Chapter 14

Responsive Ocean Governance: The Problem of Invasive Species and Ships' Ballast Water – A Canadian Study

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14.1. Introduction

The problem of terrestrial and aquatic alien invasive species as an environmental concern came to the forefront of international law and policy and public awareness in conjunction with the adoption of the 1992 Convention on Biological Diversity[1] (CBD) and the United Nations Conference on Environment and Development (UNCED). However this has been present both as a "real world" phenomenon and concern for a significantly longer period.[2] As pointed out in a recent interdisciplinary publication focusing on invasive seaweeds,

> … the introduction of alien invasive species poses one of the most serious threats to both terrestrial and marine biodiversity. In fact, habitat loss, climate change, and alien invasive species are generally considered to top the list of biodiversity threats. Concern about invasions is not limited to biodiversity per se but extends to its broader socio-economic impacts on agriculture, forests, fisheries, aquaculture, and other human activities dependent on the stability of living resources in a particular

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[1] *Convention on Biological Diversity*, 31 *I.L.M.* 818 (1992), available: <http://www.cbd.int> (retrieved 4 December 2008) [hereinafter CBD]. In force December 1993. As at October 2008, 191 states are party. Canada ratified in December 1992.

[2] As recently pointed out by E. Mitropoulos, Secretary-General of the International Maritime Organization (IMO), "Scientists first recognized the signs of introduction of aquatic alien species after a mass occurrence of the Asian phytoplankton algae *Odontella* in the North Sea in 1903," Foreword, in M. H. Fonseca de Souza Rolim, *The International Law on Ballast Water. Preventing Biopollution* (Leiden/Boston: Martinus Nijhoff/Brill, 2008). Some authors suggest even earlier dates: see O. Endresen, H. Lee Behrens, S. Brynestad, A. B. Andersen, and R. Skjong, "Challenges in ballast water management," *Viewpoint,* in *Marine Pollution Bulletin* 48 (2004): 615, citing J. T. Carlton, *Introduced Species in US Coastal Waters: Environmental Impacts and Management Priorities* (Pew Oceans Commission, 2001).

> ecosystem. As a result, invasive species pose almost incalculable economic, socio-cultural and human health security risks. Estimates of the cost of responding to this problem around the globe vary widely. One estimate of the cost to the US economy is USD137 billion per year (Murray et al. 2004). Although concern about the issue of introduction of alien species was evident in the late 1970s, the scope of the problem only gained widespread attention of law and policy makers in the 1990s.[3]

The last comment is, however, qualified by the fact that, for the most part, concern about invasive species and biodiversity protection per se focused, at least initially, on the introduction of *terrestrial* species and, in particular, *intentional* introductions. The reason for this focus probably relates to the institutional location of the CBD (the United Nations Environment Programme (UNEP)), and the fact that, at a national level, regulations could build upon existing practice in connection with agricultural health practices and border control inspections (e.g., quarantine) that were already in existence in most countries in relation to the introduction of species diseases and pests.

More recently, extensive attention, at all levels of regulatory activity, has been paid to the problem of intentional and unintentional introductions of marine or aquatic species. *Intentional* introductions, such as import of species for aquariums or aquaculture, largely fall under the same regime as terrestrial border control practices involving permits and licenses, etc.[4] *Unintentional* introductions, primarily through ships operations, pose a different, and in many respects, a more complex problem. This problem is part of the overall concern for biosecurity and protection from what has been called "biopollution."[5] As discussed extensively in other studies,[6] an important unintentional vector or

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[3] M. Doelle, M. L. McConnell, and D. L. VanderZwaag "Invasive seaweeds: global and regional law and policy responses," *Botanica Marina* Vol. 50 (2007): 438–450, p. 438.

[4] To secure biosafety, transfer of organisms that have been modified by biotechnology (Living Modified Organisms – LMOs) are the subject of the Cartegna Protocol on Biosafety to the CBD. It entered into force in 2003.

[5] Rolim, see n. 2 above.

[6] M. L. McConnell, "Ballast & Biosecurity: The Legal, Economic and Safety Implications of the Developing International Regime to Prevent the Spread of Harmful Aquatic Organisms and Pathogens in Ships' Ballast Water," *Ocean Yearbook* 17 (Chicago: U. of Chicago Press: 2003), p. 213. See also M. L. McConnell, *Globallast Legislative Review – Final Report*, Globallast Monograph Series I (London: IMO, 2002), available: <http://globallast.imo.org> (retrieved 4 December 2008). See also Endresen et al., n. 2 above and references cited therein or more recently, S. McGee, R. Piorkowski, and G. Ruiz, "Analysis of recent vessel arrivals and ballast water discharge in Alaska: Towards assessing ship-mediated invasion risk," *Marine Pollution Bulletin* 52 (2006), p. 1634 and references cited therein.

path for the transfer of species between marine ecosystems is through ships' ballasting operations: organisms can "stow away"[7] in the water taken on board ships in one port as ballast when cargo is discharged. This water is then carried in ships' tanks and discharged in another port or ports, when cargo is picked up. The potential enormity of the problem is revealed when one considers that:

> Globally, it is estimated that about 10 billion tonnes of ballast water are transferred [between ports] each year. Each ship may carry from several hundred litres to more than 100,000 tons of ballast water, depending on the size and purpose of the ship.[8]

Thus the ordinary activities of shipping and transport, the foundation for international trade, are now also "vectors" or carriers of disease and harmful aquatic organisms. The problem is largely the result of increasingly seamless transport systems and larger ships moving more rapidly between ports on continuous routes. It is also, therefore, a by-product of the increased globalisation of trade. It means that shipowners now find themselves operators of vectors that form part of a transport corridor for species and organisms that may pose a danger to human and ecological security. Port and coastal authorities in this scenario are cast as either guardians or gaps in the biosecurity of the state. In both cases the reality of a world of biosecure ports is on the horizon.[9] Indeed, the Global Ballast Water Exchange Management Programme (GloBallast),[10] created by the Global Environment Facility, United Nations Development Programme, and the International Maritime Organization (IMO) in the spring of 2000, was established on the view that:

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[7] The imagery used in describing the problem is itself of interest, although not the subject of this chapter. For example the language has focused on the "foreignness" of the organisms as analogised to the human construct of citizen and immigration practices, e.g., "alien." Perhaps, more curious, the terms have also attributed a level of intentionality on the organisms involved in the process, e.g., "stowaways," "alien invaders," "hitchhikers," and "uninvited guests." Nature itself is cast as a hostile force, with ecosystems envisaged as essentially static and as constructed at the point of ratification of the CBD.

[8] International Maritime Organization (IMO), "Alien invaders–putting a stop to the ballast water hitchhikers," *Focus on IMO* (London: IMO, 1998), available: <http://www.imo.org> (retrieved 4 December 2008), p. 1 [hereafter IMO].

[9] M. Grey, "More muscle for port health," *Lloyd's List Maritime Asia* (May 2001), p. 10, comments on this point in the context of the foot-and-mouth disease restrictions. See also the recent Canadian approach, which cast the problem as one of protecting "ocean health"; see "Purpose of the Health of the Oceans Initiatives," available: <http://www.dfo-mpo.gc.ca/oceans/management-gestion/healthyoceans-santedesoceans/initiatives-eng.htm> (retrieved 4 December 2008).

[10] *The Problem*, GloBallast Programme Website (London: IMO, 2000 and ongoing), available: <http://globallast.imo.org/problem.htm> (retrieved 4 December 2008).

> The introduction of invasive marine species into new environments by ships' ballast water attached to ships' hulls and via other vectors has been identified as one of the four greatest threats to the world's oceans.[11]

The present chapter is concerned specifically with providing an overview of the Canadian regulatory response to the issue. The study begins by providing a brief description of various dimensions and characterisations of "the problem" and is followed by an outline of international regulatory responses. The Canadian response is set out in section 14.4 and followed by observations in section 14.5. This study suggests that Canada has shown leadership internationally in raising awareness of the problem generally, as well as working effectively on a bilateral/regional basis to address it with respect to specific species. Concrete efforts have been made in Canada to find a way to bring together diverse governance institutions and interests, under the theme "Health of the Oceans." This is despite the fact that Canada has not yet ratified the relevant international convention. However, more attention still needs to be paid to regulatory design. In particular, efforts need to be devoted to risk assessment and baseline studies and monitoring in connection with the shift from discharging in ports to discharging in coastal water and to address the issue of the coasting trade. In addition, efforts need to be made to also prevent the export of species. Despite these concerns it is suggested that the Canadian experience to date demonstrates that an approach which explicitly focuses on regulatory design concerns provides a more effective means of addressing the multiple dimension of problems that cut across sectors and institutional and legal frameworks.

14.2. The Nature of the Problem[12]

This section considers, first, the nature of the problem posed by species movement. It then considers the specific problem of transport in ships' ballast water.

[11] Id.
[12] The discussion in this section is drawn from McConnell, *Ocean Yearbook*, n. 6 above.

14.2.1. The Problem of Species Movement

There has always been some natural movement of species through the medium of water; however, the combination of distance, weather, differing water temperatures, and salinity and food sources in the various marine ecosystems of the southern and northern waters has limited the scope and range of natural migration. Human assisted species transfer does not easily fit the traditional paradigm of human activity resulting in pollution. In the last two decades, particularly since 1992, environmental law and international environmental institutions have embraced a systemic view of the interaction between human activity and the physical environment. This system or ecosystem is understood to be dynamic and is not easily subject to the more usual point-in-time evaluations of cause, effect, and singular responsibility. The significance of the environment in the maintenance of human health and economic security is now also part of national security agendas. This acceptance of these ideas is evidenced by the nearly universal ratification level (190 states and the European Community as of October 2008) of the CBD.[13]

Emphasis has shifted from a narrow focus on preventing pollution to a broader approach aimed at supporting and maintaining the existing ecosystem and its chain of interdependence as intrinsically valuable. This view clearly encompasses the question of human intervention in the ecosystem through activities such as transport systems that transfer species. Despite this conceptual shift found in modern multilateral environmental agreements (MEAs), questions of enforcement and compliance are rendered somewhat more difficult by the more traditional pollutant/substance orientation of many international and domestic regulatory regimes. As alluded to in the introduction, this shift to the concept of biodiversity also has broader implications for international and domestic governance. The divide between land-based marine pollution and environmental protection (UNEP) and ocean activities (e.g., United Nations Division for Ocean Affairs and Law of the Sea; IMO; Food and Agriculture Organization of the United Nations Agency (FAO), UNESCO (Intergovernmental Oceanographic Commission)) is narrowed and perhaps even closed. At a national level, the former is usually dealt with by an environmental ministry, while maritime transport, for example, is usually dealt with by maritime transport administrations.

