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The **GloBallast** Story: Reflections from a Global Family

**Partnerships to catalyze transformational
innovations in marine biosafety**

GloBallast Monograph Series No. 25



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FOREWORD

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Shipping is a great connector between continents, countries and cities—about 80 percent of international trade relies on shipping. However, global shipping is also a significant source of the spread of invasive alien species when ship's ballast water is not managed properly.

Invasive alien species often disrupt the local ecosystems, threaten local economies and livelihoods, cause diseases, and can even cause the loss of human life. Moreover, experience shows that once invasive alien species have been introduced and established, they are virtually impossible to eradicate. Preventing their arrival in the first place is the best strategy.

This was the fundamental rationale for GloBallast. For more than a decade – in partnership with IMO and UNDP – GloBallast has mobilized a broad coalition of more than 50 countries, shipping lines, port authorities and other stakeholders around a bold vision to eliminate ballast water as a key conduit for invasive alien species and a driver of global biodiversity loss.

The entry into force of the Ballast Water Management (BWM) Convention in September 2017 will be a crowning moment for our joint efforts. The BWM Convention provides a strong basis for the world to tackle this important problem, and it is also helping create the foundations for private sector investments in the global water ballast industry that may be worth US\$35 billion over the next decade.

Furthermore, the implementation of the Convention will directly support countries to address Aichi Biodiversity Targets towards addressing invasive alien species, their pathways to control them and curb the serious economic impact alien invasive species have in coastal countries.

The GEF recognizes the critical need for global action to support ocean governance to ensure the sustainability of the shared resources in our oceans. Since its establishment, the GEF has become a large financier of transboundary investments in the world's oceans with over US\$1.1 billion in grants, leveraging more than US\$7.7 billion in funding from other sources.

I am proud of the GEF's role as a key partner in the GloBallast programme. GloBallast is an excellent illustration on how crucial multi-stakeholder coalitions are providing long term solutions to protect our oceans and ultimately, our global commons.



Naoko Ishii
CEO & Chairperson
Global Environment
Facility

FOREWORD

Welcome to the final GloBallast monograph, *The GloBallast Story: Reflections from a Global Family*. As lead for the International Waters portfolio at UNDP/GEF, I have had the unique pleasure and privilege to be involved in GloBallast from its initial conception in 1998, to its completion in June of 2017, a nearly twenty year period. It has been a truly remarkable journey, supporting and witnessing two sequential relatively modest sized GEF-financed projects play a highly catalytic role in transforming one of the world's largest industries towards addressing one of the most significant threats to ocean sustainability.

You might wonder why UNDP, with its mandate related to the eradication of poverty and reduction of inequalities and exclusion, should be so interested in a highly technical issue like ships' ballast water as an invasive species vector. In supporting countries to reduce poverty and achieve sustainable development, UNDP helps countries to integrate environmental considerations into development plans and strategies, including through managing and sustainably using natural resources. We do this by helping countries to develop policies, leadership skills and stronger institutions to sustain development results.

These strategies dovetail very clearly to the objectives and approaches of GloBallast such as through its support to ballast water legal, policy and institutional reforms. We know that invasive species not only can impact large scale infrastructure vital to economic development (such as power plants), but also local communities, for example via invasives preying on or outcompeting important fish stocks that people depend upon for their livelihoods and food security. By helping countries and the shipping industry to reduce invasives risk, GloBallast has contributed to reducing poverty that can be caused or exacerbated by degraded marine ecosystems. This legacy will carry far into the future as industry compliance continues to reduce the overall risk of introductions and their impacts on people and economies.

Of the environmental challenges facing our oceans, such as overfishing, pollution and habitat loss, in many ways invasive species is the most pernicious. While it is possible to reduce overfishing and pollution, allowing marine ecosystems to recover, there are few if any successful examples of an established invasive aquatic being eradicated. This underscores the importance of the preventive approach built into the global convention on ship's ballast water and sediments, and GloBallast's overall strategic approach building national capacity for convention compliance and engaging both the shipping and ballast water treatment technology sectors.

Following receipt of the Finland ratification in summer 2016, the Convention achieved its required number of country and tonnage ratifications and will come into force in September 2017. Over the years, GloBallast has assisted many of the countries involved in the programme on ratification matters and clearly has played a catalytic role in advancing and achieving entry into force.

As GloBallast comes to an end, on both a personal and professional level, I want to take this opportunity to thank a number of UN and GEF colleagues, past and present, who have made key contributions to the many important impacts GloBallast has delivered over these almost twenty years. This includes IMO staff I worked with in the initial conceptualization of GloBallast like Henning Brathaug and Manfred Nauke, and Phil Reynolds at UNDP; the support we received from Al Duda, Andrea Merla and Peter Bjornsen at the GEF; the various heads of the IMO Marine Environment Division from Oleg Khalimonov, Jean-Claude Sainlos, Miguel Palomares and Jo Espinoza to Stefan Micallef. Each of the IMO Secretary Generals over this period – Bill O'Neill, Efthimios Metropoulos, Koji Sekimizu and Kitack Lim, have all provided their unequivocal support to the programme over the years, ensuring its continued success.

Lastly and perhaps most of all, I would like to thank and recognize the superb suite of Technical Advisors and programme staff the project has employed over the years – Dandu Pughiuc, Steve Raaymakers, Jose Matheickal, Fredrik Haag, Antoine Blonce, Aicha Cherif, John Alonso, Christine Gregory, Baharak Bashmani, Alexandra Puhl, Robert Macciochi, Canan Karadut, Bethel Worku and Mervin Nkole – whose tireless efforts enabled the GloBallast programme to deliver again and again and again.



Andrew Hudson

Head, Water & Ocean Governance Programme, Global Environmental Finance Unit, Sustainable Development Cluster, Bureau for Policy and Programme Support



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Resilient nations.



FOREWORD



Kitack Lim
IMO Secretary-General



This is a milestone year for marine biodiversity and the sustainable use of the oceans with the entry into force, on 8 September, of the International Ballast Water Management (BWM) Convention. This key treaty aims to reduce the transfer of potentially harmful aquatic organisms and pathogens through ships' ballast water.

2017 also sees the conclusion of the decade-long GEF-UNDP-IMO GloBallast Partnerships Programme. This project has played a key role in assisting beneficiary countries to reduce the risk of ballast water mediated bio-invasions and to prepare for implementation of the global landmark BWM treaty. The International Maritime Organization (IMO) executed the GloBallast Partnerships Programme in collaboration with the Global Environment Facility (GEF) and the United Nations Development Programme (UNDP). This is a successful example of "delivery as one".

The GloBallast Programme was launched in 2007 after an initial four-year phase. Since then, GloBallast has developed a successful three-pronged implementation model of working with lead partnering countries, regional coordinating organizations and global strategic partners. It has also worked with the shipping industry and academia to catalyse knowledge-sharing, training and capacity building.

Among the tangible achievements of GloBallast are: specialized training packages; regular Ballast Water Management R&D Fora, which catalysed the development of ballast water treatment technologies; the formation of task forces and the development of strategies and action plans on ballast water management, involving more than 100 countries at the national and regional levels; and a pioneering public-private sector partnership, the Global Industry Alliance for Marine Biosecurity (GIA), just to name a few. This is a fine example of how global partnerships, as promoted by the United Nations Sustainable Development Goal (SDG) 17, can effectively encourage technology development and transfer to find innovative solutions to protect the marine environment.

As the United Nations agency responsible for developing and adopting measures to improve the safety and security of international shipping and to prevent pollution from ships, IMO has an integral role in contributing to meet the targets set out in SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development. The story of GloBallast tells how IMO, alongside the GEF, UNDP, Governments, industry and other stakeholders, has worked to reduce the negative impact of aquatic invasive species on marine ecosystems from international shipping and has acted to further improve the environmental and socioeconomic sustainability of this industry.

As this 10-year Programme draws to an end, it is also time for me to thank all the stakeholders. I am proud of the role that IMO has played in delivering the Programme and I would also like to extend my appreciation to both the GEF and UNDP for their outstanding cooperation. The success of the Programme has also depended as much on the three organizations as it has on all the women and men who have shown continuous commitment to make GloBallast a success story. IMO looks forward to building on successful examples like GloBallast, as the Organization continues to champion collaboration to protect our oceans in the spirit of the SDGs, for the benefit of our future generations.

I hope you will enjoy reading this book, as much as I did, to learn about the GloBallast story, its achievements and legacy.



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CONTINUING
THE
TRANSFORMATIONAL
IMPACT

A large blue and red cargo ship is shown at sea. The ship has a prominent red stripe along its upper decks. A white circular graphic is overlaid on the ship's hull, containing the title text. The ship's hull number '314' and other markings are visible. A large plume of white water is being discharged from the side of the ship into the dark blue water.

THE TROUBLE WITH BALLAST WATER



Cases of species being introduced into new areas either intentionally or unintentionally, are thought to date as far back as the 13th Century when humans began to venture farther across the oceans to explore and learn more about their world. The likelihood of incidences increased, slowly at first then faster, tracking the growth in trade between nations and the accompanying rise in maritime activity, especially in the wake of the Industrial Revolution, which paved the way for today's globalised economy.

In 1903, a single-celled algae, known to scientists as *Odontella sinensis*, was found in the Skagerrak, a strait running between Denmark, Norway and Sweden. It was later discovered again in the North Sea and, in 1909, was recorded off Plymouth, England. Whilst it is not unusual to find such algae, or diatoms, in all oceans and seas, this particular species was known to prefer the warm, tropical waters of the Indo-Pacific region rather than the cold seas of the North.

And so it was that this marine organism, typically less than 25µm in size, also found its way into the history books as one of the first cases of an aquatic invasion. But how did this tropical algae travel halfway around the world? In the mid-20th Century it became clear that the ballast water carried by ships was to blame not only for this algae's voyage but for a host of other species too.

SHIPS AS PATHWAYS OF AQUATIC INVASIVE SPECIES

Ships are designed and built to move through water carrying both cargo and people. If the ship is travelling without cargo, or has discharged some cargo in one port and is en route to its next port of call, ballast is often taken on board to achieve the required safe operating conditions.

Seawater is most often the ballast of choice and is carried by ships, in segregated tanks, in order to manage stability, balance and draft. However, this routine operation for ships provides an opportunity for aquatic species to be transported to new locations which they would not usually be able to reach by natural means.

As much as 10 billion tonnes of ballast water is carried around the world per year, in turn carrying up to 7,000 thousand species of aquatic plants, microbes and animals every hour of every day. Whilst some species are not able to survive when discharged into environments different from that in which they originated, some of these travellers can find similar environmental conditions such as sea temperature or salinity and, in the absence of natural predators, can quickly establish themselves and multiply in number often having disastrous impacts on their new homes.

The increasing ease and frequency of shipping operations has exacerbated the problem by allowing ever more species to survive the voyage

and move across geographical boundaries. The quantity of goods carried at sea has increased continuously since the 1970s with the emergence of a more globalised economy. Today, some 80% of world commodities and cargo are transported by ship.

The introduction of aquatic invasive species to new marine and freshwater environments through ships' ballast water and sediments is considered to be one of the greatest threats to the world's freshwater, coastal and marine environments. The impact of aquatic invasions go beyond those which can be seen and which are well documented in scientific literature and include reduction in fisheries production due to competition or predation and impacts on aquaculture and coastal infrastructure. They can also place tourism industries in jeopardy (through physical fouling of beaches and severe odours from algal blooms), impact human health and, more importantly, compromise existing efforts to create sustainable livelihoods in coastal communities.

Moreover, unlike most other threats to the marine environment, aquatic invasive species are nearly impossible to eradicate, multiplying their impacts manyfold. The results of several global, regional and national studies confirm that the economic costs caused by aquatic invasive species are likely to be very significant (see *GloBallast Monograph 24*, 2017).

HOW INVASIVE SPECIES TRAVEL THROUGH SHIPS' BALLAST WATER AND SEDIMENTS



Ballast water is usually taken on at ports, within coastal waters or at sea.



As ballast water is drawn into a ship's ballast tanks, organisms living in that water are also taken on board.



This water therefore becomes 'biotic' as many marine organisms, their larvae and spores, can survive the long journeys taken by ships.



Many of these organisms are subsequently returned back to the sea when ballast water is discharged at the ship's destination.



As well as the water, any sediment which settles within ballast tanks and is later disposed of in shipyards and repair facilities during cleaning, can carry organisms.



Through this activity aquatic organisms (including fish, crustaceans, molluscs, and algae) are transported and released by ships into new environments where they are not indigenous.



Depending upon the environmental conditions into which they are discharged, organisms may not only survive but establish themselves and become dominant.



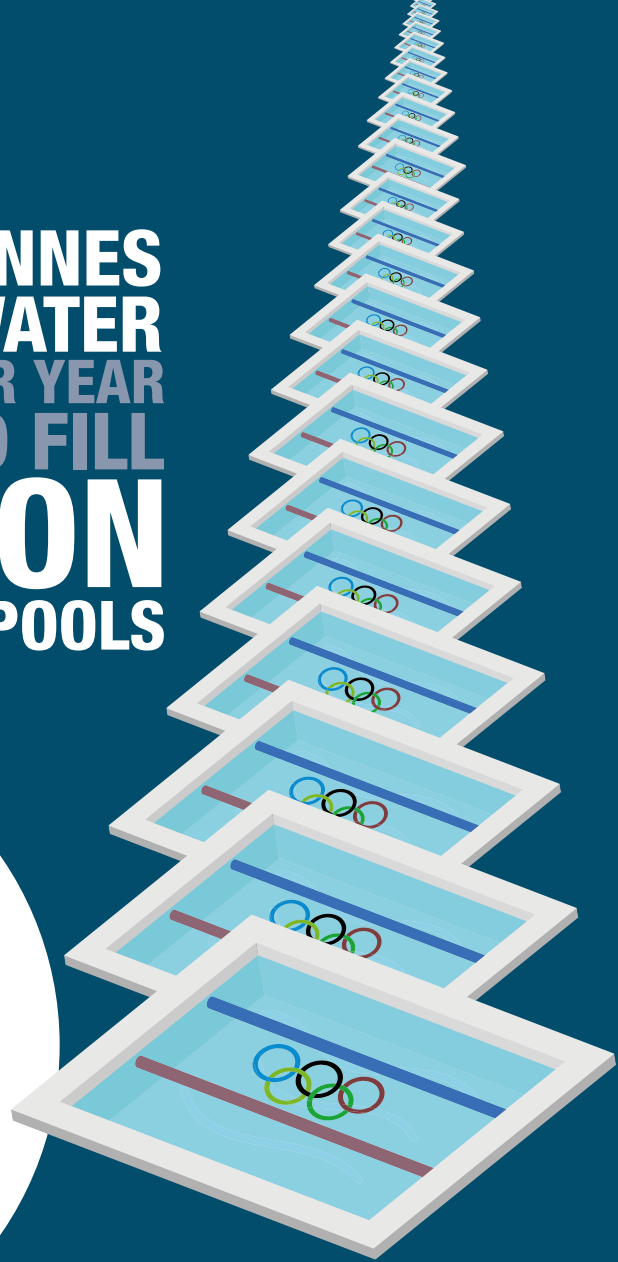
Aquatic invasive species are now globally recognised as one of the greatest threats to biodiversity. They have the potential to sufficiently affect ecosystems to the extent that serious economic, environmental and health implications occur.

