ballast water exchange at least 50 nautical miles from the land in water with a depth of 200 meters or in designated areas.[353]
Section C states that the contracting parties may implement additional methods to 'prevent, reduce or eliminate the transfer of Harmful Aquatic Organisms and Pathogens through ships' ballast water and sediments.'[354]
Section D sets out the standards for ballast water exchange.[355] In terms of this section there are two standards, the ballast water exchange standard and the ballast water performance standard.[356]
The ballast water exchange standard states the following: 'Ships performing Ballast Water exchange shall do so with an efficiency of 95 per cent volumetric exchange of ballast water. For ships exchanging ballast water by the pumping-through method, pumping through three times the volume of each ballast water tank shall be considered to meet the standard described. Pumping through less than three times the volume may be accepted provided the ships can demonstrate that at least 95 per cent volumetric exchange is met.'[357]
The ballast water performance standard states: 'Ships conducting ballast water management shall discharge less than 10 viable organisms per cubic metre greater than or equal to 50 micrometres in minimum dimension and less than 10 viable

[351] 'International Convention for the Control and Management of Ships' Ballast Water and Sediments' published by the International Maritime Organisation available at *http://www.imo.org/Conventions/mainframe.asp?topic-id=867* [accessed 15 January 2007].
[352] Ibid.
[353] Ibid.
[354] Ibid.
[355] Ibid.
[356] Ibid.
[357] Ibid.

organisms per mililiter less than 50 micrometres in minimum dimension, and discharge of the indicator microbes shall not exceed the specified concentrations.'[358]
Under section D there is a regulation D-4 that covers Prototype Ballast Water Treatment Technologies, which allows ships to participate in programmes to test and evaluate ballast water treatment technologies.[359]
Regulation D-5 requires the IMO to review the ballast water performance standard, 'taking into account a number of criteria including safety considerations; environmental acceptability; not causing more, or greater environmental impacts than it solves; practicability; compatibility with ship design and operations; cost effectiveness and biological effectiveness in terms of removing or otherwise rendering inactive harmful aquatic organisms and pathogens in ballast water.'[360]
Section E sets out the requirements for the renewal of surveys and ballast water management certificates.[361]

A few years before the adoption of the ballast water Convention, in November 1993, the IMO adopted resolution A.774 (18) Guidelines for Preventing the Introduction of Unwanted Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges.[362] The resolution was kept under review and it led to the adoption of resolution A.868 (20) Guidelines for the Control and Management of Ships' Ballast Water to Minimize the Transfer of Harmful Aquatic Organisms and Pathogens in November 1997.[363] It was adopted to help minimize the introduction of invasive species via the discharge of ballast water.[364] These guidelines are applicable to all ships but the port authorities may decide to what extent it will apply.[365]

The guidelines contains the following provisions:
Chapter 6 of the guidelines states that the training for the master and crew of a ship should include 'instructions on the application of ballast water and sediment

[358] 'International Convention for the Control and Management of Ships' Ballast Water and Sediments' published by the International Maritime Organisation available at *http://www.imo.org/Conventions/mainframe.asp?topic-id=867* [accessed 15 January 2007].
[359] Ibid.
[360] Ibid.
[361] Ibid.
[362] Ibid.
[363] Ibid.
[364] 'The IMO Guidelines' published by the International Maritime Organisation available at *http://globallast.imo.org/index.asp?page=resolution.htm* [accessed 15 January 2007].
[365] Ibid.

management and treatment procedures.'[366] It also states that the ballast water management procedures are presently the main solution to minimize the introduction of invasive species via ballast water and thus governments should include knowledge of these procedures and all duties in their training.[367]

Chapter 7 deals with procedures for ships and port states. It states that all ships that carry ballast water should have a ballast water management plan, specific to each ship, to provide safe and effective procedures to help minimize the introduction of bioinvaders.[368] Port states are encouraged to provide adequate reception and treatment facilities to dispose of ballast tank sediments in the safest possible way.[369]

Chapter 8 states that if a ship cannot perform the required ballast water procedures or treatments due to weather or impracticability the master should report it to the port state authority before the ship enters the port.[370] A responsible officer should be appointed to record all ballast water management procedures and treatments that are used and if it is followed.[371] The record should also show 'the dates, geographical locations, ships' tanks and cargo holds, ballast water temperature and salinity and the amount of ballast water that is loaded or discharged.'[372] In terms of this chapter port states are required to provide ships with information such as 'details of their requirements concerning ballast water management; locations and terms of use of alternative exchange zones; any other port contingency arrangements and the availability, location, capacities of and applicable fees relevant to reception facilities…'[373] Port states should also inform ships of areas where the uptake of ballast water should be avoided or minimized.[374] Areas such as:

- 'areas with outbreaks, infestations or known populations of harmful organisms and pathogens;
- areas with current phytoplankton blooms;
- nearby sewage outfalls;
- nearby dredging operations;

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[366] 'The IMO Guidelines' published by the International Maritime Organisation available at *http://globallast.imo.org/index.asp?page=resolution.htm* [accessed 15 January 2007].
[367] Ibid.
[368] Ibid.
[369] Ibid.
[370] Ibid.
[371] Ibid.
[372] Ibid.
[373] Ibid.
[374] Ibid.

- when a tidal stream is known to be more turbid; and
- areas where tidal flushing is known to be poor.'[375]

Chapter 9 sets out the operational procedures that ships should follow. It states that every effort should be made to ensure that invasive species are not loaded when ballast water is loaded.[376] It also states that when possible the ballast tanks should be cleaned on a regular basis to remove sediments.[377] It should be cleaned in mid-ocean or in port under controlled conditions.[378] If during the loading of cargo it becomes necessary to discharge ballast water in that port it must be done in appropriate areas.[379] Ships should perform ballast water exchange in deep water, in the open ocean or as far as possible from the shore, at least 200 nautical miles.[380] If ballast water exchange is not possible the water should be kept in the tanks or the holds.[381] If the ship cannot do this only the necessary amount of ballast water may be discharged in accordance with the port states' contingency strategies such as discharging in reception facilities provided by the port state.[382] If new treatments and technologies are developed and prove to be feasible it may be used as a substitute or in conjunction with current treatments and technologies.[383]

Chapter 10 provides guidance to port states in the implementation of their ballast water management plan and in the assessment of the risks associated with ballast water.[384] It states that port states should look at the difference between uptake and discharge ports, the age of the ballast water and the presence of target organisms.[385] These are the factors that either heighten or minimize the risks associated with ballast water.