Leaving aside the situation of disease-carrying microbes or toxic dinoflagellates, the question of whether species migration is a "natural" event and whether an organism is invasive or harmful in an absolute sense is difficult, largely because its introduction and "harmfulness" is contingent on various

[13] See CBD, n. 2 above.

factors. In many cases, a species may not be invasive or a pest in its home state, where it forms part of the ecosystem (which includes natural predators or other factors that limit its growth). However, it may become a pest in another welcoming host environment where there are no natural limits on its growth. In these cases, it may become a predator on indigenous species, or it may disrupt and even destroy the food chain or ecosystem to which it has emigrated. This can have a significant impact on indigenous species in the region, in particular, fisheries. The case of the American comb jellyfish that destroyed the entire anchovy fishery when it migrated to the Black Sea is infamous. That same species has now migrated, probably in ballast water, east to the Caspian Sea, endangering the seal and other species populations.[14] This is only one case out of many.[15] There are the obvious commercial consequences arising from the destruction of a marine capture fishery. In addition, this issue threatens coastal aquaculture species that are often more vulnerable. On a broader level, this poses a significant risk to the success of states working with international organisations such as FAO to encourage aquaculture/mariculture as a way to meet the escalating demand for protein and food security in the face of the loss of marine capture stocks as a result of environmental changes and overexploitation.[16]

Some aquatic organisms such as algae blooms or toxic dinoflagellates also pose a significant danger to human health when they enter the food chain. A summary published by the IMO regarding the Australian experience with "red tide" is a good illustration of challenges posed by the spread of some organisms:

> Toxic dinoflagellates are a type of algae known to cause paralytic shellfish poisoning in humans. Evidence suggested that the toxic dinoflagellate *Gymnodium catenatum* became established in Australian waters after arriving in ballast water – the species was already present in waters of Argentina, Japan, Mexico, Portugal, Spain, Venezuela and in Mediterranean sea ports … Dinoflagellates can reproduce simply by splitting in two, allowing multiplication wherever conditions are favourable. *Gymnodium catenateum* also has a type of reproduction in unfavourable conditions, which can result in a tough encased spore that

[14] A. Morgan, and D. Harrison, "Invading jellyfish crisis for Caspian seals," *Nature Watch*, *Sunday Telegraph* (London, 5 November 2000), p. 15.
[15] S. Gollasch, *Removal of Barriers to the Effective Implementation of Ballast Water Control and Management Measures in Developing Countries* (London: GEF/UNDP/IMO, 1997), available: <http://www.imo.org/imo/focus> (retrieved 4 December 2008).
[16] FAO, *The State of World Fisheries and Aquaculture 2000* (Rome: FAO, 2000), available: <http://fao.org/DOCREP/003> (retrieved 4 December 2008).

> can survive different conditions by staying dormant in sediment. These spores remain viable for 20–30 years, germinating in the usual swimming form when conditions are suitable, and entering the food cycle of shellfish causing the shellfish to become toxic to humans.[17]

The same study also notes that similar problems resulting from dinoflagellates introduced through ballast water have been experienced in other countries, including China and India.[18]

The fact that many species and pathogens can survive in adverse conditions and remain undetected in a new environment for a long period of time after the transfer means that both their detection and eradication is difficult, perhaps even impossible, as is the attribution of specific blame or liability. The problem is compounded in the case of pathogens. A related problem is that most countries have very little scientific knowledge about the range of organisms in their waters to determine whether they have a problem organism in their coastal water that they may be exporting or whether their systems will have a problem with a species that might be imported. This means that the determination of the current level of biodiversity is itself an inexact process.[19]

At the same time it must be understood that the majority of species will not adapt to new environments, particularly if there is a great variation in temperature or salinity or other conditions between ecosystems. However, unlike oil and other pollutants, once an invasive organism is introduced it is virtually impossible to remediate the environment. There have been some instances of physical removal or introduction of predators, but they are relatively few and may pose their own problems.[20] Accordingly most responses have focused on containment strategies.[21] Once a new species is introduced, the host ecosystem or environment is changed forever. This explains why

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[17] See IMO, n. 8 above.
[18] Id.
[19] Efforts have been underway now for several to encourage ports to conduct baseline port surveys. See S. Raaymakers, "Port Surveys Underway," *Ballast Water News* 4 (2001): 3–5; C. L. Hewitt, and R. B. Martin, *Revised Protocols for Baseline Port Surveys for Introduced Marine Species: Survey Design, Sampling Protocols and Specimen Handling*, Technical Report No. 22. Centre for Research on Introduced Marine Pests (Hobart, Australia: CSIRO, 2001), available: <http://www.marine.csiro.au/CRIMP> (retrieved 4 December 2008).
[20] F. McEnnulty, N. Bax, B. Schaffelke, and M. Campbell, *A Rapid Response Toolbox: Strategies for the Control of ABWMAC Listed Species and Related Taxa in Australia,* Centre for Research on Introduced Marine Pests (Hobart, Australia: CSIRO, posted draft August 2000), available: <http://www.marine.csiro/CRIMP/toolbox> (retrieved 4 December 2008).
[21] See *The Problem,* n. 10 above.

regulatory strategies should and indeed have focused on preventing the introduction of alien species and pathogens: there is no viable cure.

Although there is a great deal of recent interest in this problem, particularly in the last decade, it has a much longer history. Alien aquatic organism transfer has been dealt with in a number of international regulatory instruments since the 1970s. Although the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention) is not likely to come into force the near future,[22] the call to ratify it and bring it into force in order to establish obligations to address the issue is in fact a misunderstanding. International obligations regarding marine and other alien species transfer have existed since 1982. The development of a regulatory regime specific to the ballast water aspects of the pre-existing international obligations is simply a question of elaborating a respose to existing obligations.

14.2.2. Ships' Ballasting Operations and Species Movement

In simple terms, ballast and the process of ballast discharge and intake (ballast management) keeps ships balanced or stable and mitigates the stresses that the ocean's movements place on the ship's superstructure. Ballast is functionally critical to ships' safety, particularly when a ship is not fully laden. Ballast in this sense is simply a concept or a function rather than any particular substance. Various materials have been used as ballast through the centuries. However, since the development of steel-hulled ships in the 19th century, seawater has been used for reasons of economy and efficiency.[23] Modern ships are equipped with various types of ballast tanks located at strategic points, relative to the cargo or passenger spaces, in the ship's hull. Depending on the ship's structure, many ballast tanks have extensive internal piping or other formations that facilitate the build-up of sludge or sediment in which organisms can thrive.[24] Depending on the voyage conditions, whether it has any cargo on board and the

[22] The Convention will come into force on the ratification by 30 states whose combined merchant fleets constitute not less than thirty-five percent of the gross tonnage of the world's merchant shipping fleet. As of February 2009, 18 states have ratified, amounting to 15.36 percent of the world fleet: Albania, Antigua and Barbuda, Barbados, Egypt, France, Kenya, Kiribati, Liberia, Maldives, Mexico, Nigeria, Norway, Saint Kitts and Nevis, Sierra Leone, South Africa, Spain, Syrian Arab Republic, and Tuvalu.

[23] See IMO, n. 8 above.

[24] Tanks vary depending on ships' functions. Modern ships have segregated ballast tanks (SBT), i.e., tanks devoted only to the ballasting operation. Some older ships still operate with integrated systems, but these are being phased out.

size and function of the ship, e.g., bulk carrier, oil tanker, ferry, or fish factory, differing quantities of ballast water are taken on to maintain stability. It is a by-product of this core operational process, one that is intrinsically related to the operation of ships as carriers, that is causing the problem. Since the quantity of ballast required at any one time is directly related to the loading or unloading of cargo and the particular ship's stability requirements, the discharge or intake of ballast usually occurs either in or en route to and from port areas, or in sheltered waters close to the coastline of a country. The coastal and near coastal zones are replete with plant and animal organisms in various stages of their life cycles. They are also host to pathogens that may have entered port waters through municipal sewage outlets, discharge from other ships, or other land-based marine pollution sources. These organisms can live for long periods of time in the tanks. Estimates suggest they can survive up to three months or even longer in the water and sediment taken from coastal waters and pumped into the ballast tanks.

The microscopic size of many organisms and the point in their life cycles when they are taken on board also means that the ballast water filters currently in use are of limited utility. The extent of intake of organisms is exacerbated if the water is taken in very shallow or turbulent waters close to shore and at night, when many species move to the surface of the water. It is believed that at any one time "ballast water may be transporting 3000 species of animals and plants a day around the world."[25] With faster and larger ships going to more ports of call on each voyage the problems are magnified. While the operational activity causing the problem is reasonably simple to understand, given the key role of ballast in ships' operations and, ultimately, international trade, the solution is not equivalently simple.

The ballast water problem has come to international attention, particularly in the last two decades, as both ship speed and international trade have grown. This has been combined with the development of awareness of biodiversity maintenance as a core environmental and human security concern. However, concern about the transfer of species in ballast is not a new phenomenon. The problem, as it relates to transfer in ballast water, was documented as early as 1903 in the North Sea.[26] Regulatory controls of ballast discharge and dumping, not unlike those currently under discussion internationally, also existed well before the 20th century. Cohen and Foster comment on the experience in the United States as follows:

[25] See IMO, n. 8 above.
[26] Rolim, n. 2 above, and Gollasch, n. 15 above.

> Ballast dumping came under regulatory control during the 19th century, as harbor masters barred ships from dumping rock, sand, mud and miscellaneous debris carried as ballast into harbors and channels, to prevent shoaling. In many areas, ballast dumping was banned by statute, both to protect channel depths, and in some cases, to prevent the fouling of waters. "Ballast grounds" were set up where ballast could be legally disposed of, and professional "ballast haulers" and guilds of "ballast heavers" serviced the merchant shipping industry. Even on America's wild frontier, laws and regulations prohibited the dumping of ballast into harbors, although … ships on the California coast frequently violated them.[27]

Efforts are underway to develop and approve technology[28] to solve the problem of ships safety and ballasting operations. The most viable solution developed to date, aside from precautionary procedures to prevent or limit the initial intake of species in the water, is to exchange coastal ballast water for mid-ocean water that does not contain or support the coastal organisms. Open sea exchange does not totally eliminate the problem, but it can significantly reduce the risk of species transfer. However, mid-ocean or open sea exchange is anathema to most seafarers. It is seen as posing unacceptable safety risks to ships and seafarers' and passengers' lives, possibly in contravention of the annexes to the International Convention for the Safety of Life at Sea, 1974 and its Protocol of 1978 (SOLAS).[29]

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[27] A. Cohen and B. Foster, "The Regulation of Biological Pollution: Preventing Exotic Species Invasions from Ballast Water Discharged Into California Coastal Waters," *Golden Gate University Law Review* 30 (Spring 2000): 787, p. 787. NB: Citations in the original text have been omitted. Interestingly reference to ballast dumping is still found in modern legislation. For example, a recent proposal (2008) to update Canada's national fisheries law contained the following provision in connection with pollution prevention: "60. (1) No person shall (a) throw overboard ballast, stones or other substances that are detrimental to fish habitat in any waters frequented by fish." See Bill C-32: An Act Respecting the Sustainable Development of Canada's Seacoast and Inland Fisheries (the 39th Parliament ended on 7 September 2008 before the Bill was adopted), available: <http://www2.parl.gc.ca/HousePublications/Publication.aspx?Docid=3153379&file=4> (retrieved 4 December 2008).