BALLASTING PROCESS





10 BILLION TONNES
OF BALLAST WATER
TRANSPORTED PER YEAR
WHICH WOULD FILL
4 MILLION
OLYMPIC SIZED POOLS



1
NEW INVASION
EVERY
9
WEEKS

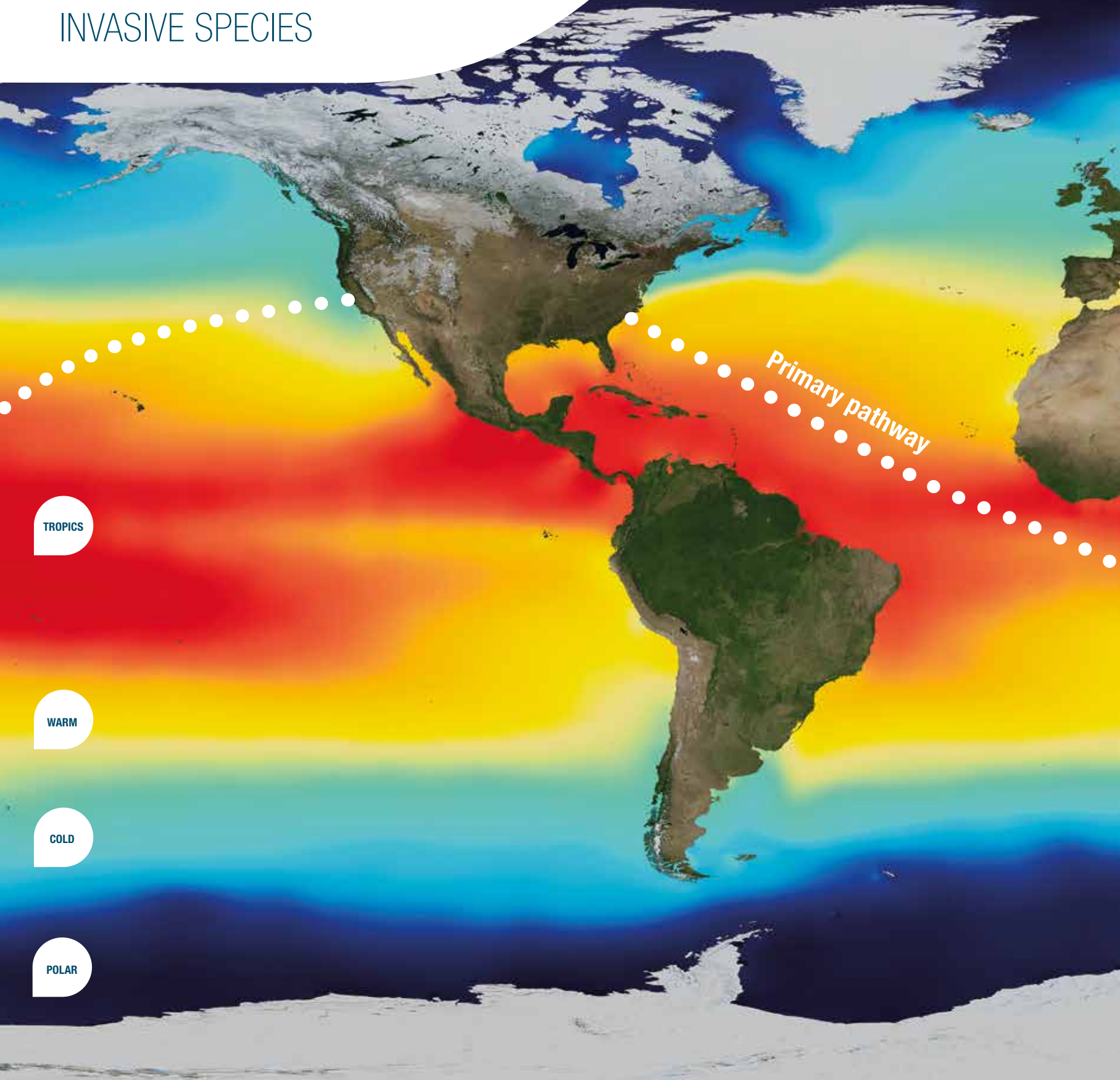
BALLAST
WATER IN
NUMBERS

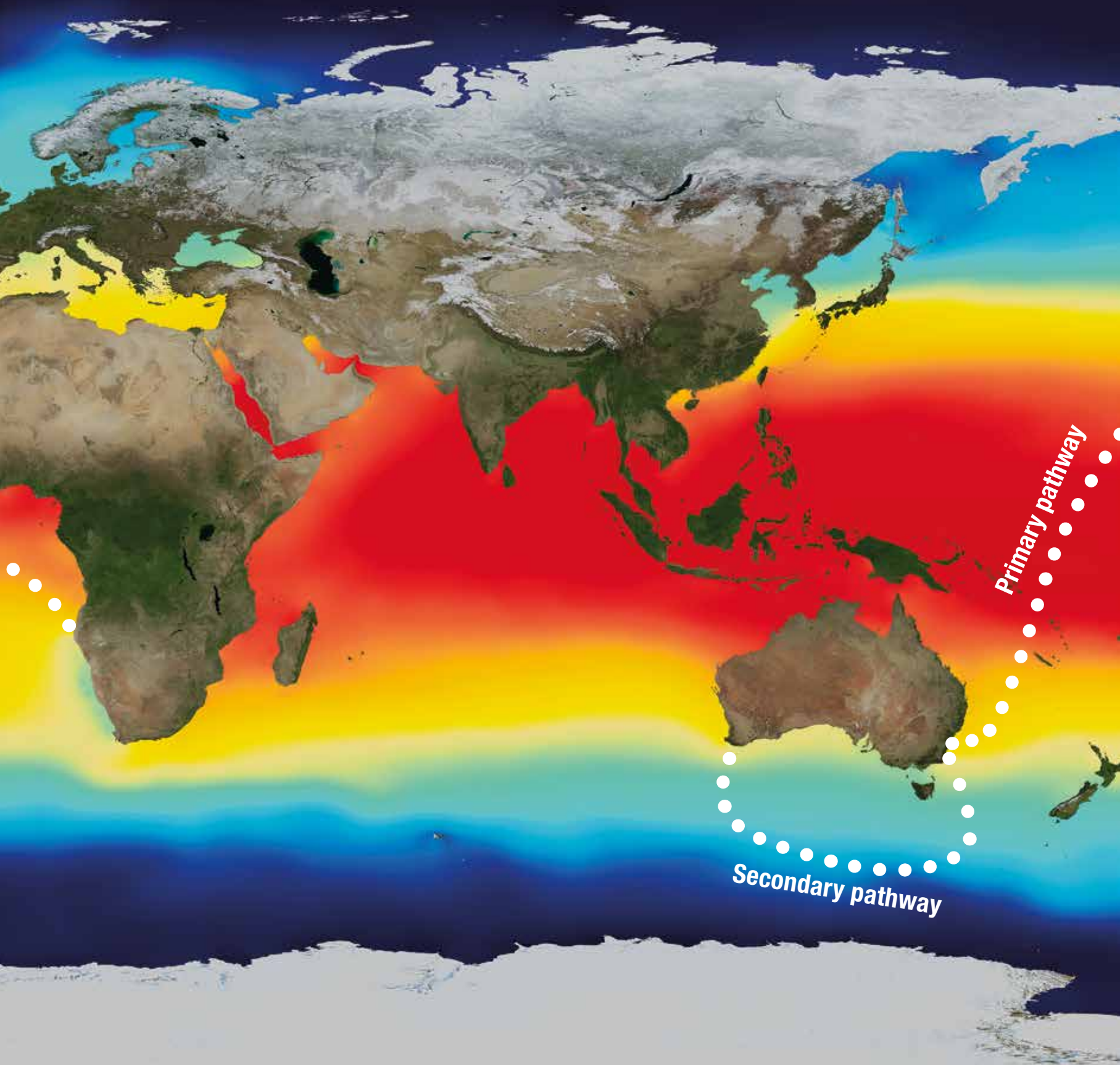
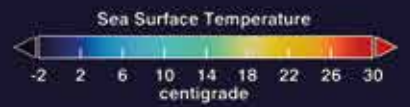


2.4 BILLION PEOPLE
LIVE WITHIN **100KM** OF THE COAST



SHIPPING FROM ONE TEMPERATURE REGIME TO A SIMILAR ONE CAN FACILITATE ADAPTATION OF INVASIVE SPECIES





Primary pathway

Secondary pathway

An aerial photograph of a large port area at sunset. The sky is filled with soft, golden light from the setting sun, casting a warm glow over the water and the silhouettes of distant mountains. The water is a deep blue, reflecting the light. Numerous ships of various sizes are scattered across the port, some moving and leaving white wakes. A large, white, semi-circular graphic element is overlaid on the center of the image, containing the text 'A GLOBAL SOLUTION REQUIRED' in a clean, sans-serif font.

A GLOBAL
SOLUTION
REQUIRED

With increasing awareness of the impacts of aquatic invasions came the increasing realisation that a global solution was required. As Dandu Pughiuc, former Senior Deputy Director, IMO, and former Chief Technical Adviser, GloBallast explains, the issue was first raised at IMO in the 1980s with Australia and Canada, in particular, concerned at the never before seen amount of scientific evidence showing new species in their waters.

In Australian waters alone some 62 exotic species were recorded in the 1980s with no Australian state or territory untouched. What really captured attention though was a proliferation of zebra mussels in Canada's Great Lakes, a species native to the Caspian Sea that had dramatic impact on the Great Lakes fisheries and caused havoc to water utilities with huge financial consequences.

One of the main challenges needing to be overcome was that ballast water discharge looks like clean water with the majority of species too small to see with the naked eye. This is in stark contrast to, for example oil pollution, which is both highly visible with impacts well reported, particularly during the 1980s

with the *Atlantic Empress*, *Castillo de Bellver* and *Exxon Valdez* spills drawing the attention of the public and policymakers. So while scientists were convinced of the need to mitigate the threat of aquatic invasive species, it was hard to persuade policymakers to stand up and take action when also dealing with other threats to the marine environment, as already recommended in art.196 of the UN Convention on the Law of the Sea (UNCLOS).

In 1992, world leaders convened in Rio de Janeiro, Brazil, for the United Nations Conference on Environment and Development (UNCED) – more commonly known as the Rio Earth Summit. As well as being the precursor for the climate change actions we see today, the summit was the venue for gathering signatories on the Convention of Biodiversity (CBD). This ground-breaking treaty made reference to aquatic invasive species carried in ballast water, and called on the world to take action. In 2010, the CBD held a meeting in Aichi, Japan and adopted the Strategic Plan for Biodiversity comprising 20 headline 'targets', commonly referred to as the Aichi Targets. Of these, the ninth specifically relates to invasive species and states that by 2020, the pathways by which invasive species migrate to new habitats should be identified and prioritised; high risk species should be controlled or, where possible, eradicated; and measures should be introduced to manage pathways to prevent their spread. Rio's Agenda 21 more specifically called on IMO to develop instruments to tackle the ballast water issue. With the pressure slowly building on the international community, there was a gradual recognition by IMO Member States of the gravity of the problem and the lack of an international legal mechanism was seen as the greatest barrier to halting aquatic invasions.



Dandu Pughiuc
former Senior Deputy
Director, IMO, and former
Chief Technical Adviser,
GloBallast

THE DAWN OF AN INTERNATIONAL CONVENTION

Following requests to take action, in 1997 IMO issued Guidelines on Ballast Water Management and Sediments. Then, in 2004, IMO adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments, herewith referred to as "the Convention." This treaty will serve as a global legal instrument that helps to address the challenge of harmful aquatic organisms and pathogens in ships' ballast water by establishing standards and procedures for the management and control of both ballast water and sediments.

After meeting the necessary conditions (30 signatory States representing 35% of world tonnage), the Convention will enter into force on 8 September 2017. The story of how the GloBallast Pilot Project and the GloBallast Partnership Programme contributed to the adoption and subsequent ratification of the Convention is told in this Monograph.

At the heart of the Convention is the requirement for ships to be subject to a range of measures to address the potential impacts associated with ballast

water operations by undertaking ballast water management based on two overarching methods: ballast water exchange and ballast water treatment.

Ballast water exchange is based on the principle that organisms and pathogens from a coastal region may not survive when discharged into an area of open ocean or deep water which may have differing temperature, salinity or chemical characteristics. Ballast water treatment relies on, for example, the use of mechanical, physical or chemical methods to eradicate organisms and pathogens. Both exchange and treatment are undertaken in accordance with two standards.

- The Ballast Water Exchange Standard (Regulation D1), which requires an efficiency of 95% volumetric exchange of ballast water with marine water at a location at least 200 nautical miles from the nearest land and in water at least 200 metres in depth; or
- The Ballast Water Performance Standard (Regulation D2), which concerns water quality for discharge, related to specified maximum concentrations of microorganisms.

GREAT LAKES BALLAST WATER PROGRAMME: A PRECURSOR TO INTERNATIONAL ACTION

Costs of the introduction of aquatic invasive species in the Great Lakes are significant. In 1993, before the Convention, it became mandatory for ships travelling to the Great Lakes to conduct open-ocean ballast water exchange.

A new measure was added in 2006, requiring empty tanks be flushed or rinsed in mid-ocean to make sure any leftover organisms were also given the salt water treatment. Rigorous inspection and compliance efforts supported these regulations.

The first scientific study of this Great Lakes Ballast Water Programme reveals that the strategy of ballast water exchange is very effective at protecting waterways from the introduction of new aquatic invasive species, which can have devastating effects on natural ecosystems. Since the introduction of the current regulations in 2006, no new invasive species attributed to ballast water release and transoceanic shipping in general have been recorded in the Great Lakes.



Zebra
mussels on
Lake Michigan
beach

The Ballast Water Exchange Standard was considered a suitable interim measure until treatment technologies became approved and commercially available but will be phased out in the near future, as it affects ship stability and safety.

In addition to undertaking management measures the Convention requires that all ships must have an approved Ballast Water Management Plan (BWMP) and maintain a Ballast Water Record Book. The management plan sets out the standard operational guidance for the planning and management of a ship's ballast water and sediments, whilst the record book logs ballast water operations such as uptake, treatment, exchange, circulation and discharge.

Whilst the Convention is largely focussed on ships, the stakeholder picture is much bigger and the successful implementation of the Convention relies on all stakeholders being truly engaged in the process.

In particular, port State control authorities are required to inspect ships and check for valid certificates and an approved BWMP, to examine the Ballast Water Record Book, and eventually sample and analyse ballast water, while balancing the needs of the inspection process with the time-sensitive nature of commercial shipping operations – to avoid undue delays to ships. Additionally, the Convention requires port State control authorities to promote and facilitate scientific and technical research including monitoring the effects of measures in the waters under their jurisdiction.

GLOBAL GOALS FOR GLOBAL OCEANS

The Sustainable Development Goals (SDGs), officially known as *Transforming our world: the 2030 Agenda for Sustainable Development* are a set of 17 “Global Goals” adopted for the period 2016-2030 aspiring to end poverty, protect the planet, and ensure prosperity for all.

Protecting life below water features prominently among the goals. SDG 14 promotes the conservation and sustainable use of the oceans, seas and marine to ensure that the riches of the oceans and seas are shared fairly for present and future generations. The goal recognises that oceans, along with coastal and marine resources, play an essential role in human well-being and social and economic development worldwide at a general level and in particular for those living in coastal communities.

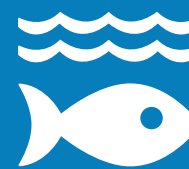
Coastal and marine resources contribute an estimated \$28 trillion to the global economy each year through ecosystem services. However, those resources are extremely vulnerable to environmental degradation, overfishing, climate change and pollution. The sustainable use and preservation of marine and coastal ecosystems and their biological diversity is essential to achieving the 2030 Agenda, especially for Small Island Developing States (SIDS).

The SDGs also highlight other areas that are particularly relevant to the mitigation of aquatic invasive species and ballast water management that are exemplified by the actions the maritime community have taken. SDG 9 focuses on building resilient infrastructure, promoting sustainable industrialisation and fostering innovation which are critical elements of ensuring sustainable shipping and SDG 17 focuses on revitalising the global partnership for sustainable development which is at the very heart of finding a solution to the challenge of aquatic invasions where a solution will require cross boundary collaboration.



SUSTAINABLE DEVELOPMENT GOALS

14 LIFE
BELOW WATER



9 INDUSTRY, INNOVATION
AND INFRASTRUCTURE



17 PARTNERSHIPS
FOR THE GOALS



AQUATIC BIO-INVADERS: THE 10 MOST UNWANTED

S

We profile the 10 most invasive species that can be transferred through ships' ballast water

Some 10 billion tonnes of ballast water are transferred around the world every year, taking a variety of marine organisms with it, including bacteria, viruses and the adult and larval stages of many marine and coastal plants and animals.

The transfer of water ballasted in one area of the world and deballasted in another can contribute to “invasive” species arriving in new regions and wreaking havoc on native marine life – but this is not a new phenomenon. In fact, some populations of invasive species were originally introduced in water deballasted from ships over 200 years ago.

CHOLERA (*Vibrio cholera*)

Port areas near the mouths of rivers are prime breeding ground for cholera bacteria, especially in countries where sanitation is poor and water has been heavily polluted with raw sewage. *V. cholera* bacteria attach to the surfaces of planktonic animals such as copepods (a type of small crustacean) and other zooplankton, particularly in tropical countries, as well as to shellfish and aquatic plants. By attaching themselves to waterborne microscopic organisms, the bacteria can enter ballast water and be transmitted to new areas around the world. If ingested in drinking water, strains O1 and O139 of the bacteria can cause cholera in humans.



Cholera



Cladoceran
water flea

CLADOCERAN WATER FLEA

(*Cercopagis pengoi*)

This macroinvertebrate is also known as the fish-hook water flea, owing to the three pairs of barbs and a characteristic loop near the end of its tail. The water flea is native to the Black, Caspian, Azov, and Aral seas in Europe and Asia, but has also been found in Europe in the Baltic Sea.

This has led US and Canadian authorities to be increasingly worried about its proliferation within North American lakes and waterways. The species has already established itself in Lake Ontario and some of the other Great Lakes, having been spread by recreational boat traffic and in ballast water. Lakes Huron and Superior are not thought to have been populated with the water fleas, but their transmission there can only be a matter of time.

The females can produce ‘resting’ eggs, which remain inactive for a long period of time and are resistant to icy conditions and even ingestion by predators such as other fish. The eggs can then hatch when environmental conditions become more hospitable. This means that although ‘laker’ vessel traffic ceases during winter, when shipping routes through the Great Lakes become ice-bound, the species is still able to maintain a foothold in the region without the need for contaminated ballast water to bring new individuals into breeding areas.