Chapter 11 deals with the enforcement and monitoring of ballast water management procedures by port states.[386] Port states are allowed to exempt ships that are within their jurisdiction from applying the guidelines and they have the right to manage

[375] 'The IMO Guidelines' published by the International Maritime Organisation available at *http://globallast.imo.org/index.asp?page=resolution.htm* [accessed 15 January 2007].
[376] Ibid.
[377] Ibid.
[378] Ibid.
[379] Ibid.
[380] Ibid.
[381] Ibid.
[382] Ibid.
[383] Ibid.
[384] Ibid.
[385] Ibid.
[386] Ibid.

ballast water in accordance with national legislation.[387] Port states should however inform the IMO how the guidelines are applied and if there are any ballast water discharge restrictions.[388] Port states should at all times consider the effect of ballast water discharge procedures on the safety of the ship and its crew and therefore they should not require the master to carry out any action that may endanger the ship and its crew.[389] The procedures used must be 'effective as well as environmentally safe, practicable, designed to minimize costs and delays to the ship and based upon these guidelines whenever possible.'[390] A port state should provide any information regarding the management of ballast water to any visiting ship that requests it and all enforcement and monitoring measures should be performed on a 'fair, uniform and nationally consistent manner at all ports within the port state.'[391] Port state authorities should, on a regular basis, take ballast water and sediment samples to test and analyse it but without causing the ship any delays when doing so.[392]

The master of the ship has a general obligation to assist with the monitoring by providing officers or crew, the ships' plans, all ballast arrangement records and all details regarding the location of sampling points.[393] The port state should inform the master what the purpose of the sample is and they should provide the master the results if they are requested to do so.[394] These samples may be taken prior to the discharge of ballast water and if harmful organisms are found in the sample a port state's contingency strategy may be applied.[395]

Chapter 12 deals with future considerations regarding ballast water exchange.[396]

It states that the guidelines will have to adjusted continuously as new ballast water management procedures are developed.[397]

It also states that all interested parties should perform detailed studies and provide information regarding:

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[387] 'The IMO Guidelines' published by the International Maritime Organisation available at *http://globallast.imo.org/index.asp?page=resolution.htm* [accessed 15 January 2007].
[388] Ibid.
[389] Ibid.
[390] Ibid.
[391] Ibid.
[392] Ibid.
[393] Ibid.
[394] Ibid.
[395] Ibid.
[396] Ibid.
[397] Ibid.

- ‘experience gained from carrying out ballast water exchange at sea, including any samples/model procedures;
- operational precautions and procedures implemented to avoid potential hazards and consequences that may arise during the ballast water exchange at sea;
- an evaluation of the safety margins between the actual metacentric height and stresses versus the allowable seagoing limits specified in the approved trim and stability booklet and loading manual, relevant to different types of ships and loading conditions;
- any hazards which may arise due to human element issues relative to the responsible execution of ballast water exchange at sea in a manner which may not be fully prudent;
- operational procedures carried out prior to initiating the ballast water exchange at sea and check points during the exchange;
- the extent of training and management necessary to ensure that the process of ballast water exchange at sea is effectively monitored and controlled on board;
- plan of action to incorporate any unique procedures should an emergency occur which may affect the exchange of ballast water at sea; and
- the decision-making process, taking into account relevant safety matters, including ships’ position, weather conditions, machinery performance, ballast system inspection and maintenance, crew safety and availability.’[398]

Chapter 13 states that these guidelines should be taken into consideration when new ships are designed or when existing ships are modified.[399]

Appendix 1 to the guidelines is the ballast water reporting form that is to be provided to port states if it is requested.[400] All information regarding ballast water should be included in this report.[401]

Appendix 2 provides guidance on the safety aspects of ballast water exchange at sea.[402] There are two methods of carrying out ballast water exchange at sea: The sequential method, which is when ships pump out it ballast water and then refills it

[398] ‘The IMO Guidelines’ published by the International Maritime Organisation available at *http://globallast.imo.org/index.asp?page=resolution.htm* [accessed 15 January 2007].
[399] Ibid.
[400] Ibid.
[401] Ibid.
[402] Ibid.

with clean water and the flow-through method, which is when a ship loads and discharges its ballast water simultaneously.[403] Ships that perform ballast water exchange at sea should be provided with procedures, which account for the following:

- 'avoidance of over and under-pressurization of ballast tanks;
- free surface effects on stability and sloshing loads in tanks that may be slack at any one time;
- admissible weather conditions;
- weather routeing in areas seasonably affected by cyclones, typhoons, hurricanes or heavy icing conditions;
- maintenance of adequate intact stability in accordance with an approved trim and stability booklet;
- permissible seagoing strength limits of shear forces and bending moments in accordance with an approved loading manual;
- torsional forces, where relevant;
- minimum/maximum forward and aft draughts;
- waved-induced hull vibration;
- documented records of ballasting and/or deballasting;
- contingency procedures for situations which may affect the ballast water exchange at sea, including deteriorating weather conditions, pump failure, loss of power, etc;
- time to complete the ballast water exchange or an appropriate sequence thereof, taking into account that the ballast water may represent 50 per cent of the total cargo capacity for some ships; and
- monitoring and controlling the amount of ballast water.'[404]

Ships that use the flow-through method to perform a ballast water exchange should take care because the air pipes of a ship were not designed to cope with uninterrupted ballast water overflow and they must ensure that all water and weather tight closures are closed if they were opened during the exchange.[405]

The appendix also states that the ballast water management plan should include all the instances in which a ballast water exchange should not be performed, instances such

[403] 'The IMO Guidelines' published by the International Maritime Organisation available at *http://globallast.imo.org/index.asp?page=resolution.htm* [accessed 15 January 2007].
[404] Ibid.
[405] Ibid.

as force majeure.[406] Every ships' officer that is involved in the exchange of ballast water must be trained and familiarised with the ships pumping plan, the method of ensuring that all sounding pipes and air pipes are in good working order, the times required to perform various ballast water exchange operations, the methods that are used to perform a ballast water exchange and the method of ballast water record keeping.[407]

It is clear from the discussion on the legislation found in various countries regarding ballast water that most countries have in some way incorporated parts of the convention and parts of the guidelines into their own national legislation. This means that most countries feel and agree that these are currently the most effective and appropriate measures to deal with the ballast water problem. It is extremely good that both the ballast water convention and the guidelines leave a door open for any new solutions that are being and will be developed in the future. This ensures that continuous studies will be undertaken to develop new and better solutions and it also discourages any rigidity when it comes to ballast water as ballast water is an issue where one cannot be too rigid.