[28] *International Convention for the Control and Management of Ships' Ballast Water and Sediment, 2004*. Circulars: BWM.2/Circ.113 October 2007, available <http://www.imo.org> (retrieved 4 December 2008). List of ballast water management systems that make use of Active Substances which received Basic and Final Approval.

[29] *International Convention for the Safety of Life at Sea* (SOLAS), 1974 (and its Protocol of 1978 (IMO, London)). See IMO, *Harmful Aquatic Organisms in Ballast Water. Alternative ballast water treatment method*. Submission by Japan. 15 February 2001. MEPC 46/INF.19 (London: IMO).

Although species carried in ballast water is the focus of this study, from the point of view of ecological security, commercial efficiency and effective regulatory design, it is important to be aware that organisms are transferred between countries in other ways related to ships' operations. These include attaching to the ship's hull (a process called fouling), sea chest, the anchor and other parts of a ship, as well as cargo, cargo packaging and loading equipment. Of these, arguably ballast water operations pose the largest problem. Concerns have been expressed about these other maritime transport related vectors in various fora, but so far there is no specific international regulatory development.[30]

14.3. The International Legal Response to the Problem of Aquatic Invasive Species and Harmful Organisms

International response to the problem aquatic invasive species and harmful organisms carried in ships' ballast water has occurred in various fora. This has led to conceptual complexity, problems of terminology and fragmented responses internationally and nationally. In part this relates to how the problem has been conceptualised and the related decisions on the appropriate institutional location for solving "the problem." However, it is one of the contemporary breed of cross cutting-issues that pose a challenge to existing international institutions and the related interaction at the national level. For example, it could be seen as purely a ship-source discharge problem and essentially addressed as a ship-source pollution issue. It could also be regarded

[30] Some states, such as Australia and New Zealand, also check for hull fouling. An electronic list serve posted a notice in early July 2001 of a proposed "Planning Meeting: Workshop on Ship Fouling and Biological Invasions in Aquatic Ecosystems" (notice on file). The workshop was proposed by a member of the US Navy, Naval Surface Warfare Centre, and a member of the US Coast Guard Environmental Standards Division. The proponents noted that:

> Historically, hull fouling has been the most important means by which shipping has transported non-indigenous species … impending limitations on the use of the most effective antifouling paint [organotin based] and on the conduct of hull cleanings, may result in increased fouling of ships and the subsequent transport of non-indigenous species.

The issue has also been raised in the meetings relating to the CBD. See, for example, SBSTTA/6/ paras 20–22, available: <http://www.cbd.int> (retrieved 4 December 208). More recently, see R. Herwig, "Vessel fouling research," and I. Davidson, "Vessel biofouling," (Powerpoint presentations to the Pacific Ballast Water Group, A Regional Coordination Project, Meeting, 4–5 December 2007), available: <http://www.psmfc.org/ballast/past-meetings/> (retrieved 4 December 2008).

as a health security problem, or as an environmental protection/biodiversity problem, or all of these.

Like many of these other cross-cutting issues, such as climate change, the particular conceptualisation adopted and institutional placement affects the design of a regulatory approach and ideas about the best way to address the problem. Should the focus be on preventing the "export" with the source country responsible for preventing the uptake and spread, or is it purely a carriage problem with efforts directed toward the carrier? Is it an import/border control problem with the focus on the receiving country to prevent the inadvertent introduction/import of species? Or is it all three? The obvious answer is that efforts should be made in connection with all three points of potential response and responsibility. However, from an international regulatory perspective, this poses a challenge for achieving a comprehensive and integrated response. Initiatives first at the international level and then at the national level have generated differing terminology and with it potential differences in the scope of coverage and approaches. For example, the range of terms adopted includes "alien species,"[31] "harmful aquatic organisms and pathogens,"[32] "aquatic invasive species (AIS),"[33] and "non-indigenous aquatic organisms and pathogens,"[34] to name but a few.

This section provides a brief overview of the international regime concerning aquatic invasive species and harmful organisms. There are two primary sources for the international obligation to prevent the transfer and spread of species. The first and earliest source, the 1982 United Nations Convention on the Law of the Sea Convention (LOS Convention),[35] with its

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[31] *United Nations Convention on the Law of the Sea*, 10 December 1982, 1833 *U.N.T.S.* 397 [hereinafter LOS Convention], Article 196.

[32] *International Convention for the Control and Management of Ships' Ballast Water and Sediments,* 2004, IMO BWM/CONF/36 16 February 2004 [hereinafter BWM Convention]. Article 1(8), Harmful Aquatic Organisms and Pathogens, means aquatic organisms or pathogens which, if introduced into the sea including estuaries, or into fresh water courses, may create hazards to the environment, human health, property or resources, impair biological diversity or interfere with other legitimate uses of such areas. *Ballast Water Control and Management Regulations*, Canada (SOR/2006-129), section 1, "'harmful aquatic organisms or pathogens' means aquatic organisms or pathogens that, if introduced into the sea, including estuaries, or into fresh water courses, could create hazards to human health, harm organisms, damage amenities, impair biological diversity or interfere with legitimate uses of the waters."

[33] The Canadian Action Plan to Address the Threat of Aquatic Invasive Species defined aquatic invasive species as "Fish, animal, and plant species that have been introduced into a new aquatic ecosystem and are having harmful consequences for the natural resources in the native aquatic ecosystem and/or the human use of the resource."

[34] Transport Canada, *A Guide to Canada's Ballast Water Control and Management Regulations* (TP 136117E 11/2007), p. 1.

[35] LOS Convention, n. 31 above.

careful delineation of flag, port and coastal state responsibilities and control over activities and actors, recognises a range of oceanic actors. Under this regime, matters relating to international standards for shipping as an ocean activity are primarily situated in the IMO, which has a well-developed regulatory model that it used for almost issues it has addressed. This model is focused on the ship and the flag state as the primary actors with port state inspections as the complementary mechanism for ensuring compliance on ships. Uniformity in approach among countries with the related minimisation of barriers to efficient and rapid movement of ships is an important value. In connection with this issue the IMO approach also involves some provisions relating to coastal state obligations to identify risky water and to warn ships regarding uptake[36] and an obligation to develop sediment reception facilities.[37]

The later source, the CBD, has grown up within in the MEA system of UNEP and affiliated institutions and actors. In the marine context, the CBD primarily addresses coastal state responsibility to prevent loss of biodiversity and to avoid transboundary harm. Concern and practices such as environmental impact assessments, precaution, and valuing ecosystem diversity are important values in the CBD.

The regimes that have evolved in connection with these two conventions are consistent with each other in terms of their objectives, however, there are significant differences in their institutional and management cultures and frameworks. Although this contribution is not focused on the issue of integration of global governance per se, it does form part of the regulatory context because the tension that results from the difference in these two regimes is played out at the level of domestic institutional and legal implementation.

14.3.1. The Law of the Sea[38]

The LOS Convention[39] was adopted in 1982, came into force in 1994 and, as of November 2008, is binding on 157 states.[40] The LOS Convention was one of the first attempts by the global community to provide a comprehensive regime for managing an international space. It also introduced an holistic framework for addressing environmental rights and responsibilities.[41] Article 196 of the

[36] BWM Convention, n. 32 above, Regulation C-2.
[37] Id., Article 5.
[38] The text in the section draws upon earlier studies, see McConnell, n. 6 above.
[39] BWM Convention, n. 32 above.
[40] See United Nations website at <http://www.un.org/depts//los> (retrieved 4 December 2008).
[41] J. Charney, "The Marine Environment and the 1982 Law of the Sea Convention," *The International Lawye*r 28 (Washington: American Bar Association Press, 1994): 879–901.

LOS Convention specifically addresses the problem of alien species and state obligations.

Article 196
Use of technologies or introduction of alien or new species

1. 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*.
2. This article does not affect the application of this Convention regarding the prevention, reduction and control of pollution of the marine environment. (emphasis added)

This provision places an obligation on all states to prevent the intentional and the unintentional transfer of species that may be harmful to another marine environment. One of the difficulties that has arisen in connection with Article 196 relates to the distinction seemingly being drawn in subsection 2 between marine pollution, defined in Article 1 (4) of the LOS Convention:

> 1. For the purposes of this Convention:
>
> …
>
> (4) "pollution of the marine environment" means the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities …

This definition of marine pollution, which does not clearly cover the situation of species transfer, has been adopted in many national laws. The negotiating history of Article 196 indicates that, in the course of developing this text, there were two distinct duties in mind: preventing pollution, and closer to the more recent biodiversity concept, maintaining the natural state of the marine environment.[42] Although it did not survive the final negotations, it is also

[42] M. Nordqvist, ed. in chief, *United Nations Convention on the Law of the Sea 1982. A Commentary,* Vol. IV (Dordrecht: Martinus Nijhoff, 1991), pp. 73–76.

interesting that one version of the text imposed a responsibility to restore affected environments to their pre-alien species transfer state.[43]

Another related question arises as to what actions states can, or are obliged, to take to prevent the risk of a transfer of invasive species and pathogens, both coming into and leaving their jurisdictions. This question might itself comprise a paper. The LOS Convention does not specifically address this question, however, it is clear that a state has a sovereign right to determine the basis of entry into its internal waters (i.e., most ports), subject to the customary practice regarding situations where human lives are in danger.[44] The coastal state can also pass laws governing the innocent passage (defined in Article 19) of foreign ships through its territorial sea (out to 12 nautical miles) in order to, *inter alia*, preserve the environment of the coastal state (Article 22 (1)(f)), conserve living resources and prevent the infringement of fisheries regulations (Article 22(1)(d) & (e)), and prevent infringement of sanitary laws and regulations (Article 22(1)(h)). However, this legislative authority is subject to the important restriction in Article 21(2):

> Such laws and regulations shall not apply to the design, construction, manning or equipment of foreign ships unless they are giving effect to generally accepted international rules and standards.