MITTEN CRAB (*Eriocheir sinensis*)

This creature is native to the coastal rivers and estuaries of Korea and China, so is often referred to as the Chinese mitten crab.

Each female mitten crab is able to carry 250,000 to 1 million eggs that hatch into planktonic larvae. The larvae grow into small juvenile crabs, which inhabit salty or brackish water, then migrate to fresh water to rear their young. Migration distances can be huge – mitten crabs have been found in China's Yangtze River 800 miles upstream.

Humans are thought to have interfered and helped the crab to establish itself on the west coast of the US, particularly in the San Francisco Bay/Delta area – and ballast water from the many container ships plying the trans-Pacific trade between China and major container ports on the US western seaboard won't help either. Germany has a population of mitten crabs, thought to have been brought from China in ships' ballast water during the 1900s. Crabs have also been sighted in Scotland's River Clyde, the River Thames in London, the Great Lakes and on the US eastern seaboard, although populations don't seem to have become permanent in these areas.

Ironically, mitten crab numbers are dwindling in eastern China, where it is considered a delicacy, because of overfishing.



TOXIC ALGAE

Over 5,000 species of marine microalgae or phytoplankton organisms exist globally, but only around 2% are known to be harmful or toxic, which cause harmful algal blooms (HABs) or red, green or brown tides in coastal areas.

Many of these HABs are caused by an influx of nutrients like phosphates that run off into the water, whether from wastewater or the overuse of fertilisers in agriculture.

As HABs photosynthesise, they produce natural toxins, which can damage and even kill other organisms. The effects can range from poisoning shellfish to large-scale marine mortality events. In spring 2004, 107 bottlenose dolphins washed up dead in Florida after ingesting menhaden fish contaminated with high levels of brevetoxin, a neurotoxin that disrupts animals' neurological processes. Similarly, mass deaths of manatees have been attributed to seagrass (the manatee's preferred food) contaminated with the toxin.

Brevetoxin is produced by *Karenia brevis*, the single-celled photosynthetic organism that causes 'red tides' on the Gulf coasts of Florida and Texas in the US, and in Mexico. The toxin can also have adverse but varied effects on human health. Some scientists say Florida red tide blooms are about 10 to 15 times more frequent today than they were 50 years ago.

In South Africa, HABs are caused every spring by the *Alexandrium ca-*

tanella, which can disrupt local fishing. The algae produces toxins which are transferred to filter-feeding shellfish. The shellfish then become poisonous to human consumption.

ROUND GOBY

(*Neogobius melanostomus*)

The round goby is a bottom-dwelling fish found in both freshwater and brackish water. The fish is native to waterways in central Eurasia and the Black Sea, but has established large non-native populations in the Baltic Sea, the Danube and Rhine river basins, and the Great Lakes.

The fish competes aggressively with native species for food such as snails and mussels, shelter and nesting sites, which can substantially reduce the numbers of native marine life.

Round gobies also like to eat the eggs of native fish, but its own populations are able to proliferate quickly. Females can spawn up to six times a year, producing egg clutches of up to 5,000 eggs, which are defended by male gobies, resulting in hatch rates of up to 95%.



AQUATIC BIO-INVADERS: THE 10 MOST UNWANTED

ZEBRA MUSSEL

(Dreissena polymorpha)

While the round goby may be considered a pest, it also helps limit the large-scale spread of another invasive species, the zebra mussel, which is eaten by the fish.

The mussel itself was originally native to the lakes and rivers of southern Russia, but today has become an invasive species in Ireland, the UK, the Great Lakes and most major rivers in the US. Some biologists think the shellfish could also have been carried on vessels' anchors and chains, as well as in ballast water. Adult zebra mussels are able to survive out of water for several days or weeks if the temperature is low and humidity is high.



Zebra
Mussel

A female zebra mussel begins to reproduce within six to seven weeks of settling on a hard structure and can produce up to 1 million eggs each year. Each individual lives for four to five years. The shells grow abundantly in dense clusters that affix themselves to marine structures such as ships' hulls, buoys, docks and have even been known to block water pipelines. The US Environmental Protection Agency (EPA) estimates it costs \$500m every year to manage zebra mussel populations in the Great Lakes alone.

Zebra mussels are extremely efficient at filtering water for food, which means they tend to accumulate pollutants and toxins. The shellfish are believed to be the source of deadly avian botulism poisoning, which has killed tens of thousands of birds in the Great Lakes since the late 1990s.

NORTH AMERICAN COMB JELLY

(Mnemiopsis leidyi)

While many creatures on this 10 Most Unwanted list seem to be invading North America from the east, the North American comb jelly is an export that has been sent back again.

The jellyfish is thought to have arrived in the Black Sea from the US Atlantic coast in 1982. By the mid-1990s, the jellies accounted for 90% of the total biomass in the Sea – more than the total annual fish catch around the world – thanks to their incredible ability to propagate.

Unfortunately, the jellies' presence in the area, which has since spread to the Caspian and Azov seas, is leading to the loss of native marine life, even impacting on larger mammals.



North
American
Comb
Jelly

The jellies eat the eggs and larvae of native fish, and also feed on zooplankton, upon which most commercially important fish in the Black Sea (such as anchovies) depend. As fish numbers have declined, so too have dolphin numbers, and the the US State Department estimates the fishing industry in the Black Sea has lost around \$1 billion in revenue since the jellies arrived.

Recent reports suggest the comb jellyfish have been found in the western Baltic Sea and along the North Sea coast of Norway, but it is not known how the jellies got there. Some think the species could have been carried in ballast water from ships travelling from the Black Sea to the Rhine Estuary via the Rhine-Main-Danube Canal.



North
Pacific
Seastar

NORTH PACIFIC SEASTAR

(*Asterias amurensis*)

Native to Japan, North China, Korea and far eastern Russia, this starfish is capable of tolerating many temperatures and wide ranges of water salinities and is often found in estuaries and intertidal zones.

Spawning between July and October, the female is capable of carrying up to 20 million eggs, which hatch and live as planktonic larvae for up to 180 days.

The species has since been introduced to south-eastern Australia and Tasmania, most probably after having been carried as larvae in ballast water. The port of Melbourne is Australia's biggest container port, handling many vessels inbound from the Far East. It is in Australia that North Pacific seastars are doing most damage. The creatures eat the eggs of the endangered handfish.

EUROPEAN GREEN CRAB

(*Carcinus maenas*)

Another species colonising Australia is the European green crab, which has found its way from its original habitat in the north-east Atlantic Ocean and Baltic Sea to the Antipodes, South Africa, South America and both the Atlantic and Pacific coasts of North America.

The green crab is a carnivore that preys upon clams, mussels, oysters, and gastropods. Its introduction to the US in the 1950s has cost the American fishing industry millions of dollars because the green crab preys on scallops and other commercially important shellfish. Aside from preying on native species, the European green crab is able to outcompete them for food, and can reproduce in high volumes.

Research suggests that the green crab's colonisation of estuaries in Washington, Oregon and British Columbia was facilitated by the El Niño storms of 1997 and 1998.

ASIAN KELP (*Undaria pinnatifida*)

Better known as wakame, this edible seaweed is commonly used in Japanese and Korean cuisine. While native to cold-water coastal areas of Japan, Korea, and China, it has found its way to New Zealand, France, Great Britain, Spain, Italy, Argentina, Australia, Mexico and the US, where aggressive measures are underway to remove the plant from harbours on the western seaboard. The kelp was discovered in San Francisco Bay in May 2009.



European
Green Crab



Asian
Kelp



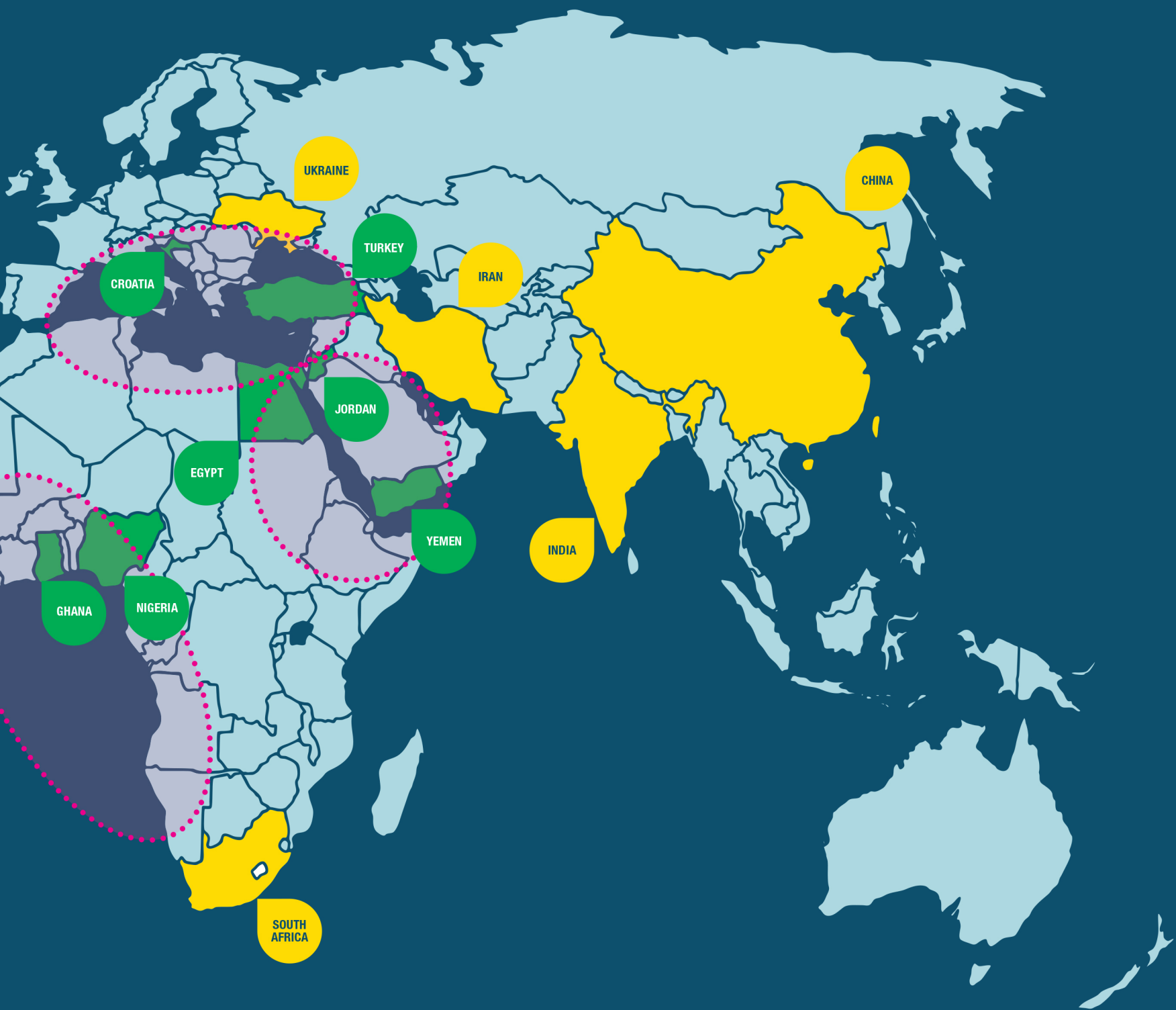
OUR PARTNERING COUNTRIES

6
PILOT COUNTRIES
FIRST PHASE

5
PRIORITY
REGIONS

15
LEAD PARTNERING
COUNTRIES
SECOND PHASE







GLOBALLAST
BEGINS
(2000-2004)



Since 2000, and driven by the desire to mitigate the impacts of harmful aquatic invasions, the United Nations Development Program (UNDP), the Global Environment Facility (GEF), and IMO have worked together under the GloBallast Partnerships Programme (herewith GloBallast) to foster an unprecedented international and public-private cooperation in the area of ballast water management.

GloBallast recognised that tackling a global environmental threat such as that posed by aquatic invasive species was particularly challenging for a variety of interconnected reasons.

Firstly, the transboundary nature of global shipping meant that for any regulatory framework to achieve its goals, implementation needed to occur at an international level. This can be a lengthy process with member States and other stakeholders all needing to reach agreement. For ballast water management, an already lengthy process was made more problematic by an almost universal lack of understanding, outside of a niche scientific community, of what can be an invisible issue that is complex both scientifically and socio-economically.

Secondly, even after the adoption of the Convention, there were virtually no commercially available, fully tested and approved ballast water treatment solutions that could be installed on merchant vessels to offer an alternative to conducting ballast water management. It was clear that a mechanism for accelerating research into, and commercial development of, such systems was a pressing need. Furthermore, it became apparent that the method of ensuring any systems were able to perform the function for which they were required needed to be consistent.

Finally, it was recognised that when the Convention eventually met the conditions necessary for ratification and subsequent entry into force, many countries would have insufficient institutional and legal frameworks to be able to implement the treaty at the national level. On one hand developing countries had concerns due to numerous societal needs competing for limited financial resources and on the other hand there were also concerns raised by developed countries around the level of technical preparation required.



AN EARLY SUCCESS

Reflective of the complexities of ballast water management, GloBallast became one of the longest running programmes under the GEF, stretching over the period from 2000 to 2017 in two phases (2000-2004 and 2007-2017). The first phase, the GloBallast Pilot Project, was extremely successful in accelerating global efforts to develop an international regulatory framework to address the issue of aquatic invasive species in ships ballast by bringing together all stakeholders to engage in fruitful discussion for the first time. In fact it was so successful that the first phase concluded in 2004 with the adoption by IMO member States of the Convention, a significant milestone and considerable accomplishment.

“This initial effort also laid a strong foundation for the establishment of cooperative regional arrangements, capacity building, strengthening of institutional frameworks and the provision of technical assistance”, underlines Jose Matheickal, Deputy Director, Major Projects, IMO and Chief Technical Adviser, GloBallast. This was conducted in six Pilot Countries: Brazil, China, India, Islamic Republic of Iran, Ukraine and South Africa.

In the initial phase, strong participation and engagement by developed countries was extremely valuable so far as they had capacity to take GloBallast further, both at policy and scientific levels. Feeding back their experience to IMO was pivotal in turning the idea of the Convention into a reality. Additionally, the catalytic role that the GloBallast played in the Convention adoption process is most vividly demonstrated by the fact that four pilot countries from the initial phase presided and vice-presided over the diplomatic conference that adopted the Convention. And whilst the Pilot countries not only played an instrumental role in accelerating the development of the Convention, they also transformed themselves into centres of excellence; with the expertise and capacity built in these countries becoming a key enabler in scaling-up global efforts.

When Brazil became one of the pilot countries for the pilot phase of GloBallast, it nominated the Port of Itaguaí (formerly known as the Port of Sepetiba) as a demonstration site. Located in the south of the State of Rio de Janeiro, Itaguaí is one of the four major ports of Brazil. “When we became involved in GloBallast I, like others had never heard about ballast water”, Flavio da Costa Fernandes, Head of the Oceanographic Department, Instituto de Estudos do Mar Almirante Paulo Moreira (IEAPM) noted.

As such, GloBallast became instrumental in highlighting the issues of aquatic invasive species. In addition it provided Brazil with the tools to monitor the environment and aquatic invasive species, and crucially implement solutions to control new invasions, and the spread of species already in Brazil. “The influence of GloBallast was to make us think differently about environmental protection which was very significant in Brazil”, da Costa Fernandes emphasised.

Guided by others in the GloBallast family, he coordinated many studies on aquatic invasive species in the Port of Itaguaí, including conducting biological research, sampling and analysis of ballast water, ballast water risk



Jose Matheickal
Deputy Director of Major Projects at the International Maritime Organization (IMO) and Chief Technical Advisor of GloBallast



Flavio Da Costa Fernandes

Head of the Oceanographic Department, Instituto de Estudos do Mar Almirante Paulo Moreira (IEAPM)



assessments, and even assessments of the paperwork ships were required to complete. In the early stages, much of the port-specific work was aimed at completing a baseline study followed by work to understand the impacts of the aquatic invasions. Over time, da Costa Fernandes has become someone who has been primarily learning about aquatic invasive species, to someone who now delivers training to others.

Da Costa Fernandes highlights Brazil's highly organised port State control (Directorate of Ports and Coasts) as instrumental in the swift introduction of Brazil's first piece of ballast water legislation. By 2005 – just five years after starting out as a pilot

country, legislation on ballast water exchange and ship inspections was introduced. This regulation required all ships to exchange ballast water before they could enter any Brazilian port. Additionally, due to high ecological sensitivity, those ships that enter the Amazon and the Para Rivers must undergo a second exchange.

Coincidentally, at the same time as legislation was being introduced, a national commission was being established which brought together the various Governmental ministries dealing with IMO related topics and critically this included GloBallast. Multi-ministry meetings focusing on ballast water and invasive species now occur on a monthly basis.