8.2 The Ballast Water Programme

The IMO in conjunction with the United Nations Development Programme (UNDP) created another project to help with the ballast water problem.[408] This project is titled the Removal of Barriers to the Effective Implementation of Ballast Water Management Measures in Developing Countries, but it is more commonly known as the Global Ballast Water Programme or GloBallast.[409]

The objectives of the project are divided into two categories, the development objectives and the immediate objectives.[410] The development objectives are to help developing countries to minimize the introduction of bioinvaders via ballast water, to

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[406] 'The IMO Guidelines' published by the International Maritime Organisation available at *http://globallast.imo.org/index.asp?page=resolution.htm* [accessed 15 January 2007].
[407] Ibid.
[408] 'The GloBallast Programme' published by the International Maritime Organisation available at *http://globallast.imo.org/index.asp?page=gef_interw_project.htm&menu=true* [accessed 17 January 2007].
[409] Ibid.
[410] Ibid.

implement the IMO ballast water guidelines and to prepare these countries for the implementation of the Ballast Water Convention.[411] The immediate objectives are there to help achieve the development objectives.[412] These immediate objectives include activities such as programme coordination and management, communication, education and awareness, risk assessment, ballast water management measures, compliance, enforcement and monitoring, regional cooperation and replication and resources and financing.[413] The timeline for this project was four years that started in March 2000 until March 2004.[414] During this four years six pilot countries, representing a developing region, were chosen in which core activities of the project would be implemented.[415] Within each country a demonstration site was chosen where the activities would be carried out and would then be replicated at all major ports within the country.[416] The countries and demonstration sites chosen were Sepetiba (Brazil), Dalian (China), Mumbai (India), Khark Island (Iran), Odessa (Ukraine) and Saldanha Bay (South Africa).[417] One of these activities was to test a standardised method of ballast water risk assessment (BWRA) at each of the demonstration sites.[418] The project was executed by the IMO through a global Programme Coordination Unit that was based in London.[419]

We will be looking at one of the pilot countries, specifically one of the demonstration sites where this project was carried out, Saldanha Bay, South Africa.

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[411] 'The GloBallast Programme' published by the International Maritime Organisation available at *http://globallast.imo.org/index.asp?page=gef_interw_project.htm&menu=true* [accessed 17 January 2007].
[412] Ibid.
[413] Ibid.
[414] Ibid.
[415] Ibid.
[416] 'The Global Ballast Water Management Programme (GloBallast) in Africa' available at *http://www.botany.uwc.ac.za/pssa/articles/features/no53.htm* [accessed 17 January 2007].
[417] Ibid.
[418] Ibid.
[419] 'The GloBallast Programme' published by the International Maritime Organisation available at *http://globallast.imo.org/index.asp?page=gef_interw_project.htm&menu=true* [accessed 17 January 2007].

8.3 Case Study – Ballast Water Risk Assessment Saldanha Bay, South Africa

URS Australia Pty Ltd (URS) performed the Ballast Water Risk Assessment, which started in January 2002 and ended in March 2003, for Saldanha Bay under contract with the Programme Coordination Unit alongside with people from SA.[420]

Ballast Water Risk Assessments has three categories:

- '**Qualitative Risk Identification**: this is the simplest approach, and is based on subjective parameters drawn from previous experience, established principals and relationships and expert opinion, resulting in simple allocations of "low", "medium" and "high" risk. However, it is often the case that subjective assessments tend to overestimate low probability/high consequence events and underestimate higher probability/lower consequence events;
- **Semi-Quantitative Ranking of Risk**: this "middle" approach seeks to increase objectivity and minimise the need for subjective opinions by using quantitative data and ranking of proportional results wherever possible. The aim is to improve clarity of process and results, thereby avoiding the subjective risk perception issues that can arise in qualitative approaches;
- **Quantitative Risk Assessment**: this is the most comprehensive approach, which aims to achieve a full probabilistic analysis of the risk of BW introductions, including measures of confidence. It requires significant collation and analysis of physico-chemical, biological and voyage-specific data, including key lifecycle and tolerance data for every pre-designated species of risk, port environmental conditions, ship/voyage characteristics, the BW management measures applied, and input and evaluation of all uncertainties. The approach requires a high level of resourcing, computer networking and sophisticated techniques that are still being developed.'[421]

The semi-quantitative ranking of risk approach was chosen for Saldanha Bay because it is cost effective and reasonably simple to be widely applicable.[422]

The first thing that URS did was to collect and computerise all data from the IMO Ballast Water Reporting Forms to identify all ports where ships may load ballast

[420] Awad, A., Clarke, C., Greyling, L., Hilliard, R., Polglaze & Raaymakers, S. 2004. *Ballast Water Risk Assessment, Port of Saldanha Bay, Republic of South Africa, November 2003: Final Report.* GloBallast Monograph Series No. 13. IMO London. 6.
[421] Ibid at 2.
[422] Ibid.

water en route to Saldanha Bay.[423] They also used the forms to identify all the destination ports following Saldanha Bay where ballast water may be discharged.[424] Once they identified the source and destination ports a comparison was made between the different environmental conditions found at these ports.[425] This was done to establish whether the organisms present in the ballast water will survive, establish themselves and spread in their new environment.[426] This also helped in the identification of high-risk species that could be spread to and from Saldanha Bay.[427] High-risk species has been defined, for purposes of the BWRA, as 'any introduced, cryptogenic or native species that may pose a threat to marine ecological, social and/or commercial resources and values if successfully transferred to and from a Demonstration Site.'[428] URS developed an integrated database and a geographic information system (GIS) in which they recorded all the data mentioned above.[429] The data was then processed with other risk factors that included voyage duration and ballast tank size.[430] This gave a 'preliminary indication of the relative overall risk posed by each BW source port and which destination ports appeared most at risk from any BW uplifted at [Saldanha Bay].'[431] These indications are displayed on GIS port and world maps which then assists in the determination of management responses.[432] The results of these data inputs showed that 1315 ships entered Saldanha Bay Harbour of which 82 ships visited the oil terminal berth, 593 ships visited the iron ore export terminal and 607 ships visited the multi purpose terminal during the period in which the BWRA was conducted.[433] It showed that the total ballast water discharges at the oil terminal were 1,269,137 tonnes, 26, 802, 325 tonnes at the iron ore terminal and 1, 576, 292 at the multi purpose terminal.[434]

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[423] Awad, A., Clarke, C., Greyling, L., Hilliard, R., Polglaze & Raaymakers, S. 2004. *Ballast Water Risk Assessment, Port of Saldanha Bay, Republic of South Africa, November 2003: Final Report.* GloBallast Monograph Series No. 13. IMO London. 2.
[424] Ibid at vi.
[425] Ibid.
[426] Ibid.
[427] Ibid.
[428] Ibid at vii.
[429] Ibid.
[430] Ibid.
[431] Ibid.
[432] Ibid.
[433] Ibid.
[434] Ibid.