Coastal/port state marine pollution prevention and enforcement rights and obligations are primarily set out in Part XII of the LOS Convention. These rights are very complex and depend on a range of factors[45] including restrictions – safeguards – placed upon the right to inspect and detain ships (e.g., Article 226). There is a clear duty under Article 194 on states to prevent, control and reduce marine pollution caused by activities under their control and to prevent damage to other states, including the duty to prevent pollution from ships by, *inter alia*, "… preventing intentional and unintentional discharges and regulating the design, construction, equipment, operation and manning of ships." Articles 194, 211 and 217 are the source of flag state responsibility for primary regulation of ships. The omission of the word operation from Article 21(2) appears to allow a coastal state to adopt national standards, subject perhaps to other agreements that may be been ratifed, in the territorial sea with

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[43] R. Platzöder, ed., *Third United Nations Conference on the Law of the Sea: Documents*, Vol. X (New York: Oceana Publications, 1986), p. 453.

[44] R. R. Churchill and A. V. Lowe, *The Law of the Sea* (Manchester: Juris Publishing, 1999), pp. 62–65, regarding the right to set conditions for access to the port as stated in *Nicaragua* [1986] ICJ Rep. 14, p. 111.

[45] For example, Articles 211, 217, 218 and 219 and 220, which all require a detailed consideration of the ship's location and standard of proof.

respect to ships' operations without offending the right to innocent passage, although any national legislation will be subject to the requirement of non-discrimination (Article 24; Article 227). In the absence of an internationally-binding standard, this point is relevant to coastal states' choices regarding the method adopted to prevent the transfer of species in ballast water (equipment based or operational procedures).

The LOS Convention regime recognises that "problems of ocean space are closely interrelated and need to be considered as a whole" (Preamble). It is based on a careful balancing of rights and claims and remains a key source of state responsibility for protection of the marine environment and its living resources. However, since 1982, the evolution of global comprehension of the relationship between human activities and the environment and the concept of sustainble development has taken the next step to an even more holistic or integrated approach based on an ecosystemic view. It means that, aside from questions of interpreting national legislation and coastal state and port state enforcement rights, the later and even more broadly supported 1992 CBD have, arguably, subsumed or at least significantly altered the understanding and implications of the LOS Convention marine pollution provisions.

14.3.2. The Convention on Biological Diversity[46]

The Convention on Biological Diversity[47] was adopted in 1992 at UNCED and came into force soon after, in late 1993. As noted earlier it has close to universal ratification.[48] The CBD also addresses state obligations regarding alien species. Article 8, In-Situ Conservation, of the CBD requires, *inter alia,* that:

> Each Contracting Party shall, as far as possible and as appropriate:
> (h) Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species;

These obligations apply not only to protecting biodiversity in the state's territory but also to the effects on biodiversity elsewhere. Article 4, Jurisdictional Scope, provides:

[46] The text in the section draws upon earlier studies, see McConnell, n. 6 above.
[47] CBD, n. 1 above.
[48] Id.

> Subject to the rights of other States, and except as otherwise expressly provided in this Convention, the provisions of this Convention apply, in relation to each Contracting Party:
> (b) In the case of processes and activities, *regardless of where their effects occur*, carried out under *its jurisdiction or control*, within the area of its national jurisdiction or *beyond the limits of national jurisdiction*. (emphasis added)

It is clear then, given the high level of ratification of both the LOS Convention and the CDB, that most states already have an international obligation to address the problem of alien species transfer, to the extent that it occurs within their jurisdiction or because of an activity under their control. This includes the role of flag states and the role of coastal/port states as "source" and"import" states. The CBD is clearly relevant to the question of a state's international responsibility to prevent *both* the export and the import of alien species and pathogens in ships' ballast water.

14.3.3. Ships' Ballast Water: The International Regulatory Response[49]

In addition to these two comprehensive conventions establishing general obligations regarding species transfer, efforts began as early as 1973, under the auspices of the IMO, to address the specific problem of species carried in ships' ballast water. These efforts, which largely follow the aproach taken by IMO Member States to dealing with ship source pollution, can also be understood as a step to implement the obligations in the LOS Convention. In 2004 these efforts, complemented by a programme for implementation, culminated in the adoption of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM).[50] The following briefly outlines the progress of the issue in the IMO.

In 1973, an International Conference on Marine Pollution organised by IMO passed Resolution 18, Research into the effect of discharge of ballast water containing bacteria of epidemic diseases.[51] However no specific international regulatory action was taken with respect to species transfer until the late 1980s and early 1990s when a number of states presented research and argued for international rules on this issue in IMO's Marine and Environmental Protection Committee (MEPC). Canada was one of the lead countries raising

[49] The text in the section draws upon earlier studies, see McConnell, n. 6 above.
[50] BWM Convention, n. 32 above.
[51] IMO, n. 8 above, p. 15.

this concern, largely as a result of the economic and other impacts of invasive species in waters shared with the United States.[52] In 1991, non-binding rules entitled Guidelines for Preventing the Introduction of Unwanted Organisms and Pathogens from Ships' Ballast Waters and Sediment Discharges, originally drafted by Canada and modified in a working group, were adopted by the MEPC.[53] These were further developed in light of more experience and adopted, in 1993, by the IMO General Assembly.[54] In 1994 a working group began to examine the possibility of legally binding regulations that also tried to address the ship safety issues. In 1997 the IMO General Assembly adopted Resolution A.868 (20)[55] that revised the earlier guidelines. One of the more significant features of the revision was the formal adoption of a risk minimisation and management approach to the problem, as reflected in the new title, Guidelines for the control and management of ships' ballast water to minimize the transfer of harmful aquatic organisms and pathogens.

The 1997 Guidelines differ from the more usual IMO regulatory strategy which emphasises flag state responsibility and control. The Guidelines apply to all ships and encourage adoption of uniform rather than unilateral state practices. However, they also state that,

> 11.2 Member States have the right to manage ballast water by national legislation. However, any ballast water discharge restrictions should be notified to the Organization.

The majority of the provisions in the Guidelines are directed either to port/coastal states or simply recommend that ships' have a Ballast Water Management Plan (BWMP) and keep a record of ballast water intake and discharge that can be reported to port authorities. Both port administrations and ships are to make use of a standardised Ballast Water Reporting Form. Governments are required to ensure training for ships' crews and masters to ensure proper implementation of the BWMP. The Guidelines also recommend that ships adopt precautionary approaches to try to prevent or reduce the risk of uptake or discharge of harmful organisms. Precautions include avoiding taking up ballast water at night; removing tank sediment regularly; avoiding uptake in

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[52] Canada and Australia were the first countries to pursue this issue at the international level as it relates to marine species transfer. In 1988, Canada presented a study, *The Presence and Implication of Foreign Organisms in Ship Ballast Water Discharged in the Great Lakes*, MEPC 26/4, IMO (4 July 1988).

[53] IMO, n. 8 above.

[54] IMO, Resolution A.774(18).

[55] IMO, Resolution A. 868(20), *Guidelines for the control and management of ships' ballast water to minimize the transfer of harmful aquatic organisms and pathogens* (1997).

very shallow water or where a propeller may stir up sediment and practice either open sea exchange, minimal or no release of ballast water; discharge into reception facilities; or making use of other treatment options. Under the Guidelines, ports are required to provide information to ships corresponding to the operational requirements. For example, a port state is required to inform ships about its ballast water management requirements, reception facilities, alternate discharge zones and other port contingency requirements. In addition, the port state is required to support ships' measures to avoid the intake of organisms and pathogens by providing information on

> … areas with outbreaks, infestations or known populations of harmful organisms and pathogens; areas with phytoplankton blooms (algal blooms, such as red tides); nearby sewage outfalls; nearby dredging operations; when a tidal stream is known to be the more turbid; and areas where tidal flushing is known to be poor.[56]

The Guidelines also recommend a risk minimisation approach that involves the port state taking into account factors that indicate that a ship's ballast water is low risk for species transfer. The two factors mentioned that can reduce the risk of an invasive species establishing in the coastal zone are disparate conditions between the place of ballast water intake and the port, and the age of the ballast water.[57] The Guidelines are important because they apportion responsibility for prevention to both ships' and the port/coastal state. Although the BWM Convention was subsequently adopted, it is not in force: the 1997 Guidelines, therefore, remain the existing applicable but non-binding instrument.

The BWM Convention, adopted by the IMO in 2004, reflects an approach based on the more traditional IMO regulatory strategy with its focus on the flag state management/certification rules, with less emphasis on port/coastal state export prevention responsibilities. Its Preamble refers to the LOS Convention

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[56] Id., Article 8.2.2.

[57] An example of this approach, called the Australian Ballast Water Decision Support System (DSS), is a key feature of the Australian regulations which became fully mandatory in July 2001. *New Ballast Water Management Arrangements for International Shipping Visiting Australia*, submitted by Australia, 16 February 2001, MEPC 46/3/5 (London: IMO, 2001). Det Norske Veritas (DNV) in cooperation with the EU Concerted Action Group on Ballast Water has also developed an on-line risk assessment tool called EMBLA that uses biogeographical data as a predictor of high risk journeys and high risk ships. Det Norske Veritas (DNV), *The EMBLA Methodology* (Norway: DNV, 1999), available: <http://www.dnv.at/branche/maritime/publicationsanddownloads/publications/maritime_news/2000/No_4_2000/RiskbasedBallastWaterManagement.asp> (retrieved 4 December 2008) [hereafter DNV].

and the CBD regimes, public health, the need for a precautionary approach, and notes concerns about unilateral action and the need for globally applicable regulations and guidelines for effective implementation and uniform interpretation. This Preamble firmly connects the issue and the Convention to the UNEP/World Health Organization biosecurity/state responsibility agenda and the UN Office for Ocean Affairs (LOS Convention Secretariat), as well as the more traditional IMO concerns about ship safety, security and uniformity of national regulation. At a macro-system level, this reflects the increasing integration and, perhaps, even overlapping oceanic interests of the various UN agencies.

The BWM Convention follows the structure and regulatory strategy used in IMO's other major ship-source marine pollution prevention instrument (MARPOL73/78) dealing with oil, chemicals, harmful substances in packaged forms, sewage, garbage and air emissions.[58] In fact, much of the text is based on MARPOL, Annex 1, Regulation from Prevention of Pollution by Oil, which regulates operational discharges of oil from ships. The Convention comprises a short agreement with articles setting out general rights and responsibilities of the states party followed by an annex with more detailed regulations that foresees the adoption of guidelines on specific technical issues. It affirms in Article 2 (3),

> Nothing in this Convention shall be interpreted as preventing a Party from taking individually or jointly, more stringent measures with respect to the prevention, reduction or elimination of the transfer of harmful aquatic organisms and pathogens through the control and management of ships' ballast water sediments consistent with international law.