With the Convention entering into force in September, da Costa Fernandes is excited about where Brazil stands in terms of ballast water and aquatic invasive species management; “GloBallast was fundamental in teaching us the basics but now we have to continue the work”. We have well trained port State control officers and created a national commission to coordinate activities. In addition, a growing number of Brazilian universities are now dedicating research efforts aimed at tackling the issue of aquatic invasive species, improving ballast water control, and devising and improving monitoring programs. International collaborations have also been formed, such as with the Smithsonian Institute in Maryland, US.”

Some 80% of Brazil's power comes from hydroelectric power plants. In the 1990s, the Yacereta hydropower plant located on the Paraná River on the border of Paraguay and Argentina was seriously affected by the golden mussel – a small, non-native freshwater mollusc – that had a tendency to clog pipes and, on occasion, even halt operations. For such a vital piece of national infrastructure, this was more than a mere inconvenience.

Scientists discovered that the only way the golden mussel could have arrived in South America is from the ballast water discharges of ships that had previously visited Asia, its native area. The introduction of the GloBallast pilot project in 2000 could not have been better timed: “Brazil had a social and economic incentive to get involved and to take steps to protect the country from more aquatic invasions,” da Costa Fernandes, explains.

A hydropower dam located between Brazil and Paraguay



TESTING THE WATER

On the other side of the Atlantic, a case-study put together by South Africa, another participant of the GloBallast pilot programme, served as a valuable example to other countries. The study established a definitive link between struggling oyster farms and an aquatic invasive species arriving in ballast water, and was essential to making domestic policy makers sit up and take action.

With a more developed national infrastructure than others, South Africa was selected on the basis it would more likely succeed in fulfilling the project's objectives and was well-positioned to taking a leadership role in the region. Activities focused on Saldanha Bay, a United Nations Heritage Site which provides a habitat for many sensitive marine species. It is also adjacent to a large commercial port, which provided a vector for invasive organisms to arrive and gain a foothold. "On reflection, those conditions made it an ideal location to carry out a risk assessment and biological baseline surveys," recalls Adnan Awad, a marine scientist who became heavily involved in the GloBallast work undertaken in South Africa.



Adnan Awad
Director of IOI
South Africa



By being the first to do these exercises, South Africa was effectively testing the water for others to follow. "At that time, no other countries had any experience of performing surveys. It was new for us too. We had to learn the hard way from our mistakes," recalls Awad. Later, South Africa convened a meeting with the lead experts from the other participating countries allowing it to share its experience. "We could provide a list of dos and don'ts, advising them what worked well and what didn't. It was very constructive. Furthermore, it cemented a lot of relationships, many of which have lasted to this day," says Awad, noting that such international gatherings have continued to prove effective in pulling countries and relevant stakeholders together, enabling them to learn from each other and exchange ideas whilst sowing the seeds for new collaborations.

The agency leading the GloBallast effort in South Africa was the Ministry of Environment, whereas the focal point for

engaging with IMO was the Transport Authority. This created a challenge in that, early on, there was a divergence of priorities. "We knew long-term success hinged on our colleagues in the transport department becoming engaged. But initially they were less than enthusiastic, preferring to observe rather than act," explains Awad.

The team that conceived GloBallast had anticipated this sort of situation and recommended the production of case-studies to present the economic and social impacts as a means to help raise awareness and convince sceptics about the seriousness of the issue. This proved decisive in the case of South Africa, which at the time had a reputation for being relatively untouched by invasive species. "We had a list of twenty or so species, which was low compared to other countries," Awad notes.

It enlisted the assistance of an expert on phytoplankton and algal blooms, who took the results from the base-

line survey and produced a catalogue, which was later published in the GloBallast Monograph series.

However, the research team did not stop there. They had found a species of dinoflagellate they were certain was not native to South African waters and was damaging local oyster fishing businesses. But other scientists were unconvinced that it had arrived via ballast water. The team decided to build a case to prove where it originated from. A genetic study revealed it was a subspecies of two populations native to the US east coast. The scientists quickly narrowed it down to which one. By cross-referencing the dates it observed to have been blooming off the American coast with shipping records, they determined when it could have been picked up. “From that, we narrowed it down to just two vessels that could have carried it across. Basically, with 99% certainty, we had justified it was a ballast water introduction,” Awad says, concluding the detective story.

The dinoflagellate in question was

causing a brown tide (a type of harmful algal bloom) and stressing the oysters. Awad explains: “They were opening up more to breathe the necessary oxygen to survive, which in turn allowed a parasitic worm to get in. This didn’t kill them but made them unmarketable. The impact on the industry was so devastating that it eventually had to move.”

The strength of this case-study was that it highlighted a growing industry that was unequivocally being affected by invasive species transferred by ballast water. It was symbolic in bringing to light tangible consequences. And as, Awad points out, it was a direct consequence of the GloBallast baseline study.

However, the story does not end here. This ground-breaking research had an accelerator effect. By drawing attention to the issue, it spurred more scientists to get involved and analyse the baseline survey results even more deeply. Under closer scrutiny, some species previously considered to be native were revealed as introductions.

“Our list of invasive jumped from 20 to more than 100 almost overnight. We started to get a glimpse of the real picture. More importantly, it was a scientific wake-up call. It made us realise that our assumptions about the South African coastal marine environment were very wrong,” Awad admits.

In light of this new evidence emerging and against a backdrop of increasing momentum at IMO for the adoption of the Convention, the initial reluctance of the transport authority to get involved was evaporating, replaced with a keen interest in the subject. Although this happened close to the end of the project’s first phase, the national task force established under GloBallast was well positioned to attend to their needs. It was an early example underlining just how effective the establishment of national task forces was at fostering cross-fertilisation and bringing together stakeholders with diverse agendas. It helped overcome and turn any internal biases into a strength, whilst working towards a single common aim.

MAINTAINING MOMENTUM

In the interim period between the two GloBallast phases, Adnan moved to the International Ocean Institute (IOI) where he continues to support the development of regional ballast water strategies in West Africa; East Africa; the Gulf of Aden & the Red Sea; and in the Mediterranean Sea.

The existing networks and the organisations in those regions played a transformative role in bringing people and resources together on the ground. They were essential in disseminating and facilitating the replication of good practice. This was particularly evident in parts of the world where resources were limited where they provided a cost-effective solution for maximising reach.

The efforts in the Middle East, facilitated through PERSGA, the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden, were funded by IMO’s Integrated Technical Cooperation Programme (ITCP) but were closely aligned to the plans for the second phase of GloBallast which was already underway. The exercise culminated in a workshop in Jeddah to draft a preliminary regional strategy (based on the GloBallast template), which was adopted shortly thereafter. A similar successful outcome was reached in West Africa.

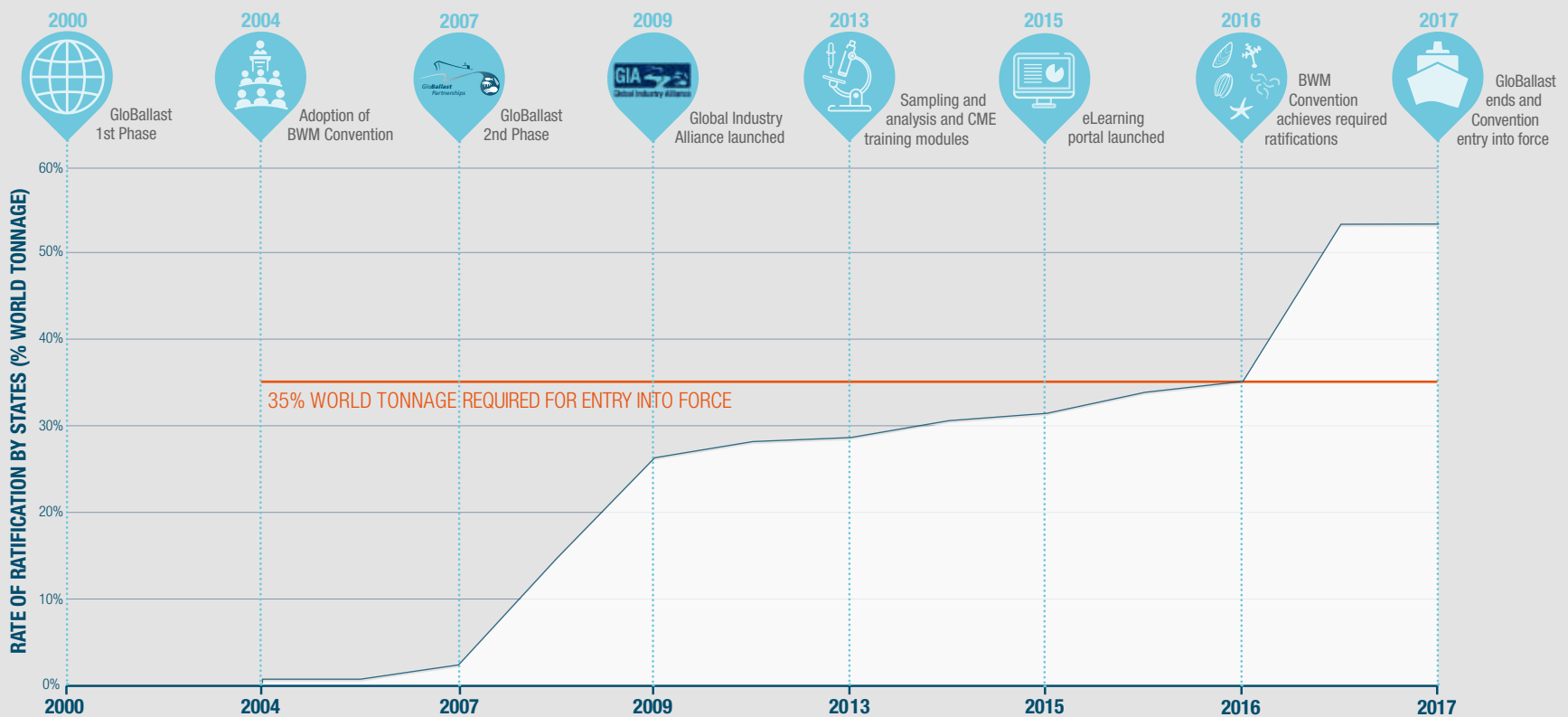
Circumstances in the Mediterranean region were more complex. Initial work with the Regional Marine Pollution Emergency Response

Centre for the Mediterranean Sea (REMPEC), the local umbrella intergovernmental organisation representing some 22 nations, was based on the same GloBallast template, which had proved its worth in the Middle East and in West Africa. However, whilst offering a platform to build upon, it was not the right fit here. “We really had to push at the boundaries, for example, looking into voluntary arrangements for open-ocean ballast water exchange,” recalls Awad. Ultimately, a suitable strategy document was formulated thanks to the strong commitment of all the stakeholders.

The GloBallast Intervention

Of the handful of countries exploring strategies to manage aquatic invasions before GloBallast got underway, most had directly experienced economic loss or had human health concerns. Yet even in these countries, outside of the scientific community, the level of general awareness was low.

Thus, a challenge for GloBallast was how to engage all potential stakeholders, around the world, in assisting in protecting the marine environment from the transfer of harmful aquatic organisms and pathogens. Without this stakeholder awareness and engagement it would be extremely difficult to encourage IMO Member States to ratify the Convention. As it transpired, a combination of GloBallast interventions and awareness-raising activities would eventually prove to be hugely significant in encouraging ratifications.



AWARENESS-RAISING IN LEAD PARTNERING COUNTRIES AND ACROSS INDUSTRY

Jamaica was one of the 15 Lead Partnering Countries (LPCs) of the second phase of GloBallast. Like many countries, it already had a broad strategy and framework covering biodiversity, but also like in other countries, it focused primarily on land-based animals and plants introduced both intentionally and accidentally. However, it wasn't really compatible with aquatic species entering local ecosystems via ships ballast water. As Bertrand Smith, Director of

Legal Affairs at the Maritime Authority of Jamaica recalls "Ballast water didn't really integrate very well. It was not accorded the same status. An invasive animal or plant with serious environmental impact on land would be treated urgently but species arriving via ballast water weren't given the same level of attention. Addressing this imbalance was a challenge."

When it was realised, for instance, that the Indo-Pacific green mussel had entered Jamaica's marine ecosystem,

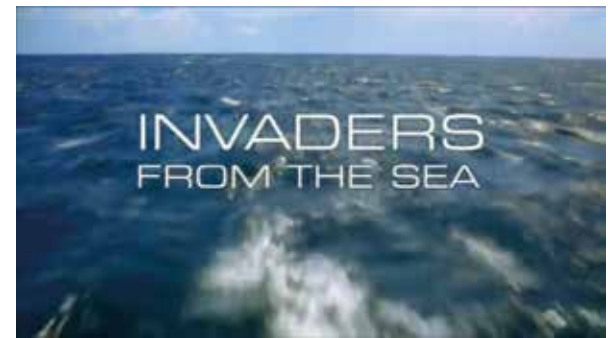
the amount of devastation it could cause - and potential knock-on effects to local fisheries – simply wasn't fully appreciated. Smith suspects this is because the danger was largely invisible. "If it were conspicuous in the same way as an oil spill, it would have been easier to gain traction and push the legislation forward," he says. In this respect, the awareness raising activities of GloBallast were invaluable.

The Globallast Programme employed a variety of mediums in its efforts to raise the visibility of aquatic invasive species ranging from traditional literature and film to online technologies and social media. Leaflets and posters with headlines of "Unwanted Stowaways", "Preventing Pests in Paradise", "Aquatic Aliens! Managing the Invasive Threat" and "Ten of the Most Unwanted" were invaluable in conveying the message that ballast water transfers and invasive aquatic species were perhaps the biggest environmental challenge facing the global shipping industry in the 21st Century.

Whilst Jamaica took advantage of the awareness raising materials and South Africa was utilising the results of its biological baseline surveys to convey the scale of the problem, other LPCs undertook similar initiatives to raise awareness. For example, Venezuela organised its First National Forum on Ballast Water in Caracas in 2012, where issues related to the international response and actions carried out by Venezuela were discussed. This was followed up

by four regional forums and nine information sharing conferences, related to the issue of control and management of ballast water, in different areas. Venezuela also prepared a diagnosis of the environmental characteristics of its ballast receiving ports, an essential input for the biological monitoring of ports and subsequently developed a database under the National Ballast Water Program, which became hugely important in raising awareness amongst the stakeholder community.

As shown by the response to the South African monograph on baseline surveys, the GloBallast monograph series was a valuable resource for all stakeholders involved in ballast water management. Produced in five languages and covering topics such as identifying and managing risk, economic assessments for ballast water management, development of National Ballast Water Management Strategies, it rapidly became a worldwide "must have" toolkit, utilised equally by the partners of the Programme, IMO Member States and other stakeholders. Alongside, the GloBallast website offered a vital repository and essential information source, particularly for the industry. In combination with other activities such as the R&D forums, awareness raising was catalytic in engaging industry with the Global Industry Alliance (GIA). This in turn led to support for one of the most important awareness-raising initiatives of GloBallast - the documentary film: "Invaders from the Sea".



REACHING A GLOBAL AUDIENCE

One of the most significant achievements of GloBallast was the highly regarded and award winning documentary, *Invaders from the Sea*, co-produced with the BBC. In one scene, an Iranian fisherman in the Caspian Sea emotionally explained the dramatic impact the invasive comb jelly had on the local economy, and the lack of alternative resources to support his family. This was the 'poster story' that was necessary to raise awareness about the damage caused worldwide by harmful invasive aquatic species and captured the imagination of the industry and general public at large.

Although the early awareness raising activities were successful throughout the Programme, GloBallast realised that technology was changing the way people accessed information. GloBallast was quick to adopt new technology to produce resources that could be viewed online and also downloaded and viewed offline. This latter capability was especially important for reaching out to one critical audience: those working at sea, who often don't have the same level of electronic connectivity as we enjoy on land.

The GloBallast e-learning portal is a prime example. More than 4000 stakeholders around the globe have benefited from this innovative and inclusive approach. More recently GloBallast has embraced social media as a means to reaching a new global audience and a new generation of people who will play a critical role in ensuring the future protection of our ocean.