The results also showed that Saldanha Bay has 131 ballast water source ports of which Durban was identified as supplying the highest frequency of ballast water discharges to Saldanha Bay.[435] Following closely on its heels were Richards Bay, SA and then Rotterdam and Port Talbot, United Kingdom.[436] It was established that Rotterdam provided the largest volume of ballast water to Saldanha Bay followed by Port Talbot, Singapore and Immingham.[437]

The calculation of the relative overall risk showed that 19 of the 131 source ports posed the highest risk in terms of their ballast water source frequency, volume, environmental similarity and invasive species threat.[438] The invasive species threat 'posed by each source port varied according to the number of introduced and native species in its bioregion and the categorisation of these species as either unlikely, suspected or known harmful species.'[439] The high-risk source ports were identified as the Mediterranean, Piraeus in Greece, Taranto in Italy, Gijon in Spain, Brazilian ports and European ports.[440] These findings fitted with the origins of the invasive species already found in Saldanha Bay, European and Asian species, which indicates that the project is accurate and will most definitely be helpful if it should be implemented at other ports.[441] If the countries know which ballast water source ports poses the greatest threat to their coasts they can set up much more appropriate management procedures. The main objectives of the ballast water risk assessment for Saldanha Bay were successfully completed during the time frame given of year.[442] The project outputs included 'a trained in-country risk assessment team, an operational BWRA system and a User Guide for use as a demonstration tool in the region.'[443] This means that South Africa is enabled to establish further ballast water management activities and can also provide 'assistance, technical advice, guidance and encouragement to other African ports.'[444]

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[435] Awad, A., Clarke, C., Greyling, L., Hilliard, R., Polglaze & Raaymakers, S. 2004. *Ballast Water Risk Assessment, Port of Saldanha Bay, Republic of South Africa, November 2003: Final Report.* GloBallast Monograph Series No. 13. IMO London. viii.
[436] Ibid.
[437] Ibid.
[438] Ibid.
[439] Ibid.
[440] Ibid.
[441] Ibid.
[442] Ibid at xi.
[443] Ibid.
[444] Ibid.

9. Other Conventions dealing with Ballast Water

9.1 United Nations Convention on the Law of the Sea (UNCLOS)

UNCLOS requires Parties both generally and specifically to 'prevent marine pollution' and to 'control the intentional or accidental introduction of alien species.'[445] In terms of the general obligations Parties must take measures that are 'designed to minimize…pollution from vessels' in order to 'prevent, reduce and control pollution of the marine environment from any source.'[446] These measures should also 'protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened and endangered species and other forms of marine life.'[447] In addition Article 196(1) provides that:

- 'States shall take all measures necessary to prevent, reduce and control pollution of the marine environment resulting from the use of technologies under their jurisdiction or control, or the intentional or accidental introduction of species, alien or new, to a particular part of the marine environment, which may cause significant and harmful changes thereto.'[448]Article 211 states that all States should implement laws that prevent all vessels flying their flag from polluting the marine environment.[449] These states are also encouraged to set out, as a 'condition for entry for all foreign vessels into their ports/internal waters', requirements for the prevention or reduction of marine pollution or in other words, to prevent the introduction of bioinvaders via ballast water.[450]

9.2 Convention on Biological Diversity (CBD)

The CBD requires that Parties 'prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species'.[451] This is thus also directly relevant to the ballast water problem as it states that Parties should prevent the introduction of bioinvaders and currently the most common method of introduction is via ballast water.

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[445] Jan Glazewski, Emma Witbooi 'Final Report: Recommendations for the Implementation of International Ballast Water Guidelines into South African Law' (October 2001) *University of Cape Town, Institute of Marine and Environmental Law* at 14.
[446] Ibid.
[447] Ibid.
[448] Ibid.
[449] Ibid.
[450] Ibid.
[451] Ibid at 16.

Article 22(2) states that the 'provisions of the Convention are to be implemented…consistently with the rights and obligations of States under the law of the sea'.[452] This then means that all domestic laws, which States develop to implement the CBD, should be developed in line with the law of the sea.[453]

Part D: Solutions

10. Possible problems/difficulties with exchanging ballast water at sea

As mentioned before the method set out to minimize or avoid the introduction of invasive species via ballast water by the IMO and most of the countries above is the exchange of ballast water in the open ocean. In terms of the Ballast Water Convention ballast water can be exchanged at sea in one of two ways, the flow-through method or the sequential method. The question arises if this is truly a safe thing for ships to do even with the safety measures provided in the IMO Guidelines. Thus a study was undertaken to establish what the risks are when exchanging ballast water at sea using the sequential method in particular. The sequential method is when a ship empties and then refills its ballast tanks.[454] This means that almost the complete volume of ballast water has been exchanged which leads one to believe that this method is an effective way of prohibiting the introduction of invasive species.[455] However, the use of this method causes the pumping and piping systems of the ship to carry an extra workload.[456] Thus this method 'requires careful planning and monitoring by the ship's staff to mitigate the risks imposed on the ship in respect of longitudinal strength, dynamic loads, excessive trim, bottom forward slamming, propeller emergence, intact stability and bridge visibility.'[457]

In the course of the study, twenty-six ships were considered, which included single skin tankers, double skin tankers, double hull tankers, single side skin bulk carriers,

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[452] Jan Glazewski, Emma Witbooi 'Final Report: Recommendations for the Implementation of International Ballast Water Guidelines into South African Law' (October 2001) *University of Cape Town, Institute of Marine and Environmental Law* at 16.
[453] Ibid.
[454] 'An Investigation of Ballast Water Management Methods with Particular Emphasis on the Risks of the Sequential Method' available at *http://www.nmri.go.jp/main/cooperation/ujnr/24ujnr_paper_us/Environmental_Science_and_Engineering/ESE_Karaminas_Ocakli.pdf* [accessed 20 January 2007].
[455] Ibid.
[456] Ibid.
[457] Ibid.