Flag state control and responsibility is central to the Convention, which provides for certification and recognition of an International Ballast Water Management Certificate. Ships must also have a flag state approved BWMP and ballast water record book that is available for inspection in foreign ports. This requires an initial ship survey, monitoring, and regulatory control by the flag state (as delegated in many cases to a classification society), with port states monitoring to ensure ongoing ship compliance with the certificate requirements. There are "existing ship" and "new ship" requirements for tanks and other equipment design issues, with a schedule under negotiation for

[58] *International Convention for the Prevention of Pollution from Ships*, London, 2 November 1973, as amended by *Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships of 1973*, 17 February 1978, reprinted in *MARPOL 73/78 consolidated edition 1997* (London: IMO, 1997) [hereinafter MARPOL 73/78].

phasing out existing ships. As is the case with MARPOL73/78[59] it also requires efficient port state reception facilities for sediment disposal. The BWM Convention also provides for inspection and sampling but recognises potential commercial consequences by providing compensation for "undue delay."

Also similar to MARPOL's designated "special areas" formula found in, for example, MARPOL Annex 1 (Regulation 10),[60] the BWM Convention establishes generally applicable measures and standards with some ability to designate (based on internationally accepted criteria) areas in which more stringent ballast water discharge requirements may be imposed.[61]

The BWM Convention details technical standards and requirements for the control and management of ships' ballast water and sediments. Ships are to maintain the on board BWMP and record ballast water operations in the ships' ballast water record book. Ballast water exchange (discharge port/coastal water and up take of new water), if that is the management method used by the ship, is to be conducted at least 200 nautical miles from the nearest land and in water which is at least 200 metres in depth. In cases where the ship is unable to do this, the exchange can be conducted in areas at least 50 nautical miles from the nearest land and where the depth of the water is at least 200 metres. However, if the parameters of distance and depth cannot be met, the coastal/port state can designate, in consultation with adjacent states, areas where a ship could conduct the exchange.

The Convention also establishes standards for ballast water exchange, if that is the management method adopted, and ballast water performance standards if other measures are adopted beside ballast water exchange, i.e., concentration of viable organisms in the ballast water discharged. The latter has been one of the more complex issues with guidelines on the performance standards for the Convention only recently adopted.[62] In addition, states are to have sediment reception facilities.

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[59] Id.

[60] Id.

[61] See BWM Convention, n. 32 above, Regulation C-1. See also the discussion in *Advice Concerning Legal Aspects of the Draft International Convention for the Control and Management of Ships' Ballast Water and Sediments*, 16 February 2001, MEPC 46/3/4 (London: IMO, 2001).

[62] The following Guidelines have been adopted so far:
Guidelines for sediment reception facilities (G1) adopted by resolution MEPC.152(55);
Guidelines for ballast water management equivalent compliance (G3) adopted by resolution MEPC.123(53);
Guidelines for ballast water management and development of ballast water management plans (G4) adopted by resolution MEPC.127(53);
Guidelines for ballast water reception facilities (G5) adopted by resolution MEPC.153(55);
Guidelines for ballast water exchange (G6) adopted by resolution MEPC.124(53);

Since ballast water exchange can have serious repercussions for the safety of ships, the BWM Convention provides that a ship need not comply with these requirements if the ship's master reasonably decides that such exchange would threaten the safety or stability of the ship, its crew, or its passengers either due to adverse weather, ship design or stress, equipment failure, or any other extraordinary condition.[63] Article 13 of the Convention provides that parties with a common interest in protecting the environment, human health, property, and resources in a given geographical area, particularly those parties bordering enclosed and semi-enclosed seas, can establish regional agreements consistent with the Convention.[64]

This very brief overview of the BWM Convention illustrates the complexity of the regulatory challenges posed by this issue. There are also numerous aspects that are not addressed here, for example, the problem of coasting trade ships that may spread existing invasive species within

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Guidelines for risk assessment under regulation A-4 of the BWM convention (G7) adopted by resolution MEPC.162(56);
Guidelines for approval of ballast water management systems (G8) adopted by resolution MEPC.125(53);
Procedure for approval of ballast water management systems that make use of active substances (G9) adopted by resolution MEPC.126(53);
Guidelines for approval and oversight of prototype ballast water treatment technology programmes (G10) adopted by resolution MEPC.140(54);
Guidelines for ballast water exchange design and construction standards (G11) adopted by resolution MEPC.149(55);
Guidelines on design and construction to facilitate sediment control on ships (G12) adopted by resolution MEPC.150(55);
Guidelines for additional measures regarding ballast water management including emergency situations (G13) adopted by resolution MEPC.161(56);
Guidelines on designation of areas for ballast water exchange (G14) adopted by resolution MEPC.151(55);
Guidelines for ballast water exchange in the Antarctic treaty area adopted by resolution MEPC.163(56).

[63] BWM Convention, n. 32 above, Regulation B-4 (4).

[64] On 13 July 2007, IMO adopted *Guidelines for Ballast Water Exchange in the Antarctic Treaty Area* (IMO MEPC 56, 2007). These Guidelines provide international guidance on the implementation of Article 13 of the BWM Convention on how ballast water is to be managed in regions of extreme cold with fragile ecosystems. The Guidelines provide an interim measure for all ships entering the Antarctic Treaty area before the Convention comes into force. Ships with ballast tanks entering the Antarctic waters should prepare a ballast water management plan taking into account the problems of ballast water exchange in cold environments and under Antarctic conditions. In addition, the Guidelines recommend exchange well before entering the Antarctic area. Importantly, the Guidelines address specific concerns for ships sailing in both Arctic and Antarctic waters, proposing special measures with respect to sediment in ballast tanks (para. 9) and the discharge of ballast water from Antarctic waters into Arctic and sub-Arctic waters (para.7).

a jurisdiction or the emerging concern with respect to ships that do not have ballast on board (NOBOB).[65]

Although many coastal and port states have adopted national laws or regulations to implement the IMO resolutions and to protect their coastlines from this threat, the BWM Convention, which is primarily directed to flag states, is not yet in force. To date, the BWM Convention has been ratified by only 18 countries representing 15.36 per cent of the world gross tonnage.[66] It is unclear when or, perhaps even, whether the BWM will come into force. At present, then the binding preventative international obligations under the LOS Convention and the CBD are the applicable international regulatory regime. Until the the BWM Convention enters into force, Resolution A.868 (20) Guidelines remain the main international source for harmonising national practices. The problem of diverse national practices and the extent to which more stringent standards can be adopted, consistent with international law are, as yet, unresolved.

It is troubling that, despite some consideration in the MEPC working group for consistency in format between the BWM Convention and the then developing (and now in force) Anti-fouling Convention,[67]the former was not expanded to cover the other ways that ships carry organisms, such as on anchors and other equipment. The problem with the Anti-fouling Convention is that, whilst the decision to ban organotin-based anti-fouling paint is laudable and sensible, unless a substitute can be found that is equally effective, then the risk of alien species transfer will be increased due to increased ship fouling. The increased speed of trips may also mean that transfer by fouling will be increased. This means that regulators must also be prepared to inspect hull

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[65] The International Joint Commission (IJC) established between Canada and the United States in 1978 to address concerns with respect to the shared Great Lakes' waters areas reported:

> According to U.S. Coast Guard data, NOBOBs represent over 70 percent (74 percent in 1999, 72.1 percent in 2000 and 68.5 percent in 2001) of incoming ships to the Great Lakes–St. Lawrence River system. These NOBOB ships are fully loaded with cargo and as a result their ballast tanks contain minimal (generally less than 3 percent) residual untreated ballast water and sediment. Yet even these small residues can be contaminated with alien invasive species. Both a Transport Canada study and a more recent study presented at the 11th International Conference on Aquatic Invasive Species in 2002 reported finding live organisms in virtually all ships that reported as NOBOB. Clearly, current ballast water regulations are not sufficient to eliminate the risk these vessels pose.

International Joint Commission, *11th Biennial Report, on Great Lakes Water Quality*, Chapter 3 (2002), available: <http://www.ijc.org/php/publications/html/11br/english/report/index.html> (retrieved 4 December 2008).

[66] See n. 22 above.

[67] *International Convention on the Control of Harmful Anti-fouling Systems.* 18 December 2000, AFS/Conf/2, MEPC (London: IMO).

fouling as well as ballast water to ensure that there are no invasive species. The fact that other parts of the ship are not addressed in the ballast water regime has been noted in meetings related to the CBD and concern was expressed at the time about a piecemeal, gap-filling approach to dealing with related issues.[68]

14.4. The Canadian Regulatory Response

As pointed out in the 2005 Canadian Action Plan to Address the Threat of Aquatic Invasive Species:[69]

> Aquatic invasive species (AIS) have been entering Canadian waters for centuries but never as rapidly as today. Every decade, some 15 alien species establish themselves in our coastal or inland waters and, in the absence of their natural predators, the most aggressive of them spread rapidly. They can radically alter habitat, rendering it inhospitable for native species.
>
> Invading species have been implicated in both the vast reductions in, or outright extinction of, indigenous fish and the resulting devastation of local fisheries. Some invasives, such as the zebra mussel, do millions of dollars in damage annually to human infrastructure. In addition to damage to the environment, in total, invasive species cost billions of dollars every year due to lost revenue and the implementation of control measures. With more species poised to enter the country, these costs will only rise. Canada has 20 per cent of the world's fresh water and one of the longest coastlines, thereby placing it at high risk from AIS. As a result of insufficient awareness of the nature and size of the threat, there have been limited levels of compliance with practices and regulations designed to minimize the damage.
>
> World leaders officially recognized the threat posed by invasive species in 1992, with the adoption of the UN Convention on Biodiversity.

[68] See SBSTTA/6/, n. 30 above. See also *Invasive Alien Species, Options for Future Work*, SBSTTA VI/8 (20 December 2000), available: <http://www.cbd.int> (retrieved 4 December 2008).

[69] Fisheries and Oceans Canada, Canadian Council of Fisheries and Aquaculture Ministers, Aquatic Invasive Species Task Group, *A Canadian Action Plan to Address the Threat of Aquatic Invasive Species* (2005), available: <http://www.dfo-mpo.gc.ca/science/environmental-environnement/action_plan/action_plan_e.htm> (retrieved 4 December 2008).