BEFORE GLOBALLAST

1903

Asian phytoplankton algae spotted in the North Sea providing some of the first evidence of aquatic invasions

1980

Slow regulatory international discussions

1982

North and South American comb jelly first recorded in the Black Sea



TIMELINE

GloBallast
Start of Phase 1

2000

Global Task Force to explore the problem of marine invasions convened by the IMO, the UNDP and the GEF – named GloBallast involving six pilot countries

2001

First GloBallast Ballast Water Treatment R&D Forum held in London, UK

2002

First GloBallast Monographs published providing a legal and environmental review of the six pilot countries

2008

Regional Task Forces established. GloBallast reaches out: awareness-raising – introductory training on ballast water management

2009

National Task Forces setup in LPCs. Global Industry Alliance for Marine Biosecurity established
Growing number of testing facilities in place to enable progress on Type Approval

2010

GloBallast and the European Bank for Reconstruction and Development join hands to create the marine biosecurity initiative

**2011-
2013**

GloBallast publishes guidance monographs. LPCs develop national assessments
Sufficient number of Type Approved treatment systems available
GloBallast TestNet Busan MoU signed

1988

Member States including Australia and Canada raise issue of invasive species at IMO

1992

UN Conference on Environmental and Development (UNCED) request IMO consider the adoption of rules to prevent the spread of non-indigenous organisms in ships ballast water

1997

IMO Assembly adopts guidelines for management of ships ballast water

2003

Phase one of GloBallast concludes

2004

The International Convention for Control and Management of Ships Ballast Water and Sediments is adopted by IMO (BWM Convention)

GEF Funding granted for the preparatory phase of what will become the GloBallast Partnerships Project

2005

Adoption of 14 guidelines in support of the Convention

2006

First Ballast Water Treatment System receives IMO Type Approval

IMO-BBC "Invaders from the Sea" documentary has global premier

GloBallast
Start of Phase 2

2007

GloBallast Partnerships Project officially launched

2014

Specialised training modules developed by GloBallast

2015

GloBallast e-learning course. 'Train the trainer' on sampling and analysis

22nd Monograph published providing guidance on port biological baseline surveys

2016

BWM strategies developed in 17 partner countries. Accession by Finland

GloBallast wins best portfolio solution award at the 8th International Waters Conference

2017

Revision of guidance on approval of ballast water management systems

GloBallast stakeholders meet in Panama for the final Global Task Force meeting

GLOBALLAST ENDS.

Entry into force of the Convention



SCALING UP PARTNERSHIPS (2007-2017)

Motivated by, and building on the successes of the pilot phase, the GEF, UNDP and IMO joined forces again in 2007 for a follow-up project: Building Partnerships to Assist Developing Countries to Reduce the Transfer of Harmful Aquatic Organisms in Ships' Ballast Water, the programme now more often referred to simply as the GloBallast Partnerships. It added even greater energy to efforts to address the issue by securing further financing to support legal, policy and institutional reforms and securing significant private sector financing to address the concerns of the shipping industry.

Throughout the follow up project and building on early achievements, GloBallast has been invaluable in helping, in particular, developing countries and their maritime industries to reduce the risk of aquatic invasions and the associated environmental and socio-economic impacts. Additionally, it has been instrumental in preparing them to be able to implement the Convention. The second phase was initially focused on 15 Lead Partnering Countries (LPCs): Argentina, Bahamas, Chile, Colombia, Croatia, Egypt, Ghana, Jamaica, Jordan, Nigeria, Panama, Trinidad & Tobago, Turkey, Venezuela and Yemen. The LPCs were guided by a Global Project Task Force (GPTF) with representatives of the GEF, UNDP, IMO, the participating countries, the shipping industry, international environmental NGOs and other parties that have been able to contribute to the programme in a meaningful way. However, spearheaded by the activities of the LPCs, over 85 more countries have also participated and benefited from the work of GloBallast, some of them either participating in regional task forces or developing their own national strategies for ballast water management.

A major component of GloBallast was devoted to devising guidance and training packages specifically addressing the legal, policy and technical challenges that might be expected to arise on the road to implementation of the Convention at a national level. These built upon the introductory course produced during the pilot phase, which was primarily intended to bring the issue to the attention of stakeholders and raise their awareness of the issue of aquatic invasive species.

These packages were deliberately produced to be applicable to the widest possible audience. “Whether it is training material or other capacity building components, a key attribute of the Glo-X model (i.e. the 3-tier implementation structure developed by GEF-UNDP-IMO through GloBallast) is to maximise reach and ensure consistency. It means the methods and intended outcomes can be replicated not just in the LPCs but also more widely, therefore creating a multiplier effect,” explains Jose Matheickal, Chief Technical Advisor to the project at IMO.

But it wasn’t a case of one-size-fits-all. In each LPC, national consultants were engaged to modify these packages to fit their requirements factoring in culture and geography, and engaging local academic establishments to assist and provide their specialised knowledge. “The value of local knowledge cannot be overstated. In addition to the practical aspects of facilitation, it helps bring a sense of ownership and strengthens commitment, which are vital in a project of this kind. You simply wouldn’t get the same effect by temporarily parachuting in a specialist from overseas.” Using local expertise to develop ma-



A FOCUS ON CAPACITY BUILDING THROUGH NETWORKING, GUIDANCE AND TRAINING

terial and also developing links and working with academic and educational establishments to deliver that material had an important side-benefit: it increased the likelihood that the newly created training capacity would last. “Ensuring longevity was a consideration from the outset, not just for training but also for all the capacity building activities carried out under GloBallast,” remarks Matheickal.

As GloBallast progressed, it became increasingly evident that training port State control (PSC) officers in matters related to Compliance Monitoring and Enforcement (CME) would be necessary. However, this realisation also bought two problems to address: firstly, any training material would be dependent on decisions at IMO that were still under deliberation; and secondly, PSC officers were generally more familiar and comfortable spotting mechanical or structural non-conformities than

analysing biological samples.

An adaptive management style, that characterises so many aspects of GloBallast, was extremely useful. Explains Matheickal: “We deliberately held back until the final years of the project to push PSC training, as there would be greater consensus on the topic at IMO. We also quickly recognised that classroom training wasn’t going to be an appropriate vehicle for effective delivery for this particular topic. Instead, we opted for shipboard training as that’s where PSC officers spend most of their time”.

The four country profiles that follow demonstrate the transformative impact of GloBallast in building capacity, formulating national strategies, and simply bringing people together into new networks with greater collective power to tackle a global environmental issue.



LEAD
PARTNERING
COUNTRY:

ARGENTINA

Capacity building in action

GloBallast provided Argentina with a unique network for cooperation as it sought to protect the delicate ecology of its ports and inland waterways



Argentina had some early understanding of the risks posed by aquatic invasive species and particularly the threat to its rivers and inland waterways. Back in the 1990s, like its neighbour Brazil, it had contended with a proliferation of zebra mussels blocking the cooling water inlets to power stations. GloBallast helped to expand their existing national programme to the shipping community with the support of the Argentine Naval Prefecture (PNA)*. It is now well down the road of adapting internal regulations ahead of the Convention entering into force.

“A sense of urgency stemmed from a strong desire to protect the delicate ecology of our rivers – especially the Paraná River and the Río de la

Plata” says Miguel Humberto Bartorelli, who heads the Department of Pollution Prevention at the PNA.

In its capacity building efforts, the PNA worked in close cooperation with other state agencies, not least the Ministry of Environment, and engaged several universities to assist in the process of identifying aquatic invasive species and pathogens in Argentinean coastal and inland waters.

Through its participation in GloBallast, the PNA developed a range of training courses catering for different audiences, including in-depth modules on ballast water sampling and inspections. Says Bartorelli: “It was important that this was delivered in such a way that the knowledge and



*Prefectura Naval Argentina (PNA) is a service of the Argentine Security Ministry charged with protecting the country’s rivers and maritime territory. It therefore fulfils the functions of other countries’ coast guards, and furthermore acts as a gendarmerie force policing navigable rivers.



practical experience gained could be passed on to other personnel to maximise the benefit and ensure consistent application.”

“GloBallast offered a unique network allowing an unprecedented degree of technical cooperation between partner countries as they worked towards establishing and developing capacity for implementing the Convention,” adds Bartorelli. “It provided a mechanism so that partner countries could share their experiences. Comparing notes with other countries gave some valuable insights into some of the practical challenges that can be expected.”

Bringing clarity to both the multiple legal and practical aspects of implementing the Convention into domestic legislation was a major positive of the project for Argentina, notes Bartorelli. “This shouldn’t be underestimated. It is an absolute prerequisite for harmonising the application of the Convention at a global level so that it achieves its objectives of preventing the transboundary spread of potentially harmful aquatic organisms around the world.”

The PNA states it will continue regional cooperation as it prepares for the Convention entering into force in September 2017 and beyond. Bartorelli says there will be an ongoing requirement to undertake more training of personnel with respect to the new technologies being fitted on board vessels and different methodologies for managing ballast water.



Miguel Humberto Bartorelli,

Head of the Department for Pollution Prevention, Prefectura Naval Argentina

“A sense of urgency stemmed from a strong desire to protect the delicate ecology of our rivers – especially the Paraná River and the Río de la Plata – from cargo ships undertaking ballasting operations.”



RIO DE LA PLATA

The Rio de la Plata commonly refers to the river and estuary formed by the confluence of the Uruguay and the Paraná rivers. Extending 180 miles from the rivers’ confluence to the Atlantic Ocean it behaves as an estuary in which freshwater and seawater mix and hosts significant biodiversity, with a wide range of aquatic life from warm, temperate and cold waters. Several of these species are of outstanding global importance, from an ecological, economic and social standpoint including the rare La Plata River Dolphin. Already threatened by pressures such as overfishing, pollution and damming, the minimisation of an additional pressure, such as that of an aquatic invasion is a high priority.



LEAD PARTNERING COUNTRY: BAHAMAS

Building national strategies

In the Bahamas, the national policies put in place as a result of the GloBallast activities are as important in tackling aquatic invasive species as the Convention itself

ver 3,000 islands and small cays form the Commonwealth of the Bahamas, meaning whilst the impacts of aquatic invasive species can be significant ballast water management can be a daunting challenge. Nevertheless, in the last six years, the Bahamas have gone from having little concern about aquatic invasive species to embracing GloBallast so they can monitor the issue and put measures in place to manage ballast water. “We now have several strategies in place that would not have been in place if it were not for GloBallast,” explains Brent Williamson, Maritime Consultant at the Ministry of Transport and Aviation.

As they have done in many island nations, aquatic invasive species transferred through ships’ ballast water could significantly impact the Bahamas’ commercial fisheries as well as fishery-dependent communities, and to a lesser extent its tourism industry. There is also concern that some species could be problematic for powerlines and cables running through the port areas. As such, undertaking full assessments of the potential threats and impacts of aquatic invasive species on fisheries and other sectors is high on the agenda in the Bahamas, as are baseline surveys to assess – and later monitor – which aquatic invasive species have already made their home in some of the ports and surrounding waters of the Bahamas. GloBallast not only increased awareness about the risk of aquatic invasive species coming into the islands via ballast water, but also through other vectors. “We have a national invasive species policy document, not specific to ballast water or the sea, but a national policy,” Williamson proudly adds.

Central to the Bahamas success in GloBallast has been the development of a national ballast water strategy. Williamson believes the various documents that make up the strategy including assessments of the economic and legal aspects of ballast water management, and those that put in place policies and lay down plans of action, can be even more powerful than the Convention itself. These documents, Williamson explained, are the blueprint from which countries



BUILDING ON E-LEARNING

A major component in developing Bahamas’ ballast water management strategy was the training offered by GloBallast, which ranged in scope from specialist training for port State control in sampling methods, to ‘train the trainer’ programmes, to more generalist introductory courses in aquatic invasive species and the risks they pose, and on the Convention and its requirements. Williamson highlights e-learning as a particularly useful mode of delivery in reaching people from a mix of different backgrounds and representing different stakeholders.

Alongside the e-learning produced by GloBallast itself, Williamson notes that with the assistance of a higher education institution in the Bahamas, national e-learning programmes were also created. The advantage of e-learning as opposed to a more traditional classroom setting is its flexibility – it allows people to train at a time that is best for them whilst eliminating the logistical challenges and cost overheads.

The national training programmes have attracted interest from a wide range of sectors including port State control, immigration, customs, marine pilots, private companies, and oil companies. “The institution has really created a solid foundation for sustaining the programme after GloBallast officially concludes.”

are to work from. However, creating a national strategy is not straightforward – there are many different, and at times competing, stakeholder interests that need to be considered; “It’s about trying to satisfy the various stakeholders without compromising protection.”

The Bahamas is continuing to develop a legal framework for implementing the various Convention requirements on the ground. The size of the Bahamas’ ship registry poses some challenges, but from Williamson’s perspective the biggest challenge is technology. “New equipment, new vessels, new treatment systems – you aren’t going to get everything right the first time,” he remarks.

During some of the monitoring training for the port State control officers, Williamson observed how two different officers taking samples from the same ship can come up with two different results, if their methodology for collecting and analysing samples are not similar. The sampling process – including testing ballast water – can be a complex one. Williamson hopes that in the future some of the technology used to undertake inspections and to take and test samples, will become more streamlined and automated to reduce the risk of human error.

He also raised ongoing training of officers as vital, noting that officers were used to checking ship condition rather than running biological checks. “They are like fish out of water. It is something you have to get them accustomed to,” he emphasised. That said, Williamson estimates that within the next year or two, any problems related inconsistencies in compliance

monitoring will be ironed out, largely thanks to training initiated as part of GloBallast.

As the Convention comes ever closer to entry into force, securing funding for continuing to implement the strategies that have been put in place – training, assessments, etc. – becomes a greater priority. For this reason, the Bahamas is reaching out to industry partners to attract their support in coming up with mutually beneficial arrangements.

An arguably larger vision for the future is to share the fruits of GloBallast more widely. Williamson strongly believes that LPCs like the Bahamas have a duty to assist neighbouring countries who have not been a part or benefited from GloBallast so far. “The national strategy, economic assessments, legal framework are all documents that would not have been produced without the assistance of GloBallast”, he explains, noting that the Bahamas and other countries have received financial, advisory, and knowledge support from the wider GloBallast family. “We have a responsibility to act as a regional catalyst and ensure that our experience is maximised to its fullest potential.”

Here IMO could offer tremendous support by opening diplomatic doors between neighbouring nations through its Integrated Technical Cooperation Programme (ITCP), and support efforts and forge links between other countries. “If we can get the other countries on board with even basic guidelines and a framework of where they are, where they need to go, this will help tre-



Brent Williamson

Maritime Consultant at
the Ministry of Transport
and Aviation

“*The national strategy, economic assessments and legal framework are all documents that would not have been produced without the assistance of the GloBallast Programme*”

mendously,” he explained. Certainly partnering with other countries and helping them strengthen their own institutions is vital to ensure the success of GloBallast becomes a lasting legacy. As Williamson notes, when it comes to aquatic invasive species “you are only as strong as the weakest country around you.”



**LEAD
PARTNERING
COUNTRY:**

COLOMBIA

National hands-on trainings

The national strategy developed under GloBallast proved so successful in Colombia that the country plans to replicate the model for tackling other issues

Situated in the northwest of South America, Colombia is in the unique situation of having a coastline that stretches from the Pacific into the Caribbean. Ballast water discharge in its eight ports that service international trade is estimated at around 33 million tonnes, and the risk of introducing aquatic invasive species is high. “Identification of species is very complex, and the difficulty for our country is we don’t have all the specialists in taxonomy,” Mary Luz Cañón Paez, Asesor Defensa at the Dirección General Marítima (DI-MAR) explained.

Despite these difficulties,

Colombia has successfully documented a number of invasive species in their ports, including a crab that has made its way over from Indonesia. Cañón Paez highlighted that Colombia is not only a recipient of invasive species, but is also a donor, pointing out that some Colombian species have reportedly made their way into the US.

In the early years, much of Colombia’s GloBallast focus was on creating baseline surveys of the ports. These surveys are a fundamental component of ballast water management, though Cañón Paez notes that they are expensive. A Rapid Assessment Report was delivered in 2010, with an economic assessment of aquatic invasive species following in 2011. Together with risk assessment reports, compliance monitoring, and enforcement indicators, Cañón Paez highlights that updating these reports will ensure that Colombia continues to have the best available information on the invasive species that may threaten its biodiversity and human endeavours. Knowledge management tools in the form of a ballast water management database for eight major ports and the publication of quarterly newsletters, were also crucial in improving management, monitoring, and understanding of ballast water and aquatic invasive species throughout the country.