container ships, liquefied natural gas carriers, self-discharging bulk carriers, oil-bulk-ore carriers and general cargo ships.[458] For purposes of the study all of these ships used the sequential method to exchange ballast water and both light and heavy ballast conditions were investigated.[459] The study was based on the consideration of the following criteria:

- 'Assigned permissible still water bending moments and still water shear forces. The calculations were carried out for full and empty tanks assuming that the hull girder is in good condition;
- As an indication of the ship's intact stability, the metacentric height corrected for free surfaces was checked against the ship's minimum metacentric height at 20 per cent;
- As an indication of the ship's bridge visibility, the view of the sea surface forward of the bow from the conning position was checked to be not more than two ship lengths or 500m whichever is the less…existing ships are expected to comply in respect of forward view and blind sectors in so far as is practicable without structural alteration being required;
- Minimum draught forward as indicated in the ship's plans and/or loading manual;
- Propeller immersions (top dead centre of propeller in still water).'[460]

The results of the study showed that the majority of the ships considered with the exception of container ships indicated an insufficient longitudinal strength and one of the self-discharging bulk carriers indicated an insufficient vertical bending strength.[461] All of the ships had sufficient metacentric height corrected for free surfaces while most of the ships had an insufficient view of the sea surface forward of the bow.[462] Most of the ships' propellers emerged that could cause a temporary reduction in manoeuvrability and slamming aft.[463] The results also showed that the following things should be avoided:

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[458] 'An Investigation of Ballast Water Management Methods with Particular Emphasis on the Risks of the Sequential Method' available at *http://www.nmri.go.jp/main/cooperation/ujnr/24ujnr_paper_us/Environmental_Science_and_Engineering/ESE_Karaminas_Ocakli.pdf* [accessed 20 January 2007].
[459] Ibid.
[460] Ibid.
[461] Ibid.
[462] Ibid.
[463] Ibid.

- 'Partial filling of ballast tanks;
- Partial filling of topside tanks in light ballast conditions; and
- Partial filling of ballast tanks of single skin oil tankers unless the tanks are designed for unrestricted filling levels for the ballast condition under consideration.'[464]

Thus it is clear that while the exchange of ballast water at sea, using the sequential method, certainly prohibits the introduction of invasive species it may compromise the safety of the ship.[465] Ships that are unable to conduct a ballast water exchange using the sequential method should make use of other available alternatives such as the flow-through method or ballast water treatment options.[466] The flow-through method could be used by bulk carriers in heavy and light ballast conditions and also by single skin tankers.[467]

11. Different treatment options for ballast water-an alternative solution to the ballast water problem

11.1 Heat Treatment

Various industries have used heat treatment for a number of years now to control biological contamination and in 1980 heat treatment technologies were developed to use against the zebra mussel.[468] This led to the testing of heat treatment applications to ballast water.[469] However, the Australian Quarantine and Inspection Service conducted a study on the effectiveness of heat treatment on dinoflagellate cysts in ballast water and found that the energy required to heat large volumes of ballast water would make the technology cost prohibitive.[470] Thus they looked at alternatives to direct heating of ballast water, which led to the consideration of boilers and heat exchanges to treat ballast water on intake only.[471]

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[464] 'An Investigation of Ballast Water Management Methods with Particular Emphasis on the Risks of the Sequential Method' available at *http://www.nmri.go.jp/main/cooperation/ujnr/24ujnr_paper_us/Environmental_Science_and_Engineering/ESE_Karaminas_Ocakli.pdf* [accessed 20 January 2007].
[465] Ibid.
[466] Ibid.
[467] Ibid.
[468] 'Heat Treatment Technology Description' available at *http://www.nemw.org/balsurv4_heat.htm* [accessed 22 January].
[469] Ibid.
[470] Ibid.
[471] Ibid.

11.1.1 Boilers

The factors that affect heat treatment effectiveness are 'exposure time, intake water temperature and target effectiveness temperature.'[472]

Thus various industrial boiler vendors were contacted to help evaluate the availability of this type of technology for ships and the boiler vendors reported that each ship would have to have a custom-built boiler system for ballast water treatment.[473] They reported that it would be technologically simple to design and off-the-shelf components configured to each ship would be used.[474] The way in which the boiler system works is that water is pumped into the boiler and is then raised to the desired temperature and discharged into the ballast tanks.[475] Boilers can use almost any source for energy that is available on the ship such as electricity, diesel fuel and bunker fuel oil.[476] The important thing is that the source of energy for the boiler has to be decided before the boiler is designed and built.[477] It is said that most of the large carrier ships uses bunker fuel oil to power their main plants and on these ships a burner designed to use bunker fuel oil would be installed along with fuel lines and exhaust manifolds.[478] However, before these things are installed it has to be determined whether the ship has the necessary fuel, space and operation requirements, particularly on existing ships.[479] The current fuel delivery systems will have to be rerouted to accommodate the boilers which means that appropriate shield fuel lines will have to be installed through vessel compartments that were not originally designed for this purpose.[480] On certain types of ships there is not enough space available below deck for the boilers which means that the boilers will have to be installed on deck wherever there is space available that will not cause unnecessary interference with other shipboard operations.[481]

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[472] 'Heat Treatment Technology Description' available at *http://www.nemw.org/balsurv4_heat.htm* [accessed 22 January].
[473] Ibid.
[474] Ibid.
[475] Ibid.
[476] Ibid.
[477] Ibid.
[478] Ibid.
[479] Ibid.
[480] Ibid.
[481] Ibid.