> Canada responded in 1995 with the Canadian Biodiversity Strategy. In September 2001, federal, provincial and territorial ministers of forests, fisheries and aquaculture, endangered species and wildlife agreed to develop a Canadian plan to deal with the threat of invasive alien species. In 2002, they approved a blueprint for the plan. Also in 2002, the Canadian Council of Fisheries and Aquaculture Ministers created the Aquatic Invasive Species Task Group to develop an action plan to address the threat of aquatic invasive species.
>
> The most effective approach to dealing with the hundreds of species that are (or could become) established in Canada involves managing the pathways through which invasive species enter and spread through Canadian waters. For aquatic species, these pathways are shipping, recreational and commercial boating, the use of live bait, the aquarium/water garden trade, live food fish, unauthorized introductions and transfers, and canals and water diversions. This plan does not address authorized introductions such as aquaculture or fish stocking, as they are covered by the *National Code on Introductions and Transfers of Aquatic Organisms*.
>
> The shipping pathway is considered the largest single source of new aquatic invasive species. Ballast water that is taken on in foreign ports, for ship stability and safety at sea, is discharged in Canadian waters, along with undesirable "hitchhikers"—foreign species ranging from bacteria to larger organisms. While other pathways can also be a source of new species, they generally serve to spread species that have already established themselves in Canada and other parts of North America.

As discussed above in section 14.3.3, Canada has been active in raising international awareness and taking steps to address the problem of aquatic invasive species carried in ships' ballast water (or hull fouling) in the IMO since the 1980s. Despite this relatively lengthy history of interest, progress on developing legislation has been surprisingly slow with the *Ballast Water Control and Management Regulations*[70] adopted only in 2006. Canada has not ratified the BWM Convention, although it is clear that the Regulations have been designed with view to implementation of the BWM Convention if Canada does ratify.[71] There were, however, efforts and cooperative and research

[70] BWM Convention, n. 32 above, adopted pursuant to section 657.1 of the *Canada Shipping Act, 2001*.
[71] Transport Canada, n. 34 above.

activities underway well before the adoption of these Regulations, including adoption of national guidelines in 1989 and cooperative activity with the United States in connection with specific species in the St. Lawrence Seaway and Great Lakes, since the early 1950s. These were areas that had been colonised by two very invasive species, the zebra mussel and the sea lamprey, as well what is now estimated as,

> … over 150 other Aquatic Invasive Species (AIS)... [that are] believed to have been introduced initially via ballast water discharged from incoming foreign vessels, with secondary invasions and dissemination facilitated in many cases by carriage as hull-fouling organisms.[72]

A brief overview of the wider Canadian response to invasive species in general is offered here to provide information on the institutional framework that was developed to address the fact that a number of institutions have a role to play, given that Canada has ratified both the LOS Convention and the CBD and was instrumental in encouraging the IMO to adopt the resolutions to address the problem species transferred in ships' ballast water. This is followed by a review of the specific responses to species carried in ships' ballast water.

14.4.1. Invasive (Alien) Species in General

Canada is a federation with legislative jurisdiction (powers) under its constitution shared between the national (federal) level and the provincial level.[73] The federal parliament is assigned the power to make international commitments. However, in many areas it cannot implement these obligations without the agreement and, often, the adoption of legislation by the provincial legislature. Navigation and shipping is a subject that is allocated to the federal government. However, for more recent cross-cutting issues such as "environment," both the federal and provincial governments have established government agencies and adopted legislation. "Canada is a dualist jurisdiction

[72] Fisheries and Ocean Canada, Canadian Scientific Advice Secretariat, *Alternative Ballast Water Exchange Zones*, *30 November – 1 December 2004, Montreal PQ*, Proceedings Series 2004/042 (April 2005), pp. 1–2.

[73] Canada has 13 provinces and territories. The *Constitution Act, 1867,* section 91 and 92, contains a list of enumerated "heads " or subject matters of legislative concerns over which parliament (federal) and each legislature (provinces) have exclusive authority. Residual law-making power is left with the federal government (Parliament). See N. Craik and C. Forcese, *Public Law, Cases, Materials and Commentary* (Toronto: Emond Montgomery, 2006), p. 125.

… [which means that a] … treaty has no direct effect in domestic law until domestic legislation is passed to "transform" or "implement" it into Canadian law."[74] Canada ratified the CBD in 1992[75] and the LOS Convention in late 2003.[76]

As noted in the above excerpt from the Action Plan,[77] a Canadian Biodiversity Strategy was adopted in 1995. This was followed in 2001 and 2002 by efforts to coordinate responses by the various implicated departments of the federal government and a Canadian plan to deal with invasive species adopted in 2001. In 2004, An Invasive Alien Species Strategy for Canada[78] (IAS Strategy) was approved by federal, provincial, and territorial ministers responsible for wildlife, forests, fisheries and aquaculture, and endangered species.[79]

In 2004, the federal government also committed to addressing invasive species in general in cooperation with the United States through agencies such as the International Joint Commission.[80] In 2005, a trilateral Prosperity Agenda for North America agreed to by the political leaders of Canada, the United States, and Mexico called on the governments of all three countries to "[c]ombat the spread of invasive species in both coastal and fresh waters."[81]

The federal government's budget in 2005 provided CAD85 million over five years to support implementation of the IAS Strategy. The funding was to be divided between:[82]

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[74] Craik et al., id., p. 73.

[75] CBD, n. 2 above.

[76] 7 November 2003. See UN website at <http//www.un.org/depts/los> (retrieved 4 December 2008).

[77] Fisheries and Oceans Canada, n. 70 above.

[78] Environment Canada, "Invasive Alien Species Strategy for Canada," available: <http://www.ec.gc.ca/eee-ias/Default.asp?lang=En&n=98DB3ACF-1&> (retrieved 4 December 2008).

[79] Canadian Intergovernmental Conference Secretariat, "Backgrounder: Invasive Alien Species," available: <http://www.scics.gc.ca/cinfo05/830859006_e.html> (retrieved 4 December 2008).

[80] Environment Canada, "Canada's Response to the Recommendations in the Twelfth Biennial Report on Great Lakes Water Quality of the International Joint Commission," available: <http://www.on.ec.gc.ca/greatlakes/Links/Great_Lakes_Water_Quality_A…ment/Canadian_Response_to_12th_Biennial_Report-WSF09D81D4-1_En.htm> (retrieved 4 December 2008) [hereafter Canada's Response to 12th IJC].

[81] Security and Prosperity Partnership of North America, "Prosperity Agenda," available: <http://www.spp.gov/prosperity_agenda/index.asp?dName=prosperity_agenda> (retrieved 4 December 2008) [hereafter SPP].

[82] Fisheries and Oceans Canada, *News Release* (1 March 2005), available: <http://www.dfo-mpo.gc.ca/regions/central/media/news-presse/nr-ca-06-05_e.htm> (retrieved 4 December 2008). See also Canada's Response to 12th IJC, n. 80 above.

- Environment Canada
- Fisheries and Oceans Canada
- Natural Resources Canada
- Canadian Food Inspection Agency

Several other initiatives were also undertaken in connection with this Strategy.[83] For example, an inter-departmental "Leadership and Coordination Committee" oversees implementation of the IAS Strategy and addresses IAS issues of a horizontal nature.[84] The Ministers of Environment, Fisheries and Oceans, Agriculture, and Natural Resources play a leadership role with regard to implementing the IAS Strategy at the federal level.[85] National IAS working groups were also established to develop national action plans for aquatic species, terrestrial plants and plant pests.

In connection with aquatic invasive species (AIS) and national action plans, Fisheries and Oceans Canada (DFO) is the federal lead agency. It facilitated, through a task group, the development of the Canadian Action Plan to Address the Threat of Aquatic Invasive Species[86] (Action Plan for AIS). The Action Plan for AIS was approved at the ministers' joint meeting in October 2005,[87] along with other action plans for terrestrial species.

The Action Plan for AIS outlines a strategic management framework for addressing AIS and their pathways of introduction. It addresses "unauthorised" (unintentional) introductions of AIS from seven key "pathways" including shipping, recreational and commercial boating, and the live bait and aquarium trades, and, like the Strategy, prioritises prevention. The Action Plan "does not

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[83] The Invasive Alien Species Partnership Program (IASPP) (pursuant an interdepartmental MOU 2006–2010) is administered by Environment Canada in cooperation with the Canadian Food Inspection Agency and Fisheries and Oceans Canada. It provides funding of up to CAD50,000 per project to provinces, municipalities, educational institutions and non-government organisations, as well as to other groups, who are working in support of the goals of the National Strategy. The IASPP received CAD5 million over five years and to November 2007 had supported 76 projects totalling nearly CAD2.8 million. *Summary of Canada's response to the risk of invasive alien species* (November 2007), available: <http://www.cbd.int/doc/submissions/ias/ias-ca-2007-en.pdf> (retrieved 4 December 2008).

[84] *Summary of Canada's response*, id.

[85] Environment Canada, *An Alien Invasive Species Strategy* (Ottawa: Environment Canada, 2004) [hereinafter IAS Strategy], p. 20. In addition, an IAS web portal is also under development for use by the federal government departments concerned and is expected to be launched in early 2009.

[86] Fisheries and Oceans Canada, n. 69 above.

[87] It was previously approved by the Canadian Council of Fisheries and Aquaculture Ministers in 2004.

address international introductions such as aquaculture or fish stocking, as they are covered by the National Code on Introductions and Transfers of Aquatic Organisms."[88] Leadership for implementing the Action Plan for AIS is shared between the federal government and the provinces. At the federal level, the lead agencies are DFO and Environment Canada (IAS activities are coordinated by Environment Canada through a secretariat). In the federal budget of 2005, DFO was allocated CAD10 million over five years to assist with the implementation of the aquatic component of the national IAS Strategy.[89]

It is of interest to note that the issue of AIS issue is now addressed by DFO under the rubric "Health of Oceans Initiatives," [90] under the auspices of the 2005 Oceans Action Plan and the subsequent 2007 National Water Strategy, which were both adopted pursuant to the *Oceans Act*.[91] In turn these initiatives are intended to

> … protect fragile marine environments, counter pollution and strengthen preventive measures by:
>
> - strengthening pollution prevention at source (conservation of natural resources); increasing capacity to lessen the effects of pollution when and where it occurs; increasing protection of ecologically significant marine areas through the establishment of nine new marine protected areas (MPAs);
> - investing in science to better understand the oceans; and
> - co-operating more closely with domestic and international partners for more integrated oceans management[92]

DFO is the lead agency under for the overall initiative; however, other departments also have specific roles where they are to take a lead role. Relevant

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[88] IAS Strategy, n. 85 above, p. 2. See also, Action Plan on AIS, n. 69 above. The Code was developed by DFO and each province and territory. It sets out standards for assessing the risk from the introduction and transfer of new aquatic organisms between the various regions and jurisdictions. See Fisheries and Oceans Canada website at <http://www.dfo-mpo.gc.ca/science/aquaculture/code/prelim_e.htm> (retrieved 4 December 2008).

[89] Although the idea was not to address individual introduced species but instead address vector or pathways and prevent introductions, an additional CAD10 million over five years was specifically allocated for sea lamprey control. This specific programme was established in cooperation with the United States in 1955.