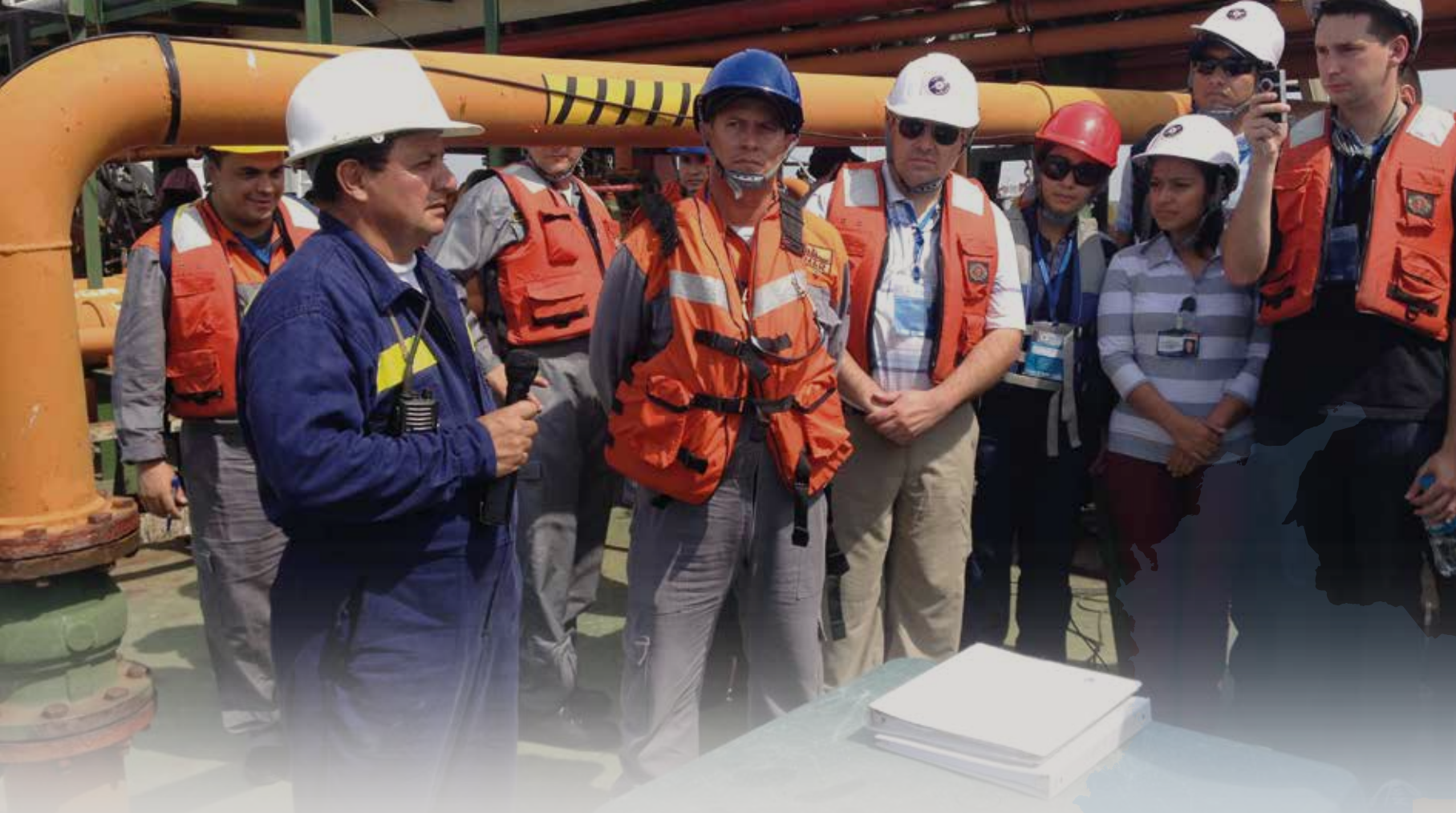
The importance of coordinating activities has played a central role in Colombia’s ballast water strategies. Although the Maritime Authority has responsibility for port, flag and coastal



**Mary Luz
Cañón Paez**

Ministry of Defence
Consultant, Responsible
for Marine Environment
Protection

“ Knowledge management tools, such as a ballast water management database for eight major ports, were crucial in improving our ability to monitor and understand ballast water and the extent of invasive species in Colombia. ”



State control, it does not have the legal power to call on any single government department to take action. Nevertheless, the Maritime Authority has facilitated discussions to tackle the problems associated with ballast water and aquatic invasive species in the country, and by 2008, a National Task Force was created. Its primary aims were to coordinate Colombia's Maritime Administration, create national legislation for ballast water management and monitoring, and ultimately ratify the Convention. To date, the Task Force has held 10 meetings with over 270 delegates attending, and has successfully created a National Ballast Water Management Strategy. The strategy is revised every five years, and has recently been updated with a plan put in place for 2016-2020.

At the regional level, Colombia sees such plans as including common guidelines and common actions among the countries that make up the Permanent Commission for the South Pacific (CPPS) – a regional organisa-

tion that represents Chile, Colombia, Ecuador and Peru. They also see the partnerships and implementation framework developed under GloBallast acting as a model for successfully implementing other international instruments such as the Biofouling Guidelines.

Cañón Paez also noted that the national strategy created under GloBallast can be applied in other areas. Colombia's Instituto Humbolt, for instance, adapted the framework for creating a strategy for safeguarding biodiversity and conservation on land.

Colombia has also embraced training to ensure the implementation of its ballast water strategies since 2008. Within Colombia itself, approximately 270 people have been trained from a number of different institutions and backgrounds, including inspectors, administrators, and scientists. Colombia has also taken on the role of creating regional training programs (including one for South American

and Caribbean countries), and has recently launched an online course for PSC Officers. Creating these courses is a lot of work. Translation of the GloBallast course and creating something specific to Colombia's inspectors took around four months. However, Cañón Paez believes that these courses, particularly the regional courses, are well worth the effort.

Cañón Paez acknowledges that Colombia could not have been so successful without the technical assistance and international cooperation brought through GloBallast. Whether looking at the local, regional, or international level, Cañón Paez emphasised that the GloBallast strategy was fundamental in standardizing procedures, and what's more, allows countries like Colombia to prepare before formally adopting the Convention. "We have to support and to implement this Convention, because our country has a lot of sensitive marine ecosystems, and a lot of biodiversity that is very important for us," Cañón Paez emphasised.



LEAD
PARTNERING
COUNTRY:

JAMAICA

Bringing people together

In Jamaica, the National Task Force set up under GloBallast facilitated a joined-up approach that proved vital in reaching agreement on policy, legal aspects and compliance issues

The biggest task facing Jamaica, one of five Lead Partnering Countries in the Wider Caribbean Region was to interpret and translate the Convention so that it could be successfully implemented in the Jamaican legal framework.

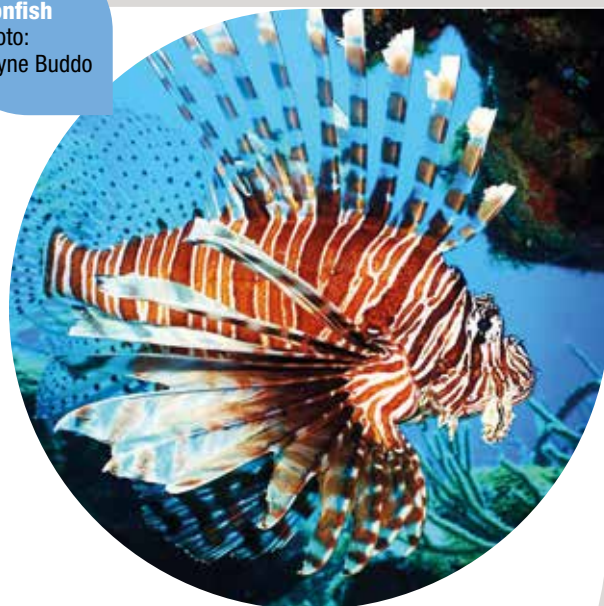
“The Convention is unique as it not only involves the maritime administrations and shipowners but calls for involvement from a large number of other local agencies,” explains Bertrand Smith, Director Legal Affairs, Maritime Authority of Jamaica, who was the national project coordinator. “A major achievement of GloBallast was the way it helped us to bring together and unite all the relevant stakeholders, including the public health department, environmental agencies, and academic institutions.”

The formation of a National Task Force was key to realising this. “It brought everyone on board to reach agreement on policy, legal aspects and compliance issues so as to meet the Convention’s requirements. It was essential in driving up engagement.”

In this respect, Smith credits the administrative framework devised under the programme, comprising a national focal point supported by a national task force with representatives from each agency. “In contrast to other IMO instruments such as SOLAS and MARPOL, the Ballast Water Management Convention has a much wider reach and spans more government departments – and each have their own distinct perspectives and focus areas. Sometimes these interests can initially seem at odds with each other, which can potentially result in conflicts that, without the intervention of GloBallast, might frustrate or delay the implementation process.”

Jamaica took full advantage of the training provided on the legal, policy and institutional arrangements that are necessary to implement the Convention. It held workshops at a national level aimed firstly at introducing the Convention to stakeholders and then delving into more detail on matters such as Compliance Monitoring and Enforcement for port State control officers and for flag State inspectors, and the technical aspects of sampling. It also participated in regional events.

Lionfish
Photo:
Dayne Buddo





“We were the first country in the programme to hold a national workshop on drafting of the legislation,” recalled Smith. “In addition to bringing together specialists from the various agencies, we invited a drafter and government attorney. This was a critical move since there are considerable challenges in drafting legislation to implement a convention you are not familiar with – for example, not knowing the full history behind particular clauses can impact how they are interpreted. This is probably true for any country but more so for developing ones. It was a highly beneficial and very fruitful exercise.”

The final national workshop was a ‘train the trainer’ event held in September 2016 targeted at lecturers who will deliver courses after the Convention has entered into force. This was another success story in terms of capacity building, said Smith. “Thanks to GloBallast, we have developed a pool of national expertise. The people delivering the course were Jamaican, as were the recipients. And they will carry and pass that knowledge on in the future.”

The combination of this knowledge, sufficient numbers of local personnel and an effective administrative structure – in the form of the National Task Force – puts Jamaica in a strong position for sustaining momentum when GloBallast comes to an end.



Bertrand Smith,
Director Legal Affairs,
Maritime Authority
of Jamaica

“GloBallast brought everyone on board to reach agreement on policy, legal aspects and compliance issues so as to meet the Convention's requirements. It was essential in driving up engagement.”

Overall, Smith paints a very positive picture. The structure of the support provided by GloBallast matched very closely with the needs of developing countries. In particular, the National Task Force was effective in breaking down barriers and building bridges between government departments that generally don't come together and collaborate in pursuit of a common goal. He also commends the PCU. “Having a structure is one thing, but you also need the personnel to make it work. The PCU made a difference because, throughout the whole journey, they were very open and available in providing support.”



TECHNICAL COOPERATION IN PRACTICE

MO adopts international shipping regulations but it is the responsibility of governments to implement those regulations. As such, effective technical cooperation was at the heart of GloBallast to support areas where a lack of technical knowledge or expertise was problematic. This was essential to enable LPCs to take ownership of the programme development and implementation process, with GloBallast support available through the provision of guidance, facilitation of networks and mobilisation of regional expertise and resources for technical assistance activities. One area in which this was particularly relevant was in the case of risk assessment and Port Biological Baseline Surveys – where technical cooperation was needed to generate in country expertise in marine biological concepts and applications related to ballast water management.

RISK ASSESSMENT

The movement of aquatic invasive species cannot be completely halted. Species have always migrated across the oceans by currents, for example, but this natural relocation is slower and more gradual than when being transported in the ballast water tanks of ships. Moreover the potential dangers of aquatic invasions vary in different waters and in different ecosystems. An understanding of the biological baseline is a fundamental first step to gaining a fuller understanding of these risks and to assess them.

One of the first achievements of GloBallast was to devise a risk assessment methodology based on the Centre for Research on Introduced Marine Pests (CRIMP) protocol developed by Australian researchers. This methodology takes into account where ships are travelling to and from, differences and similarities in water characteristics and water quality between the source and receiving port, and many other parameters in order to ascertain a baseline for future comparisons and analysis. GloBallast facilitated training, in particular for developing countries, building capacity for them to carry out and

perform their own risk assessments and baseline surveys in their own waters.

The value of these risk assessments is such that the effort was carried throughout the GloBallast project. However, it was realised that the methodology based on the CRIMP protocol was sometimes too meticulous and could be burdensome on developing countries who often had limited financial resources. As such, a tiered approach for baseline surveys was developed, allowing countries to select the one that best matched their capacity and capability.

BASELINE SURVEYS AND THE ASSESSMENT OF RISK

Throughout the period of GloBallast, Port Biological Baseline Surveys (PBBS) were undertaken in a number of ports within the LPCs. The aim of a PBBS is to provide an inventory of marine life in and around ports frequented by ships carrying ballast water to determine the presence, abundance and distribution of both native and invasive aquatic species. These surveys provide a baseline of biological data against which future changes in the structure and function of marine communities can be measured.

The ability to assess risks (of species transfer) presented by particular vessels operating between ports is dependent on having this biological data easily and readily available. Throughout the first phase of GloBallast PBBS informed a series of extensive ballast water risk assessments which were carried out in Brazil, China, Iran, India, South Africa and Ukraine. The ultimate outcome was the creation of a risk assessment tool to assess the potential risk from ships coming to those ports. This could then be employed as a decision support system by port State control when implementing the Convention.

Training on undertaking PBBS was carried out in most LPCs, while Turkey went a stage further and developed enhanced risk assessment software based on the risk assessment methodology from the first phase. Taking into account the source and receiving ports, as well as particulars of the ship type and voyage, the system gives an estimated risk level for each ship. Hence, inspections can be focused on ships which are assigned the highest level of risk.

COOPERATION WITH THE ACADEMIC COMMUNITY

The role of scientists in the undertaking of PBBS and risk assessment was of crucial importance. In fact, throughout the duration of GloBallast, LPCs have benefitted from engagement with local academic partners in order to benefit from expertise and to ensure sustainability of training. In one example, Jamaica addressed concerns held by port State control inspectors, with regards to the task of sampling ballast water, by engaging marine scientists from the University of West Indies, who were familiar with the task of biological sampling and had a genuine interest in the results. However, as well as understanding the scientific method, there was also a need for scientists to understand the Convention's requirements and the peculiarities of shipping. This is where the training provided by GloBallast really paid off.

Also of significant importance was the relationship built with the World Maritime University (WMU), a strategic partner to GloBallast – where the WMU focused on supporting administrations from developing countries. As Raphael Baumler, Associate Professor at WMU elaborates: “The expertise acquired through GloBallast is continuously shared with WMU students. Indeed, selected aspects of the training packages developed during GloBallast have been incorporated in the curriculum and discussed in classrooms. The ultimate aim is to prepare students to face the challenges related to the aquatic invasive species and also to highlight the broader role of IMO in technical cooperation”

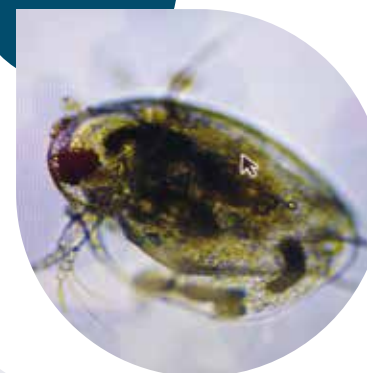


Raphael Baumler

Associate Professor,
WMU



Analysis of ships' ballast water



HOW LONG DOES A BASELINE SURVEY TAKE?

It takes on average two years to plan, prepare for, execute and analyse the results of a PBBS including planning, field work, laboratory analysis of samples and identification and classification of organisms. Choosing a representative sample is a particular challenge. The tools available and the fact species often move means that it is impossible to capture everything.

The work is both complex and rewarding. “You venture into environments that scientists seldom ever have opportunity to explore,” Adnan Awad explains. And Adnan knows the complexity and rewards more than most having helped implement several surveys in South Africa, as well as in Mombasa, Kenya and through training teams of scientists working along the East African coast and building local capacity in Ghana.



LEAD PARTNERING COUNTRY: TURKEY



A case-study in baseline surveys

Situated between the Mediterranean Sea and the Black Sea, Turkey offers an instructive case-study on taking a strategic approach to tackling aquatic invasive species based on risk assessment and the cost-benefits that may result

Shipping plays a vital role in Turkey's economy, with 87% of goods entering or leaving the country by sea. Some 387.5 million tonnes of cargo – including 7.1 million TEU containers and 350,000 vehicles are handled by 175 ports called on by ships 75,000 times annually, with an increase of 53% over the past decade.

A consequence of this activity is the discharge of an estimated 23 million tonnes of ballast water annually in Turkish waters and while these discharges originate from more than 800 different ports worldwide, most of the ballast water discharged is from the Black Sea and the Mediterranean Sea. To date, 66 different aquatic invasive species have been identified as being carried by ships to Turkish coasts, of which 19 have been classified as harmful organisms. The most damaging of those identified so far are the comb jellies *Mnemiopsis leidyi* and *Beroe* originating from the North Atlantic and the sea snail *Rapana Venosa* originating from the Sea of Japan.

As a GloBallast LPC, Turkey has been part of both regional and global responses to tackle the threat of aquatic invasive species. Capacity building and awareness-raising efforts, and specific scientific studies and projects, have been carried out in the country, both under GloBallast and a national programme.

Recognising the need for more informed risk-based decision-making, Turkey initiated a \$1 million national initiative, jointly executed by the Ministry of Transport's department of Maritime Affairs and Communications and the country's Scientific and Technological Research Council aimed at developing a ballast water management strategy.

Within the framework of the project, an inventory of shipping activity on the Turkish coasts was carried out to quantify the amount of ballast water discharged into Turkish ports and to define the sources of the ballast water.

THE COST OF AN AQUATIC INVASION

An economic assessment of the ballast water management plan for Turkey was carried out by the Maritime Administration of Turkey with support of GloBallast. The results indicated that the operational cost of implementing the management plan for ballast water would be significantly less than the estimated cost of the impacts from a potential aquatic bio-invasion.


It should be noted that only the direct economic loss from aquatic invasive species was calculated as the assessment methodology could not incorporate the indirect economic impacts for the non-use values related to cultural loss and other societal aspects.