However, if the boiler is installed on deck it will have to sheltered from the elements of seawater and salt air to maintain operational status.[482] If it is placed in the engine room the boiler will not require as many modifications to treat ballast water.[483]
The performance of the boiler is based on its ability to raise the temperature of the ballast water to or above the thermal threshold of invasive species.[484] The thermal threshold is ' the point at which an organism is instantly killed due to either denaturing of cellular proteins or increasing the organism's metabolism beyond sustainable levels.'[485] The thermal threshold varies according to the organisms' ability to endure periods of high temperatures.[486] Certain organisms can tolerate temperature that are close to their thermal threshold for a short period with little or no damage caused and if the temperature is much cooler than their thermal threshold they will survive for longer periods.[487] Thus the ballast water temperature will have to be considerably higher than the thermal threshold of the organisms to ensure that they are eliminated.[488] If the ballast water is not heated until the thermal threshold is reached the exposure time of this cooler heat to the organisms will have to be increased to ensure effectivity and efficiency.[489] If the ballast water is heated to 65.5 degrees Celsius then filtration of ballast water will not be necessary.[490] Filtration may, however, still be helpful because it will 'reduce the amount of sediment and biological detritus that collects at the bottom of the boiler.[491] Thus if pre-treatment filtration is conducted it will considerably reduce boiler maintenance requirements (since sediment accumulations are lessened) and lengthen exposure periods of incoming ballast water.[492]
Boilers are stand-alone units and they do not require extraordinary supervision during operation and they are 'equipped with external pressure and temperature gauges that can be wired to a main control panel for monitoring.[493]

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[482] 'Heat Treatment Technology Description' available at *http://www.nemw.org/balsurv4_heat.htm* [accessed 22 January].
[483] Ibid.
[484] Ibid.
[485] Ibid.
[486] Ibid.
[487] Ibid.
[488] Ibid.
[489] Ibid.
[490] Ibid.
[491] Ibid.
[492] Ibid.
[493] Ibid.

The boilers can be maintained and repaired by the ships' engineers and does not require extensive extra training.[494]

There are few safety concerns that should be looked at such as the heating of large quantities of ballast water may create a hot-water hazard.[495] Hot-water hazard are usually created in the boiler room and if the boiler is installed elsewhere on the ship it might cause a hot-water hazard in a different area, which may then require special engineering considerations during the design and installation of the system.[496]

11.1.2 Heat Exchangers

Heat exchangers transfer heat between two liquids by circulating it through a stack of metal plates, which then lowers the temperature of the hot liquid and raises the temperature of the cold liquid.[497] The effectiveness of heat exchangers depends on 'the thermal gradient, which equates to the temperature and amount of heated liquid or steam that is circulated through the hot side of the exchanger, as well as the temperature and amount of cold liquid circulated through the other side.'[498] The installation of heat exchangers is not a problem because they are readily available from several manufacturers.[499] Like boilers heat exchangers do not have to be constantly monitored and special training is also not required.[500] Unlike with boilers the ballast water coming into heat exchangers must be filtered to prevent sediment and small debris from accumulating between the metal plates.[501] If the sediment and small debris is allowed to accumulate it will cause a decrease in the efficiency of the heat exchanger and it may even be damaged.[502]

Heat treatment gives rise to two environmental concerns, air pollution and thermal pollution.[503] Thermal pollution might occur if ballast water is heated on discharge instead of uptake.[504]

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[494] 'Heat Treatment Technology Description' available at *http://www.nemw.org/balsurv4_heat.htm* [accessed 22 January].
[495] Ibid.
[496] Ibid.
[497] Ibid.
[498] Ibid.
[499] Ibid.
[500] Ibid.
[501] Ibid.
[502] Ibid.
[503] Ibid.
[504] Ibid.

The ballast tanks might expand or contract because if the water is heated on discharge the tanks will not cool off quickly enough.[505] It may also cause localised effects on the environment such as heat stress to native flora and fauna.[506] It is said that 'the design and construction of an efficient system can reduce the concern of thermal pollution, as well as save energy, by using the heated water leaving the treatment boiler to preheat the water coming into the boiler.'[507]
Air pollution from boiler exhausts is especially a concern seeing that the treatment process will be conducted in a port that already, in most instances, has pre-existing air-quality problems.[508] However it is assumed that in most cases treatment boiler exhaust will be 'either routed to the main stack on board the ship or a separate stack will be constructed.'[509]

Thus one could say that heat treatment boiler and heat exchanger technology, despite a few small concerns, are well-established and extremely effective applications.[510]

11.2 Alfa Laval

Alfa Laval Marine and Diesel is the market leader in separation, heat transfer and freshwater generation and they have developed a new solution to the ballast water problem.[511] The system that they have developed has two stages, a pre-treatment stage and the patented Benrad advanced oxidation technology (AOT).[512] Benrad AOT uses a low 'amount of a special ultraviolet light wavelength in combination with catalysts to generate hydroxyl radicals, which effectively destroy the micro organism by breaking down the cell membrane.'[513] The Alfa Laval system works as follows: 'During deballasting, water passes through a pre-filter to remove any larger particles and organisms. The water then continues to the Benrad AOT unit, which produces free radicals that effectively break down any organisms, which have passed the filter.

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[505] 'Heat Treatment Technology Description' available at *http://www.nemw.org/balsurv4_heat.htm* [accessed 22 January].
[506] Ibid.
[507] Ibid.
[508] Ibid.
[509] Ibid.
[510] Ibid.
[511] 'Alfa Laval to meet the ballast water challenge' available at *http://www.walleniusmarine.com/doc_upload/Pressrelease_SMM2004EN_1101909561.pdf* [accessed 23 January 2007].
[512] Ibid.
[513] Ibid.

Sediment build-up in the ballasting tanks is avoided thanks to the pre-filter stage, and any back flushing water is returned to the ocean directly at the ballasting site.'[514] Studies were undertaken to establish the effectiveness of the system and the results showed that the system is 99 per cent effective.[515] The Alfa Laval system also has no environmental impacts because Benrad AOT breaks down the organisms without producing any lasting toxicity.[516] Thus the system is effective, reliable and it uses a very low amount of energy, which makes this a system worth trying out.[517]

11.3 Chlorine Dioxide

Various industries and municipalities have used chlorine dioxide to help control invasive species and almost all types of organisms for quite some time and thus far it has proved to be safe and economic to use.[518]

Chlorine dioxide can be defined as the following:

'[It is] a gas with strong oxidation properties and a high antimicrobial activity over a wide pH range. This gas does not occur in nature. It is used as an effective disinfectant in drinking water treatment facilities, in various applications of food and beverages industries, in bleaching of textiles, pulp and paper as well as in industrial cooling systems, waste water treatment facilities, in sterilizing manufacturing and laboratory equipment and in treating medical wastes.'[519]

Matson Navigation Company went into partnership with the California State Lands Commission and Ecochlor Inc. (Ecochlor) to test Ecochlor's chlorine dioxide ballast water treatment system.[520] The way this treatment system works is that a diluted solution of chlorine dioxide is injected into the ballast water piping as the ballast water is loaded.[521] The strength of the chlorine dioxide is determined by operational factors such as flow rate and target dosage and is automatically adjusted as required during the ballasting process.[522]

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[514] 'Alfa Laval to meet the ballast water challenge' available at *http://www.walleniusmarine.com/doc_upload/Pressrelease_SMM2004EN_1101909561.pdf* [accessed 23 January 2007].
[515] Ibid.
[516] Ibid.
[517] Ibid.
[518] 'Shipboard Demonstration of Ballast Water Treatment to Control Aquatic Invasive Species' available at *http://www.slc.ca.gov* [accessed 25 January 2007].
[519] Ibid.
[520] Ibid.
[521] Ibid.
[522] Ibid.