[90] This is in conjunction with the key enabling legislation for DFO, the *Oceans Act,* 1996, S.C. c. 31. Fisheries and Oceans Canada, "Health of the Oceans Initiatives – A Listing by Lead Department or Agency, available: <http://www.dfo-mpo.gc.ca/oceans/management-gestion/healthyoceans-santedesoceans/initiatives-eng.htm> (retrieved 4 December 2008).

[91] *Oceans Act*, id.

[92] Id.

to the issue of AIS in ships' ballast water, DFO has responsibility for "ecosystem science to provide support and advice on the health of the oceans, while Transport Canada (the national maritime administration) is the lead agency for adoption, implementation and enforcement of the Ballast Water Control Regulations."[93]

14.4.2. Control of Invasive Species in Ships' Ballast Water

The majority of the efforts mentioned above in connection with invasive species and ocean health are largely responding to the obligations under the CBD. However, it should be noted that well before these efforts, in 1989 and into the 1990s and early 2000 in parallel to the CBD-related activity, Canada had also adopted voluntary guidelines which influenced the adoption, in 1991, of the IMO resolution on ships' ballast water management.[94] These guidelines were developed under the auspices of the Canadian Coast Guard (an agency later transferred to Transport Canada and then to DFO). Despite this early history of concerns about this issue in Canada, there has been relatively less research activity or resources devoted to the issue until the last few years, at least in comparison with Australia or the United States.

In 1988, Canada presented a study to IMO entitled "The Presence and Implication of Foreign Organisms in Ship Ballast Water Discharged in the Great Lakes."[95] Canadian concern was triggered by the significant economic impact of the introduction and spread of a non-native mussel species (zebra mussel) in the St. Lawrence Seaway and Great Lakes as well as earlier action taken in connection with the sea lamprey. Parts of this water system are shared with the United States with the result that a cooperative approach was developed to deal effectively with the problem.[96] In 1988, the Shipping

[93] BWM Convention, n. 32 above.

[94] As noted in section 14.3.3, in 1973 the IMO Member States had adopted a resolution in connection with spread of infectious diseases. The first resolution dealing with invasive species was drafted by Canada and/or Australia and adopted by the IMO in 1991, *Guidelines for Preventing the Introduction of Unwanted Organisms and Pathogens from Ships' Ballast Waters and Sediment Discharges*. See McConnell, Globallast, n. 7 above, p. 11, footnotes 34 and 35.

[95] Government of Canada, "The Presence and Implication of Foreign Organisms in Ship Ballast Water Discharged in the Great Lakes," MEPC 26/4 (4 July 1988).

[96] As early as 1954 a bilateral *Convention on Great Lakes Fisheries Between the United States and Canada* was adopted. This created the Great Lakes Fisheries Commission, which was set up to control the introduction and eradication of the non-native, highly invasive Atlantic sea lamprey that had spread in the waterways of both countries.

Federation of Canada, an industry association, was among the first to take action to encourage the development of a ballast water exchange regime to prevent the further spread of harmful aquatic organisms to the Great Lakes.[97] In 1989, the Voluntary Guidelines for the Control of Ballast Water Discharges from Ships Proceeding to the St. Lawrence River and Great Lakes were developed by the Canadian Coast Guard.[98] These Guidelines require that the ship's master file a Ballast Water Exchange Report on entering the St. Lawrence Seaway. The Guidelines also provided for a designated alternative discharge zone where deep water exchange was not possible for reasons of safety or the voyage route. The main concern was to ensure that the ballast water had high salinity—a fact that made it unlikely that species could survive in the water of the Great Lakes. In all cases, ship and seafarer safety was declared paramount.

The 1989 regionally specific Voluntary Guidelines were rescinded in September 2000 when they were replaced by the Canadian Ballast Water Management Guidelines, as amended to 8 June 2001.[99] These Guidelines were explicitly intended to implement the IMO Guidelines, with regional annexes setting out specific additional requirements. One of the main changes was that the Guidelines apply to "all vessels entering Canada's exclusive economic zone from seaward." The Guidelines were developed by the Canadian Marine

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[97] Shipping Federation of Canada, *Submission of the Shipping Federation of Canada to The Senate of Michigan Natural Resources and Environmental Affairs Committee In respect of Senate Bill No. 955*, Lansing, Michigan, 18 September 2000, available: <http://www.shipfed.ca> (retrieved 4 December 2008).

[98] The federal government was not the only level of government to take action. Transport Canada also, in part, regulates ports; however, as noted earlier, under the Canadian constitution, provincial governments have power over property rights. The Port Authorities of Vancouver, Nanaimo, and Fraser River (using a Harbour Master Standing Order) also issued supplemental requirements in 1998 requiring compliance with the Transport Canada Guidelines and mandatory ballast water management for vessels discharging more than 1,000 metric tonnes or from specified areas. These were included in Annex I of the Guidelines.

[99] Transport Canada, *Guidelines for the Control of Ballast Water from Ships in Waters Under Canadian Jurisdiction*, as amended to 8 June 2001, TP 13617 E, available: <http://www.tc.gov.ca/marine safety/directorate/tp/Tp131617> (retrieved 4 December 2008). The amendments mainly related to clarifying the Guidelines' application from the earlier version, which defined application on the basis of ships governed by the vessel traffic service (VTS) systems on each coast. That may have caused uncertainty in that the regional VTS applies on one coast (ECAREG) to vessels 500 gross tonnage and greater while on another coast, vessels 300 gross tonnes and more (NORDREG). Twenty-four hour notice prior to entry is required, including listing of relevant IMO international certificates. As of 1 October 2001, all ships 500 gross tonnes and above were required to seek clearance 96 hours before entering Canadian waters (consistent with US enhanced security requirements).

Advisory Council (CMAC),[100] a consultative body with a Secretariat in the Coordination and Consultation Directorate of Transport Canada. CMAC is jointly chaired and coordinated by Transport Canada (which deals with shipping) and the Canadian Coast Guard (which by then was relocated to DFO).

In 2001 it was believed that these Guidelines would become regulations in September 2002 as there was already legislative authority to adopt such regulations under the applicable *Canada Shipping Act* (a predecessor to the *Canada Shipping Act, 2001*[101]), a comprehensive national law that governs most aspects of shipping in Canada. However, regulations were not in fact adopted until 2006, perhaps to allow for consideration of the changes that would be needed to implement the BWM Convention which was under negotiation during that period.

The Guidelines also provided for alternative ballast exchange zones and one was designated, as noted earlier, in 1989 by the Canadian and US Coast Guards, located near the entry to the St. Lawrence Seaway. However, this site eventually became controversial as studies indicated that it may result in risk to fisheries and aquaculture in fisheries in nearby provinces. During the late 1990s and first few years of 2000, in conjunction with the heightened awareness of the problem of invasive species and the move to develop the BWM Convention in IMO, increasing interest and studies of ships' ballast water were undertaken in ports in Canada.[102]

Under the auspices of the CMAC, Transport Canada initiated both national and regional working groups on ballast water. The result of the consultations with industry players was that the original intention to regulate ships that enter the St. Lawrence River and Great Lakes water system, was expanded to apply to all ships in Canada.[103] DFO and academic researchers at

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[100] CMAC has both national and regional consultations, and includes representatives from parties (government, industry, environmental groups) with an interest in navigation, shipping and marine pollution.

[101] *Canada Shipping Act,* 2001, available: <http://www.tc.gc.ca/acts-regulations/GENERAL/c/csa/MENU.HTM> (retrieved 4 December 2008).

[102] See, for example, M. Balaban, *Vessel Traffic/Vessel Shipping Patterns on the East Coast of Canada 2002,* Transport Canada Marine Safety Technical Report 1-13 (Ottawa: Transport Canada, 2001). Balaban reported the views on studies undertaken for the Atlantic Regional Ballast Water Subcommittee. The studies, *inter alia*, examined the relationship between shipping patterns and testing for the presence of "aquatic non-native species." The report proposed a need to develop region-specific responses to address differing kind of ship and traffic patterns and differing ecosystems within Canada. The designation of a ballast water discharge zone in the region was seen as not based on reliable scientific data and posing a risk to interests in the region. The same concern was echoed in 2005 by the Canadian Science Advisory Secretariat (DFO), see Fisheries and Oceans Canada, n. 72 above, pp. 8 and 9.

[103] Balaban, id.

universities were also consulted, in particular on the recommended use of alternative ballast water exchange zones.

The *Ballast Water Control and Management Regulations*[104] (the "Regulations") under the *Canada Shipping Act, 2001* came into force on 28 June 2006. The Regulations were developed by Transport Canada and were based on the Guidelines. As noted above, they were also drafted with an eye to potential future ratification of the BWM Convention. Interestingly one of the main concerns cited was prevention of harm to existing fish species in the fisheries. (This in turn was linked to an estimate of potential economic consequence of inaction in connection with fisheries.) Accordingly, their terminology reflects the BWM Convention rather than the Action Plan on AIS terminology. For example, the Regulations arguably deal with much wider range of concerns then AIS in that they are concerned with "harmful aquatic organisms or pathogens"[105] (HAOP). The purpose of the Regulations is to prevent the introduction of HAOP in ships' ballast waters and sediments. Accordingly, the Regulations require all ships entering Canada (except from US Great Lakes' water and adjacent French waters) to "manage" their ballast water.[106]

The Regulatory Impact Analysis Statement published in the Canada Gazette when these draft Regulation were published for public review and comment[107] states that three alternatives were considered in preparing the Regulations:

1. Maintain the *status quo*
2. Incorporate the BWM Convention
3. Follow the US regulations

Maintenance of the *status quo* was seen as unsatisfactory because of Canada's obligations under the CBD. There was also some concern that voluntary compliance was insufficient to curb the risks posed by HAOP.[108] Incorporation of the BWM Convention prior to its entry into force was also deemed ineffective "in particular with respect to the fact that foreign administrations would be under no obligation to ensure that their ships meet the

[104] *Ballast Water Control and Management Regulations* [hereafter Regulations], SOR/2006/129.
[105] Id., s. 1.
[106] Id., s. 4(2).
[107] "Regulatory Impact Analysis Statement," *Canada Gazette,* Vol. 139, No. 24 (11 June 2005), available: <http://gazetteducanada.gc.ca/partI/2005/20050611/html/regle6-e.html> (retrieved 4 December 2008).
[108] Id.

requirements for certification, inspection and fitting of approved ballast water treatment systems."[109] The option of duplicating the US rules for ballast water management was rejected because they did not provide for alternative ballast water exchange areas (established in the Regulations) if the primary exchange area could not be used. In the United States, if the exchange cannot be made for safety or other reasons, the ship may discharge ballast water in port but only the amount "operationally necessary." In Canada, however, it was possible to identify alternative exchange areas, thus foreclosing the need for discharge in ports.[110]

Under the Regulations, ballast water can be managed by a combination of the following:

- Exchange
- Treatment
- Discharge into a reception facility
- Retention on board ship

The Regulations provide that ships coming into Canada from a transoceanic voyage must exchange ballast water before entering Canada in an area at least 200 nautical miles from shore where the water depth is at least 2,000 metres.[111] The Regulations provide for alternative exchange areas in each region of the country if the previous exchange is not possible because it would be impractical or compromise the safety of the voyage.[112] Alternate Ballast Water Discharge Zones (ABWDZ) have been designated for the Atlantic/East Coast, the Laurentian Channel, and in the north in Hudson's Bay and the High Arctic.[113] The Regulatory Impact Analysis Statement published in the Canada Gazette[114] explains how the ballast water exchange areas were identified:

> A preliminary scan conducted in support of the strategic environmental assessment (SEA) suggests that further consideration be given to the selection of areas where exchange is permitted. Thus, for the selection of these zones, Transport Canada sought scientific advice from DFO. In order to provide this advice, DFO used scientific criteria to select zones

[109] "Regulatory Impact Analysis Statement," n. 107 above.
[110] Id.
[111] Contrast with the BWM Convention, which only requires 200 metres in depth (Regulation B-4).
[112] Regulations, n. 104 above, s. 4(4)(e).
[113] Id., s. 6(4).
[114] "Regulatory Impact Analysis Statement," n. 107 above.