Successfully preventing and managing aquatic invasive species can provide long-term economic, social and environmental benefits, including conserving biodiversity and health of ecosystems and maintaining the services they provide to local communities and wider society.

Total potential costs from IAS introduction in Turkey were calculated at \$8.16 billion.



Training
in Turkey



In addition, ballast water risk assessment software was developed allowing all Turkish ports to feed into the risk assessment process based on the GloBallast Risk Assessment Methodology. From this, a Geographical Information System (GIS) was prepared, which allowed the collected data to be visualised graphically. Furthermore, an aquatic invasive species database was produced.

Turkey also organised a pilot implementation of a ballast water management plan in the Port of Botas between 2011 and 2012 with the scope to develop training for port State control officers, enhance the inspection capacity of the port and execute ballast water sampling in high risk ships. Over the two year pilot study, 206 ships were inspected for their implementation of ballast water management plans and 37 of them were declared as high risk and ballast water samples taken and analysed.

This pilot study aided the identification of bottlenecks in the national implementation of ballast water management regulations, while the training boosted the capacity of local officers. As a result, Turkey started the Convention ratification process in order to create the legal basis for its implementation. Turkey prepared the draft national legislation to implement the Convention, with the continuous support of GloBallast. The Convention was adopted by the Turkish Parliament in April 2014, opening the way to ratification by Turkey later that year.



ORIGIN OF BALLAST WATER DISCHARGED IN TURKEY Data: 2010

SEAS	BALLAST WATER (TONNES)	PERCENTAGE
Mediterranean	12,794,422	54%
Black Sea	6,271,615	27%
North East Atlantic Ocean	1,332,463	6%
North West Atlantic Ocean	755,201	3%
Indian Ocean	582,168	3%
South Atlantic Ocean	493,292	2%
North West Pacific Ocean	465,468	2%
East Pacific Ocean	261,882	1%
Red Sea	250,398	1%
Persian Gulf	223,239	1%
Other	160,771	0%
TOTAL	23,590,920	100%

LESSONS LEARNED

- Strategic investments in prevention measures are required — rather than post-aquatic invasion damage control. This includes ratification of the Convention and the development of necessary national strategies and policy frameworks.
- While national policy frameworks should not be unduly burdensome, they should meet requirements set forth in the Convention. This implies a certain cost associated with the ratification of the Convention in ensuring its compliance, related to, for example, planning, monitoring, enforcement and capacity-building.
- Economic assessment of aquatic invasive species, their possible impacts and different management options can support strategic decisions regarding suitable responses, and facilitate national planning. It can also be used for other decision-making support, including making a case for ratification of the Convention.
- Specific partnerships should be developed at the regional level, as exemplified by the IMO- European Bank for Reconstruction and Development (EBRD) Marine Biosafety Initiative. Two workshops dedicated to the private sector and the Bank's clients were co-organised in Turkey to deliver specific advanced training on Compliance Monitoring and Enforcement of the Convention.



LEAD PARTNERING COUNTRY:
YEMEN

Responding to change

Yemen's work with GloBallast shows how environment conservation can still be considered a priority, even in the most challenging situations



With a coastline of over 2,100km extending from the Red Sea into the Gulf of Aden and over one hundred offshore islands, Yemen faces particular challenges in the management of aquatic invasive species. The Middle Eastern nation has three main ports and a number of minor ports dotted along its coast as well as several oil and Liquefied Natural Gas (LNG) terminals.

Shouldering responsibility for managing this diverse aquatic environment is the Maritime Affairs Authority (MAA). This body, which also administers maritime safety, pollu-

tion control and the implementation of international maritime conventions, was designated as the national lead agency for ballast water management under GloBallast.

The MAA drew up an ambitious two-year plan for 2015-2016 that would see the Convention submitted to the national cabinet for formal accession and set the wheels in motion for gaining formal approval from the Ministry of Transport for the relevant national legislation and regulations. The Authority was also preparing to carry out a risk assessment as well as identify ports for conducting baseline biological surveys.

“The guidance provided by GloBallast was a fundamental enabler in reaching this point,” says Mohammed Al-Gubari, MAA Deputy General Manager of Marine Environment Protection and GloBallast National Coordinator. “We had a very clear vision of where we were and where we needed to go. We had participation from the environment authority, the ministries of transport and health as well as representatives from ports and oil terminals.” Sadly, this plan was disrupted as the country has been in a state of political crisis since 2011 including seeing maritime blockades which have brought to a halt oil and gas exports from the country’s offshore terminals.

Predictably, the continuing conflict has severely undermined the ability of government bodies to function properly or at all. The MAA’s building in Aden was seriously damaged in the



Mohammed Al-Gubari

MAA Deputy General Manager of Marine Environment Protection and GloBallast National Coordinator

“Programmes like GloBallast are essential to encourage the institutions and decision-makers in developing nations to sign up and implement international conventions.”

ongoing fighting. “Until hostilities end and circumstances improve, we cannot carry out our duties as a maritime authority, explains Al-Gubari, highlighting the gravity of the situation on the ground.

Until the outbreak of the conflict, Yemen was making good progress in laying the foundations for effective ballast water management. After becoming an LPC in 2007, the first regional training workshop took place in Aden in 2008. Buoyed by this momentum, later the same year, it sent delegates to the inaugural GPTF meeting in London, UK.

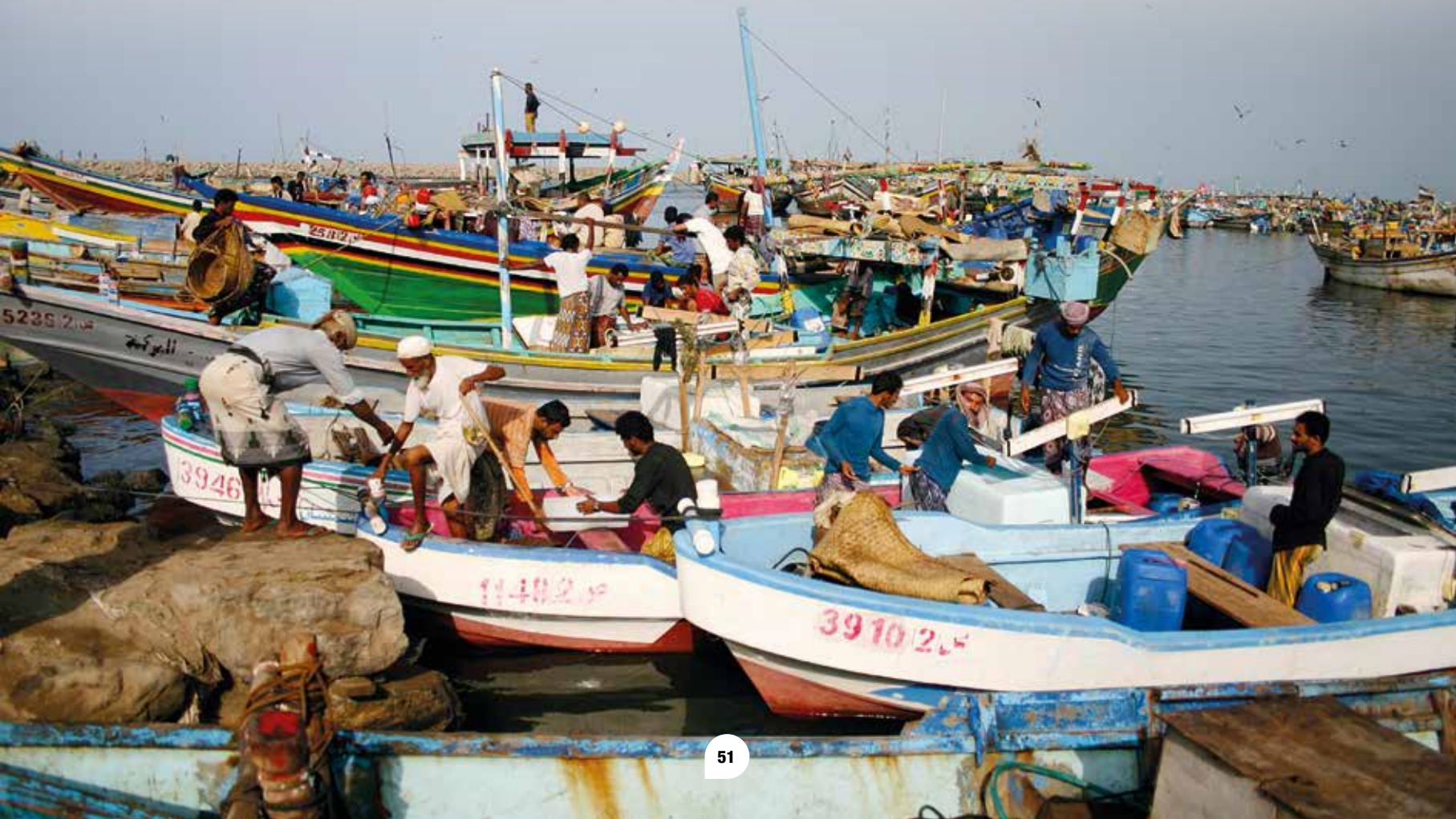
“GloBallast Partnerships was invaluable in providing us a very clear vision of what would be required for

implementing the Convention,” notes Al-Gubari. Furthermore, he credits the project for engendering a ‘positive atmosphere’ conducive to helping officials and experts get to grips with the issue and to work together in accomplishing a common goal. “Programmes like GloBallast are essential to encourage the institutions and decision-makers in developing nations to sign up to, and implement, international conventions.”

In 2009, it set up a National Task Force and joined the first Regional Task Force gathering held in Aqaba, Jordan. In 2010, a national training workshop in Al-Hodeidah precipitated the development of a National Ballast Water Management Strategy, as well as national ballast water sta-

tus and economic assessment reports. In spite of the political instability that has ensued since then, it still managed to participate in most GPTF meetings and IMO-GloBallast R&D forums.

Provided stability is restored to the country and the MAA can resume its activities, Al-Gubari is quietly optimistic that Yemen will be able to pick up where it left off and continue on its path towards ratification of the Convention and integration into national law. In spite of the conflict in his country, Mr Al-Gubari and his colleagues of MAA are a great example of resilience and a true model to all other LPCs, showing how environment conservation can still be considered a priority, even in the most challenging situations.



17 YEARS OF
ACTIVITIES



**ORIGINAL CASH
FINANCING FROM
GEF-UNDP: 13.7M**



**COFINANCING
CONTRIBUTION IN
CASH AND IN KIND: 51.9M**

COST OF THE PROJECT

140

TRAINING
COURSES

DELIVERED TO

2000+

PARTICIPANTS IN

81

COUNTRIES &

10

REGIONS

**GLOBALLAST
IN NUMBERS**

8 DIFFERENT
LANGUAGES

4000+



**PEOPLE LAUNCHED
GLOBALLAST E-LEARNING**

19

TESTING
ORGANISATIONS
AS PART OF
GLOBAL
TESTNET

5

AWARENESS RAISING
PUBLICATIONS WITH



Empowered lives.
Resilient nations.



4



INTERNATIONAL PRIZES



100+ PARTICIPATING COUNTRIES

65%

OF COUNTRIES THAT HAVE RATIFIED THE CONVENTION ACTIVELY PARTICIPATED IN GLOBALLAST ACTIVITIES

30+

COUNTRIES WITH NATIONAL BALLAST WATER MANAGEMENT STRATEGIES

GLOBALLAST IN NUMBERS



TECHNICAL PUBLICATIONS



1500+ ATTENDEES



PORT BIOLOGICAL BASELINE SURVEYS IN 6 DEMONSTRATION SITES



ENGAGING
THE PRIVATE
SECTOR

It was recognised early on that participation and support from the private sector would be an essential component in addressing the global-scale environmental challenge posed by aquatic invasive species. In a particularly innovative move, GloBallast stimulated industry involvement through the creation of the Global Industry Alliance (GIA) in 2009. This was a unique collaboration and pioneering public-private partnership between GloBallast and, principally, the major private shipping corporations.

“The Global Industry Alliance (GIA) was conceived to bring the commercial shipping industry on board with GloBallast resulting in a two-way exchange of ideas and alleviating industry concerns.”

THE GLOBAL INDUSTRY ALLIANCE (GIA)

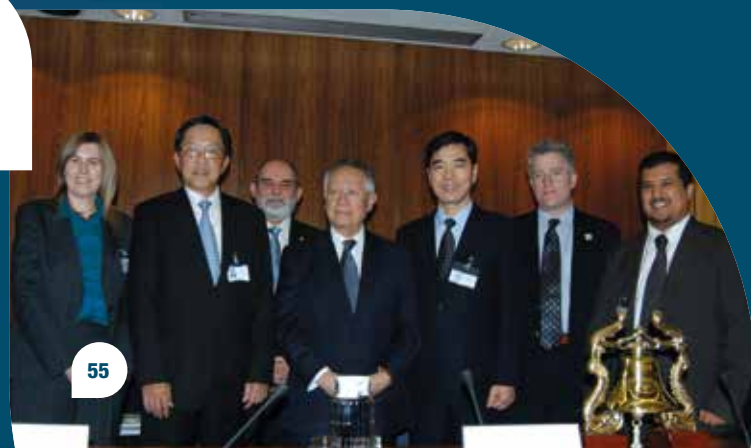


“When we designed the project, this was largely an aspirational goal. We were not entirely sure whether the shipping and other related industries would buy into the concept. Or if they did, whether that commitment would extend to supporting it financially,” admits Jose Matheickal, Deputy Director of Major Projects at IMO and Chief Technical Advisor of GloBallast.

As it turned out, these fears were unfounded. In fact, industry support initially manifested as funding for various initiatives aimed at raising awareness of the role of ballast water in the spread of aquatic invasive species. This was later followed by additional, and considerable, financial support that made the award-winning BBC -IMO documentary *Invaders from the Sea* a reality.

Shipowners recognised the value of joining the GIA as both a way of making their voice heard and to learn how they would be affected by the Convention. In the process, they gained a mix of practical and technical expertise and experience that would be necessary to meeting the Convention’s requirements. “It had an enormously catalytic effect,” enthuses Matheickal.

Signature of the GIA MoU



THE GLOBAL INDUSTRY ALLIANCE (GIA)

The increasing awareness of industry led to the formation of the GIA Fund which gathered generous contributions from industry and, under the supervision of the GloBallast Project Coordination Unit (PCU) supported a host of related activities. These activities had the aim of providing guidance in finding solutions for addressing ballast water issues that would, in particular enable the shipping industry to comply with the requirements of the Convention. This included the development of new technologies, and capacity building activities amongst other objectives.

Industry engagement, for example, precipitated the formation of the Global Ballast Water Test Organisations Network (GloBal TestNet) and ignited interest in alternative solutions for compliance, in particular port and shore-based ballast water management options and contingency measures. Furthermore, the greater awareness of the challenges facing industry emanating from conversations within the GIA was a driving factor in the development of the GloBallast e-learning course.

An example of a proactive member of the GIA was APL. CMA CGM took control of APL in June 2016. CMA CGM is the 3rd largest container ship-

GIA MEMBERS PAST AND PRESENT:

- APL
- BP Shipping
- Vela Marine International
- Daewoo Shipbuilding & Marine Engineering
- Keppel Offshore & Marine

ping company globally with Head Office based in Marseille, France. Shaj Thayil is the Managing Director for CMA CGM International Shipping Company Pte Ltd., based in Singapore, and chair of the GIA Task Force.

“As a responsible global shipping carrier, APL was dedicated to protecting ocean biodiversity,” he says. “With aquatic invasive species carried in ship’s ballast water identified as a major threat to the world’s marine ecosystems, effective ballast water management has been a hot topic of discussion among the global shipping industry and scientific community for many years.”

Thayil’s involvement with GloBallast, commenced when he was approached to join the GIA. “We recognised it as an innovative public-private partnership, which had the potential to assist in finding common solutions to address ballast water issues, including new technologies,” he recalls, adding that its capacity building activities also stood to benefit the participating private sector companies.

GloBallast was naturally very keen to engage with the private sector as a partner, as a number of concerns had been identified by the shipping industry, particularly regarding the added cost of introducing new and costly technology that had not been truly tested during real ship operations.

Participating in the GIA has helped its members to partner with technology providers, the scientific community and governmental organisations, in addressing a number of ballast water issues. In 2011, APL began installing treatment systems on board its vessels, to reduce the risks associated with the discharge of aquatic species. However, the technologies and applications

Shaj Thayil
Chair of the
GIA Task Force



that APL were pioneering at the time with the industry and solution-providers were not perfect. Preliminary implementation efforts saw equipment design flaws and operational issues, while repair and maintenance support was somewhat inadequate.

The GIA, however, was resolute in overcoming the challenges to be ready for the entry into force of the Convention. In turn APL strived to lead the way in implementing ballast water treatment technologies on board its fleet. Today, the majority of the APL-owned vessels are equipped with ballast water treatment systems (the remainder still undertake mid-ocean ballast water exchange).