When the chlorine dioxide is injected into the ballast water it eliminates all the invasive species found in the ballast water while the water is entering the tanks and it will remain active for a period of time to neutralize any biofilm left in the ballast tanks.[523] After this period the chlorine dioxide will decay and no residual chlorine dioxide will be present in the ballast tanks at the time of discharge.[524]
This system was first tested in 2004 when Ecochlor installed it on the Atlantic Container Line's *Atlantic Compass*.[525] This preliminary testing 'allowed evaluation of sampling constraints, logistics and experimental design in addition to providing data on the efficiency of the biocide against natural communities under real shipping conditions.'[526] The results showed that the chlorine dioxide reduced bacteria abundance within the first 24 hours and it effectively eliminated bacterial and planktonic populations found in the ballast water.[527] At present the Ecochlor system and installations have been approved by two classification societies, Lloyd's Register and American Bureau of Shipping.[528] The system has been safely installed and operated on two commercial ships without interrupting the normal operation of the ship.[529] The results from the Atlantic Compass showed that the system has the ability to quickly control the bioinvaders found in ballast water.[530]

11.4 Filtration Systems and Hydrocyclones

Both these technologies involve the physical separation and removal of organisms from ballast water.[531] They can be installed on ships to treat ballast water as it is being loaded or they can be installed at onshore treatment facilities to treat the ballast water before it is discharged.[532] Filtration and hydrocyclones systems in combination with other processes such as biocide or thermal treatments are considered 'mature and effective technologies for the removal of a wide range of nonindigenous species.'[533]

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[523] Shipboard Demonstration of Ballast Water Treatment to Control Aquatic Invasive Species' available at *http://www.slc.ca.gov* [accessed 25 January 2007].
[524] Ibid.
[525] Ibid.
[526] Ibid.
[527] Ibid.
[528] Ibid.
[529] Ibid.
[530] Ibid.
[531] 'Ballast Water Treatment Methods: Fact Sheet 12' available at *http://www.pwsrcac.org* [accessed 25 January 2007].
[532] Ibid.
[533] Ibid.

Various ships such as crude oil tankers already have basic ballast water filtration systems on board to keep large organisms and debris out of the ballast tanks.[534] Thus the new filtration systems that are being designed are simply more sophisticated expansions, designed to filter out much smaller organisms, of the filtration systems already found on ships.[535]

Hydrocyclonic treatment, which is also known as centrifugal separation pushes organisms and sediments to the outer portion of the intake pipe.[536] These sediments and organisms are collected and then removed.[537]

Hydrocyclonic treatment is constantly being improved to provide large ballast water application.[538]

There are a few concerns with these treatment methods such as cost effectiveness and the time required for the treatment to work.[539] It is currently extremely expensive to install these new sophisticated filters on a ship and it will add to the responsibilities of the crew, such as the maintenance and operation of the filter.[540] Hydrocyclones are fairly easy to operate but they are not as effective as other ballast water treatment options.[541]

Thus filtration systems and hydrocyclones are probably very low on the list of ballast water treatment methods unless they can be made more cost effective and easier to operate.

Kinetrics has done just this. They have developed the Ever-Clear Filter system, which is effective, safe and easy maintain.[542] The system is designed to remove organisms and sediment from the ballast water and then to return it back to the source water, which means that the system is applied when ballast water is loaded.[543]

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[534] 'Ballast Water Treatment Methods: Fact Sheet 12' available at *http://www.pwsrcac.org* [accessed 25 January 2007].
[535] Ibid.
[536] Ibid.
[537] Ibid.
[538] Ibid.
[539] Ibid.
[540] Ibid.
[541] Ibid.
[542] 'The Ever-Clear Filtration System for Ballast Water Treatment' available at *http://www.kinetrics.com/en/TechProfiles/EverClearBallast.html* [accessed 25 January 2007].
[543] Ibid.

The system has '40 micron interchangeable stainless steel filter screens, a flow rate up to 30, 000 gpm, continuous or intermittent automated back-washing and self-adjusting internal leaning heads.'[544]

The system can be used as the 'primary filtration stage for ballast water treatment system', for the 'removal of algae, silt and sediments' and for the 'removal of zebra mussels from flowing water systems at power plant intakes.'[545]

The advantages of this system is that there are no interruptions during the filtration process, it has a very high flow rate, it reduces maintenance costs and it can easily be integrated with other technologies such as ultraviolet light or chemical treatments.[546]

11.5 Deoxygenation

Deoxygenation takes place when the oxygen is removed from a space with nitrogen gas.[547] Scientists from Sumitomo Heavy Industries of Japan have recently discovered that deoxygenation is an effective method to use to help reduce corrosion of ships.[548] It was then decided to test the effectiveness of deoxygenation to either prevent or reduce the introduction of invasive species via ballast water.[549] It was found that larvae of the 'Australian reef-building tubeworm (ficopomatus enigmaticus), the European green shore crab (Carcinus maenas), and the European zebra mussel (Dreissena polymorpha)' only survived a few days in the deoxygenated ballast tanks.[550] This means that the invasive species will not survive the journey because most often cargo ships are at sea for weeks and not days.[551] Unfortunately, there are some species like 'facultative anaerobic bacteria' that may survive in very low oxygen conditions, which makes deoxygenation ineffective.[552] This is the only disadvantage that deoxygenation has and the disadvantage is far outweighed by the advantages.[553] The advantages are that deoxygenation holds no threat to the safety of the crew, there

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[544] 'The Ever-Clear Filtration System for Ballast Water Treatment' available at *http://www.kinetrics.com/en/TechProfiles/EverClearBallast.html* [accessed 25 January 2007].
[545] Ibid.
[546] Ibid.
[547] 'Ballast Water Deoxygenation: A New Technique for Preventing Species Introductions that Should Make Everyone Happy' available at *http://montereybay.noaa.gov/reports/2001/eco/exotic.html* [accessed 27 January 2007].
[548] Ibid.
[549] Ibid.
[550] Ibid.
[551] Ibid.
[552] Ibid.
[553] Ibid.