> where the environmental impact caused by ships releasing their ballast would be minimized. The zones were critically reviewed through DFO's peer review process. Transport Canada has implemented the advice provided by DFO in order to fulfill its requirement under the SEA process.[115]

It should, however, be noted that the DFO peer review process took the view that, given the risk of AIS introduction with ballast water exchanges, the preferred option was on-board or onshore treatment for management. It was pointed out:

> Ballast water exchange seeks to minimize ecological risk , not eliminate it. Any ballast water exchange option will carry a risk to the receiving ecosystem.[116]

The Regulations apply to every ship in waters under Canadian jurisdiction that is designed or constructed to carry ballast water (other than some specifically exempted categories of ships).[117] It applies to both Canadian flagged ships and foreign flag ships in Canadian waters and requires that ballast water be managed if taken on board outside waters under Canadian jurisdiction.[118] Ships in the coasting trade[119] and ships that do not carry ballast water (NOBOB ships) are not required to comply with the Regulations. Both of these are categories that raise concerns about the risk of spreading or introducing species.[120]

The Regulations essentially follow the recommendations under IMO Resolution A.868 (20) practice on record keeping and the requirement for onboard BWMP. Sections 8 and 9 of the Regulations provide for minimum ballast water exchange standards and ballast water treatment standards, respectively. If a ship cannot manage ballast in accordance with the Regulations due to exceptional circumstances, it must notify the Minister of Transport at least 96 hours (or as soon as possible) prior to entry into the territorial sea.[121]

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[115] Id.
[116] Fisheries and Oceans Canada, n. 72 above, pp. 4 and 5.
[117] Regulations, n. 104 above, ss.2 (1) and 2(2.)
[118] Id., s. 4 (2).
[119] Ships with only residual amounts of ballast water are expected, *inter alia*, to comply with the Shipping Federation of Canada's *Code of Best Practices for Ballast Water Management* <http://www.shipfed.ca> (retrieved 4 December 2008) or to carry out saltwater flushing.
[120] International Joint Commission, n. 65 above.
[121] Regulations, n. 104 above, s. 13(1) and (2). The Regulations provide criteria for the Minister's determination s. 13(4).

The decision as to measures to take is then up to the minister in consultation with the ship's master.[122] Marine safety inspectors enforce the regulations during normal periodic inspections.[123] The Canadian Marine Communication and Traffic Services Centre receives reports.[124]

According to Canada's November 2007 submission to the CBD on Canada's response to the risk of AIS:

> Joint Canadian and American inspections cover about 80% ocean going foreign ships before they enter the Great Lakes. For the 2006 shipping season, 94% of the ships inspected were in compliance with the Regulations. The remaining 6% of ships had to take corrective action, effectively providing 100% compliance of inspected ships. For 2007, non-compliance dropped to 3.5% for ships entering the Great Lakes. While the Great Lakes inspections cover all ships, for 2007, TC also selectively targeted higher risk ships destined for Quebec ports found a higher rate of non-compliance.[125]

In November 2007, Transport Canada announced that over the next five years, CAD4.5 million would be used to enforce the Regulations.[126] Specifically, the funding was to be used to:

- increase the number of marine inspectors enforcing ballast water regulations
- support the development of technologies to better deal with ballast water issues
- equip marine inspectors with the necessary tools to enforce ballast water regulations[127]

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[122] Id., s. 13(3).

[123] "Regulatory Impact Analysis Statement," n. 107 above. See also *Canada Shipping Act*, n. 101 above, s. 222(1) Inspection and Detention.

[124] Vancouver BWM Programme. As a result of the Regulations coming into force, the Vancouver Port Authority terminated its Ballast Water Management Programme as of 1 January 2007. See Pacific Gateway Portal website at <http://www.pacificgatewayportal.com/pgpsite/static/vpapages.asp> (retrieved 4 December 2008).

[125] *Summary of Canada's response*, n. 83 above.

[126] Transport Canada, "Canada's New Government Takes Action to Improve the Health of Our Oceans," *News Release* No. H 185/07 (October 2007), available: <http://www.tc.gc.ca/mediaroom/releases/nat/2007/07-h185e.htm> (retrieved 4 December 2008). This funding is part of a larger commitment of CAD60 million to the Health of the Oceans Initiative. See also, "Health of the Oceans Initiatives: DFO: Health of the Oceans Initiatives — A Listing by Lead Department or Agency," available: <http://www.dfo-mpo.gc.ca/oceans/management-gestion/healthyoceans-santedesoceans/initiatives-eng.htm> (retrieved 4 December 2008).

It should be noted, however, that these Regulations are primarily "border control" regulations that are essentially concerned with the import and introduction of HOAP/AIS into Canada and not with the *export* of species from Canada. The Regulations are jurisdictional and not ecosystem based in the sense that section 2(1) provides an exemption for ships operating exclusively in waters under Canadian jurisdiction or certain adjacent waters, thus allowing for the possibility of HOAP/AIS being spread within Canada by coasting trade ships. In addition, the designation of near costal ABWDZ may generate problems in the future with problems moved along the coast and out of the ports. The more complex and expensive aspects related to carrying out baseline and monitoring port water studies and setting up systems for warning regarding uptake and establishing reception facilities may be the next steps.

14.5. Observations

Elsewhere I have argued for a precautionary approach to regulatory design advocating an approach that is based on explicitly considering the impact of legal and institutional systems adopted to address emerging environmental protection and other issues.[128] Essentially the view advocated is that "design matters." Even the best of policies can fail or have unintended consequences if the legal and institutional implementation is not carefully designed. Too often the legal and institutional location components of responding to a problem are assumed as part of the infrastructure and receive little attention or resources. This approach is particularly relevant in connection with issues such as the introduction of harmful or invasive species or organisms and pathogens, where prevention must be the paramount concern since remediation is for the most part impossible and containment is very costly.

This Canadian study and the related EU study[129] point to some important patterns in the regulatory response, perhaps in common with other jurisdictions. First, the problem was identified and surfaced as an essentially sectoral "shipping" issue in connection with the IMO. However, as suggested in the studies, a response also along the lines of the IMO Resolution A.868 (20) requires a high level of institutional integration. Like Transport Canada, most

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[127] Id.

[128] McConnell, "Ballast & Biosecurity," n. 6 above.

[129] See Chapter 15, "Responsive Ocean Governance: The Problem of Invasive Species and Ships' Ballast Water: An EU Study" by Lotta Viikari in this book.

maritime administrations are not equipped with scientific staff to carry out risk assessments or baseline studies to determine the location of safe ballast water discharge or uptake zones. This necessarily requires coordination with other parts of the government. As a result of an explicit decision in Canada to adopt an integrated ocean governance/management approach as mandated by the *Oceans Act*, one agency, DFO, an agency with scientific expertise, was given overall responsibility for all "oceans issues." In addition, other agencies have overlapping responsibilities e.g., for environmental and biodiversity protection. This means that attention must be paid to establishing responsibilities and relationships between these actors.

Another important point in the Canadian story is that Canada had ratified the CBD at an early stage and, importantly, the CBD Secretariat is located in Canada. Not surprisingly, then, in the 1990s, the CBD-related agenda was an important concern for Canada and essentially drove the process for developing responses in general to invasive species. Under that approach, DFO became the agency responsible for AIS from the perspective of their potential impact, particularly in relation to the fisheries. However DFO does not have regulatory authority for the shipping sector. In addition Transport Canada has a long history and strong industry and stakeholder relationships with respect to the issue. The final result, whilst taking a long time to develop means that, at least on paper, there is some coherence to the approach whereby one agency addresses "Ocean Health" and, where appropriate, provides scientific advice on matters such as designating ABWDZ. However, it does not deal with regulation of ships.

In the Canadian context the designation of ABWDZ is a sensitive issue and it will probably be the case in many jurisdictions. In some cases areas designated are seen as too close to aquaculture and posing risks to those areas. On the other hand Canada exports a large quantity of agricultural products and natural resources and is very dependent on ship-borne trade. The question of whether it is acceptable to designate areas in the Arctic or other areas that are possibly considered as fragile ecosystems also poses significant problems.

The areas that still remain difficult to address are related to

- risk assessments
- preventing movement if species within the jurisdiction
- carrying out baselines studies
- establishing uptake warning systems
- establishing reception facilities.

The situation in Canada has benefitted in this respect from that fact that it has a lengthy experience in addressing the issue on a regional basis, as a result of its relationship with the United States in connection with shared waters and specific invasive species. The United States has had a long-standing concern about invasive species and has invested significant resources in scientific research as well as regulatory activity at the federal and state levels.

As discussed in the EU study, the situation in the EU has many of the same dynamics in that often there are competitor ports involved. At the same time, there is a need for a regional cooperation as well as need for scientific studies to establish baselines and warning systems. There are also similar concerns about the transfer of species and pathogens through the coasting trades.

Establishing an import related regulatory system appears reasonably straightforward (aside from dealing with the problem of the location and impact of ABWDZ) but the potential export of species and pathogens is less easy to address. In addition, problems related to ships and issues not regulated by the BWM Convention (even if not in force), e.g., NOBOB and hull fouling, also pose particular concerns. The final conclusion of this Canadian study is that when issues arise that cut across traditional regulatory allocations and require a multipronged legal and institutional approach, then it is essential that explicit attention be paid to regulatory design to ensure that the responses are, in fact, effective.