are no negative effects on the environment when the deoxygenated water is discharged and deoxygenation is not only a cost effective method to use it is actually a cost saving method because it helps to reduce corrosion, in other words it kills two birds with one stone.[554] Although deoxygenation has so many more advantages than disadvantages it still very low on the list as a treatment of ballast water.[555] This is probably because the method does not entirely eliminate invasive species, which is after all, the main objective.[556] Despite this, it is still felt that deoxygenation should be studied more intensively and should be considered as a 'potential high priority treatment option because it 'represents a working solution that should appeal to both' environmentalists and the industry.[557]

11.6 Non Ballast Water Ships

The Shipbuilding Research Center of Japan (SRC) has found, 'the ultimate solution to the ballast water problem', by designing the new and innovative Non Ballast Water Ship.[558] This development prevents the introduction and spread of invasive species by taking away the need for ballast water, although the ship only has two very small 'redundant' ballast tanks for trimming and extreme sea passage.[559] Thus this new ship eliminates the need for expensive ballast water treatment systems and the need for ballast water exchange.[560]

This is truly the ultimate solution because it also takes away the need for ballast water regulations and guidelines, which means ships would not have the additional duty of keeping ballast water discharge and upload records or filling out countless forms when stopping at a port ergo no more delays at all. The crew would not have to be trained to perform ballast water treatment and no new crew for this specific purpose would have to be employed which means less money is spent by shipowners. No logbooks would be needed, no reception facilities because the problem would not exist at all.

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[554] 'Ballast Water Deoxygenation: A New Technique for Preventing Species Introductions that Should Make Everyone Happy' available at *http://montereybay.noaa.gov/reports/2001/eco/exotic.html* [accessed 27 January 2007].
[555] Ibid.
[556] Ibid.
[557] Ibid.
[558] 'The Ultimate Solution – Non Ballast Water Ships' available at *http://www.maritimejapan.com* [accessed 27 January 2007].
[559] Ibid.
[560] Ibid.

All of the above alternative solutions sound good and some have been proven to be extremely effective. In the end it is the decision of each individual ship which of the treatment options it wants to make use of, always taking into consideration the preferences of all ports it comes into contact with.

12. Reactions from shipping industry to new ballast water requirements, laws and regulations

The reaction from the shipping industry has thus far not at all been favourable to the new ballast water requirements, laws and regulations. One example I could find of an unfavourable reaction from the shipping industry was in Michigan, USA. The Michigan state law regarding ballast water came into effect on 1 January 2007 and it requires that all seagoing ships entering Michigan ports must have a permit and may not discharge untreated ballast water into Michigan coastal water.[561] In response to this 'four shipping companies, four shipping associations and one dock company', including Seaway Great Lakes Association and the US Great Lakes Shipping Association filed a lawsuit on Thursday, 15 March 2007 in the US District Court in Detroit.[562] They asked the judge to declare the Michigan Ballast Water Act unconstitutional because 'it interferes with interstate commerce'.[563] They argue that 'it casts too wide a net because only a tiny fraction of fewer than 100 ships that visit Michigan ports each year discharge their ballast water'.[564] The case is still going on.

Michigan state law not only requires ships to have a permit but a permit will only be issued if the ships 'adopt one of four mandated treatment technologies or prove that an alternative treatment method is as effective'.[565] This also brought a lot of consternation and it is said by Canada's largest shipping company that:

> 'Michigan's conclusion of the adequacy of these four systems is one that is unique in the world, as, to the best of our knowledge and belief, no ballast water treatment system has yet to be certified by any credible agency as

[561] 'Shipping interest say Michigan Ballast Water Act is Unconstitutional' published by Red Tape Blog available at *http://blog.lib.msu.edu/redtape* [accessed 20 March 2007].
[562] Ibid.
[563] Ibid.
[564] Ibid.
[565] 'Russ Harding: State could rule itself out of lake shipping trade' published by Lansing State Journal available at *http://www.lsj.com* [accessed 20 March 2007].

treating ballast water to the standards prescribed in the International Maritime Organisation Convention'.[566]

If ships are not able to fulfil the above requirements they may dock at another port, which means that the Michigan port will lose money and a lot of people may lose their jobs.[567] Companies and other entities may have to pay higher freight costs if they are to make use of a port outside of Michigan.[568]
As a result the shipping industry have asked that an extension of at least one year be given for the permit requirements 'to enable further testing of ballast water treatments and to allow international standards to be developed, which would enable companies to use the technologies at ports worldwide'.[569]

This is just the first of what will probably be the common reaction to the new ballast water laws and regulations. It will probably be better if most ballast water laws and regulations are enacted simultaneously to avoid confusion or situations where shippers say: 'But I did not have to this at the previous port!'.

Conclusion

This paper clearly shows that ballast water is still a very young concept and it is going to take some time and a lot more research on the subject before anyone will truly be comfortable with it. Perhaps it will be a good idea to start some ballast water awareness campaigns to ensure that everyone in fact knows what the problem is. If people know what the problem is and they understand it, then most generally, they will not put up as great a fuss about it.

As regards the solution to the problem it should be kept in mind that ballast water exchange in mid ocean is only an interim measure and treatment options are developed and refined every day that will provide an easier and more effective

[566] 'Russ Harding: State could rule itself out of lake shipping trade' published by Lansing State Journal available at *http://www.lsj.com* [accessed 20 March 2007].
[567] Ibid.
[568] Ibid.
[569] Ibid.

solution.[570] Ballast water exchange can, unfortunately, not be used indefinitely due to safety reasons as set out in the paper.

Ballast water laws and regulations should also not be too strict and rigid because it places an extra burden an on already overburdened shipping industry. The shipping industry already has so many forms and records and certificates that they must keep, thus it should be made as easy as possible for the shipping industry to comply with ballast water laws and regulations.

In the end, however, the shipping industry is going to have to accept these new laws whether it is easy or not, especially if the world unites on this matter. Either way, new laws have to be made and existing laws will have to be updated because the problem cannot go away by itself.

[570] 'Hazards to Shipping: Bugs, Slime, Smoke and Prosecutors' published by MarineLog available at *http://www.marinelo.com* [accessed 20 March 2007].

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