Thayil recognises that active engagement, coupled with ongoing training efforts to educate treatment system providers and their representatives on maritime safety, is vital in finding solutions to any problems with installation and operation. Meanwhile, the rigorous operational procedures implemented by the crew working on APL’s vessels, supported by training and upgraded safety and control measures, have helped to improve the optimal functioning of these treatment systems. Resulting from these ongoing efforts, the functionality of APL’s installed systems has improved from 37 percent in 2014 to 73 percent in 2016.

“Through our involvement with the GIA and GloBallast we are

THE IMO-EBRD MARINE BIOSAFETY INITIATIVE

In 2010, GloBallast and the European Bank for Reconstruction and development (EBRD) joined hands together through an innovative partnership to build ballast water management related capacity in the EBRD region. The partnership was titled the IMO-EBRD Marine Biosafety Initiative (MBI) and utilised the GloBallast training materials to conduct training courses. In order to support the initiative, the EBRD agreed to provide co-financing of \$350,000.

Dr Craig Davies, now Senior Manager, Climate Change Adaptation, Energy Efficiency and Climate Change at the EBRD explained the reasoning behind the bank's interest: "There is, of course, a very good environmental reason why vessel operators, ports and other actors should tackle this problem," he said. "However, there is also an important business reason: it will soon become mandatory for the shipping industry to comply with the Convention. Those who don't will face serious operational constraints, as they may not be allowed to call at ports of countries that have ratified." The hope behind the initiative was to have a catalytic effect in the EBRD region, improving the competitiveness of the maritime and port industries and setting an example that neighbouring states would seek to emulate.

The MBI consisted of training on how shipping companies can safely exchange and treat ballast water, together with practical advice on how their vessels can be certified as compliant with the Convention. In addition, guidance was provided on infrastructure investment for International Financial Institutions (IFIs) to enable investment teams to identify and appraise practical and viable ballast water management implementation measures to be incorporated into an overall Financial Investment Decision (FID).

The MBI activities and training courses, which totalled 7, were organised in Russia, Ukraine, Turkey and Georgia and focused on the operational requirements for ballast water management and was aimed at public and private sector participants from the port and shipping industries. As stated by one of the participants, Eduard Tripolitov, a Trainer at the Batumi High Marine Engineering School ANRI and a sea captain with more than 45 years' experience "the training was necessary and excellent!" Additionally, following these interventions both Turkey and Georgia ratified the Convention.

contributing to better ballast water treatment technology," says Thayil. In fact it was discussions held at GIA that paved the way for the creation of GloBallast TestNet, an association of 16 worldwide testing organisations to promote and increase levels of standardisation, harmonisation and openness in testing ballast water treatment systems. Now, the market for commercial ballast water treatment systems is estimated to be worth between \$30-50 billion for the period 2014-2021."

The GIA also participated actively at the IMO-GloBallast Research and Development (R&D) Forum, which has established itself as one of the most highly-respected international gatherings on ballast water management and surrounding issues.

The sharing of technical and industry knowledge across the shipping community, scientific experts and government bodies has enabled the GIA to develop a dynamic e-learning portal on the GloBallast website. Available both online and offline, it offers courses which train stakeholders – including seafarers – on the operational aspects of ballast water management.

Thayil concludes: "It is our belief that collectively, the efforts of the GIA and GloBallast have enhanced the implementation of the Convention, and if it hasn't already, will dramatically reduce the number of new aquatic invasions. As the global shipping industry gets ready to comply with the Convention, once it has entered into force, public-private sector partnerships, exemplified through the GloBallast GIA, will be essential to raise global momentum in further tackling the ballast water issue and developing effective solutions collaboratively.

REPLICATION AT THE NATIONAL LEVEL

The momentum of the GIA was in clear evidence in November 2016 when the GloBallast team in Croatia organised and held its first National Global Industry Alliance (GIA) Conference on Ballast Water Management in the capital city of Zagreb. Held over two days, the gathering attracted a diverse group of national and international participants and speakers, with representation from IMO, the International Chamber of Shipping (ICS), shipbuilders, shipowners and operators, industry organisations and societies, the scientific and research community, as well as local government ministries and the EBRD. "We wanted to enable and create a platform for discussion of ballast water management issues from different angles and different perspectives," remarks Maja Markovic, who oversaw the country's involvement in GloBallast.

The conference put the spotlight on a range of topics, including Compliance Monitoring and Enforcement at a port State level, exemptions and exceptions and Port Biological Baseline Surveys. Updates from stakeholders including the shipping industry, ballast water treatment system manufacturers and testing organisations through the chair of the GloBallast TestNet also featured heavily.

Heralded as a huge success for all of those who attended, Croatia plans to host a second conference in 2018. Markovic points out that the tentative timing of the second conference is a year after the Convention enters into force. Certainly it will be interesting to see how the various stakeholders continue to progress to translate the GloBallast goals into real-world solutions.



**LEAD
PARTNERING
COUNTRY:**
CROATIA

Croatia knew it had to take ballast water seriously. GloBallast provided the tools and support that would enable stakeholders to work together in reaching workable solutions



Maja Markovic

State Secretary at the
Ministry of the Sea,
Transport and
Infrastructure

Public Private Partnerships (PPPs) at the National level

Croatia, with its long mainland coastline and over 1,200 islands – only 49 of which are permanently inhabited – in the Adriatic Sea, became an early adopter of ballast water management and one of the first countries in Europe to ratify the Convention. Croatia has fully embraced its role as a LPC. In 2005, five years ahead of ratifying the Convention, it had introduced mandatory ballast water reporting. By September 2007 Croatia became one of the first countries in the world to implement national regulations on ballast water management.

When Croatia first joined GloBallast, concern about aquatic invasive species was building within the Croatian government and among the general public. Tourism provides significant income and is a major source of employment for Croatia, much of which is centred on the Adriatic Sea. “Anything that could spoil that was immediately considered to be a future threat,” said Maja Markovic, who oversaw the country’s involvement in GloBallast.

Croatia also possesses oil in sufficient quantities for commercial production, and around the same time as the joining GloBallast, the government was considering oil exportation from one of its ports. “You have this biological threat and you have this potential income-earning opportunity from oil exports. GloBallast provided a set of tools that would allow us to strike a balance between protecting the environment and the need to keep trade and shipping open”, Markovic explained.

Perhaps one of the most important steps Croatia took early on was to create a national ballast water task force. Founded in 2008, the National Task Force (NTF) brought together a wealth of government ministries including the Ministry of the Sea, Transport and Infrastructure, the Ministry of Environmental and Nature Protection, the Ministry of Economy, Entrepreneurship and Crafts, and the Ministry of Agriculture, Fisheries and Rural Development, as well as the scientific community including universities and institutes such as Institute of Ocean-



ography and Fisheries, and industry stakeholders including shipowners and operators and shipbuilders.

Markovic recalls that initially there was some resistance from industry, but over time this diminished as industry participants recognised that the NTF provided an opportunity to raise their concerns and work with the government and other stakeholders to devise workable solutions. Croatia aims to keep the task force alive after the Convention enters into force in September 2017.

Thanks to guidance from GloBallast, some of the challenges Croatia faced in the early stages relating to Port Biological Baseline Surveys were quickly overcome, which added considerable value to the survey outcomes. “These were very important, not just to enable our scientists to work, but to harmonise the systems and make results comparable.” Today, baseline studies have been completed in almost all of Croatia’s major shipping ports, giving a full inventory of which aquatic invasive species are in ports around Croatia.

Training provided by GloBallast was equally important. Markovic emphasised the resources developed for seafarers and ‘train the trainer’ programmes as being particularly beneficial. “While people often have a general understanding of the ballast water issue, they seldom realise its full complexity or what the real solutions are.”

Croatia has nominated one marine institution for ballast water manage-

ment training so far, but is looking to expand the training nationwide. The long-term goal is to make ballast water management training an integral part of the regular seafarer training program offered in the country. It also wants to maximise training opportunities for port State control officers, so they have monitoring and compliance tools and skills necessary for successful ballast water management.

ENCLOSED SPACES

The Adriatic is a semi-enclosed sea, with an average depth of just 260 metres. Most of the sea, however, is much shallower. Only one area in the southeast reaches depths below 1,000 metres – though it is close to the coastline of Italy, Albania, and Montenegro.

This presents a unique but significant problem for Adriatic countries – where can ships arriving into the Adriatic conduct their ballast water exchange under the terms of the Convention?

Croatia is working closely with the other Adriatic Sea countries to answer this question. How they do so will most certainly help guide other countries facing similar situations, such as those around the Black Sea and Baltic Sea, and ultimately strengthen the implementation of the Convention.

DRIVING INNOVATION





Image: Aveva Marine

GloBallast played an instrumental role in the establishment of two significant annual, alternating events in the ballast water calendar: the IMO-GloBallast Research and Development (R&D) Forum and the International Conference on Ballast Water Management (ICBWM). These events quickly established themselves as some of the most highly-regarded, well-informed, multi-stakeholder gatherings on the subject and were pivotal in driving innovation- innovation in treatment systems, transparency in testing those systems, sampling and monitoring technologies and contingency-based measures amongst others. Each of the Conferences published proceedings which gathered every year the state-of-the-art scientific papers covering the latest research and development advances.

The R&D Forum in particular achieved what was widely regarded to be a rather difficult objective: bringing together all stakeholders with (often) differing views and diverging agendas including government representatives, regulatory bodies, industry, academia, leading scientific experts and technology developers. Engaging such a diverse audience in productive discussions on fast-moving, expanding areas of research and development proved crucially important in enabling progress in areas such as technology commercialisation.

The history of the R&D Forum provides an interesting parallel to the key technological and regulatory developments in the field of ballast water management from the introduction of novel treatment methods, the type approval process and alternative methods among others.

In particular, these gatherings played an instrumental role in facilitating the development of new equipment and solutions for treating ballast water on board ships, as well as techniques and methodologies for ensuring ships met the requirements of the Convention. As Jose Matheickal notes, the first R&D Forum was a uniquely important platform for manufacturers. “You have to remember we were laying the foundations for a completely new application of technology. There was little in the way of prior experience to draw upon. The forums allowed these engineering specialists to come together, exchange notes and share progress.”

A distinguishing feature of the forums, which convened six times in the 17-year span of both GloBallast phases, was its strong and sustained technical focus. It also served as a much-needed pipeline for disseminating the latest outputs from IMO, for example, regarding the efficacy standards for eliminating unwanted organisms that treatment systems would eventually have to satisfy.

This was particularly relevant during the pilot phase when the Convention text was still under development. While the overall objectives of the Convention were not in any doubt, progress was hindered by indecision over standards. It was proving difficult to reach agreement on what extent organisms residing in ballast water should be removed so that discharges would no longer pose a significant risk to new marine habitats. In short, how clean is clean?

It became increasingly clear that the Convention would hinge on setting these standards. Recognising that a growing number of experts were coming together under the GloBallast umbrella, IMO called upon the project to organise a global forum to inform its discussion, devise some possible standards and, hopefully, break down some barriers that were holding up the development of the Convention.

It was, recalls Matheickal, a critical milestone. “By the end of the first R&D Forum, scientists had drawn up a shortlist of about a dozen options. These were reverted back to IMO, where they could be assessed and evaluated from a policy perspective,” he explains. Besides helping remove the roadblock, it demonstrated the value of GloBallast in coordinating a growing number of experts and specialists, who had, until that point, mostly worked independently or with limited spheres of influence.

RESEARCH MATTERS

INCENTIVISING R&D INTO TREATMENT TECHNOLOGIES

27-29 March 2001, London, UK

Papers presented: 30

The first forum, held prior to the development and adoption of the Convention, had the positive effect of opening lines of communication between IMO, the R&D community, governments, ship designers, shipyards and shipowners on the issue of ballast water management and, in particular, the need to develop an alternative to ballast water exchange. This dialogue was vital for advancing R&D efforts related to treatment technologies which were, in 2001, all at very early stages of development. Now, of course many of those technologies are readily available and being installed on vessels – a testament to this early work.

THE EMERGENCE OF COMMERCIAL TREATMENT SYSTEMS

26–29 January 2010, Malmö, Sweden

Papers presented: 36

The third forum was held jointly with the World Maritime University as part of a week of ballast water activities – seven years after the second event and six years after the adoption of the Convention. It showcased a number of commercially available systems that had been developed in the wake of progress made at the previous gathering. By this time, seven treatment systems had received Type Approval Certificates, while some 20 others were in various stages of approval process. So with reasonable confidence that the matter of test protocols was in hand, the discussion turned toward shore reception facilities, sediment management, and the regulatory, technical and environmental challenges that might be dissuading parties to ratify the Convention. The third forum also began to consider the challenges facing shipowners.

CATALYZING INNOVATION

23-25 October, 2013, Busan, Republic of Korea

Papers presented: 27

With the Convention moving closer to its entry into force, the fifth forum held in the Republic of Korea further focused on CME and fostering innovative ways of meeting these requirements – providing assistance to those IMO Member States contemplating ratification and needing further expert opinion. Additionally, a secondary theme was the increasing consideration of ultra-violet light as a potential method of treatment. Already well-established for purifying drinking water and treating wastewater, the forum explored its suitability for ballast water, discussing the ‘live versus dead’ issue and calibration and validation of the methods used.

A GLOBAL SCOPE WITH FOCUSED OBJECTIVES

21-23 July 2003, London, UK

Papers presented: 35

The second forum introduced a number of viable, practical and effective management solutions and first recognised something that is still as valid today as it was then: that a single treatment technology would not match all vessel types and voyage profiles. Combined technologies were one of the main orders of business concluding that primary filtration or physical separation would almost certainly be necessary, followed by secondary biocidal treatment(s). The recognition and recommendation from the forum – that internationally standardised test protocols and verification procedures were in urgent need of development – was crucial in leading to progress with the Type Approval process and the subsequent rigorous testing against IMO approval standards via shore-based and shipboard testing of equipment.

A NEW R&D CHALLENGE AND OPPORTUNITY

26-28 October 2011, Istanbul, Turkey

Papers presented: 35

With the number of type approved systems more than doubling to 17 and a further 30-40 systems at different stages of development, the fourth forum explored more deeply issues surrounding Compliance Monitoring and Enforcement (CME), including such topics as sampling, monitoring and risk assessment. By this time, although the field of ballast water management was still developing, the ever growing pool of knowledge and experience around the world provided an encouraging sign that the global community was rising to the challenge and was determined to work together to address the issue. The critical knowledge gap identified at the forum was that operational experience was now what was really required. The fourth forum was also the first to give proper consideration to the needs of shipowners with a dedicated event held alongside.

MOVING TOWARDS IMPLEMENTATION

16-18 March 2016, Montreal, Canada

Papers presented: 29

With only 0.18% tonnage required for the Convention to enter into force, the sixth forum was focussed on some of the last remaining R&D challenges. In particular, the event highlighted the significant progress in alternatives to on-board treatment systems, such as port-based contingency measures, mobile treatment solutions and ballast water treatment boats. A diverse affair, the final event during GloBallast truly achieved the initial aim of engaging with a wide range of global stakeholders including national maritime administrations; shipowners and operators; ship builders and repair yards; test facilities; commercial treatment system manufacturers; R&D community; and the financing community.



Alongside the IMO-GloBallast R&D Forum, and since 2001, international stakeholders also met on a biennial basis in Singapore under the banner of the International Conference on Ballast Water Management (ICBWM). With the eighth gathering held in 2017 the ICBWM has expanded and enhanced on the work of the R&D Forum.



CONTINGENCY MEASURES

First expert workshop on contingency measures

Despite the significant technological advances related to on-board treatment systems even the most well outfitted vessel is at risk of sometimes being out of compliance with the Convention requirements due to challenges with equipment, operations, logistics, ambient water conditions, or other unexpected circumstances. As such, a need was recognised by GloBallast to explore contingency measures that could be available to ships entering ports in order to avoid undue delay.

The Global Industry Alliance (GIA) held two expert workshops on Port-Based BWM Contingency Measures under the auspices of GloBallast. These workshops were attended by experts representing the shipping in-

dustry, test facilities, port operators and administrators, BWT research (Academia and NGOs), technology developers, and the IMO. Whilst the first workshop concluded that the level of “need” was still unknown and was dependent on uncertainties in the ultimate demand and regulatory requirements, the second workshop catalysed a number of developments in this area that continue today:

- A ballast treatment boat which delivers and receives ballast water at a network of ports throughout various trading areas. A vessel could either be loaded with treated ballast water for future compliant discharge or a vessel could discharge untreated ballast water to the boat for treatment.
- A barge-based treatment system which connects directly to a vessel’s hull at the ballast water discharge pipe and carries on-board a treatment system to process ballast water as it is discharged from ships.
- An onshore solution where treatment systems are placed in containers that can be moved to a required destination on board a barge, truck or pontoon for example. The vessel then pumps ballast water off to the system for treatment.
- A mobile treatment kit which can be used on board a vessel. The principle is based on the lowering of a device into the ballast water tanks where an active substance is mixed into the ballast water, a hold time recorded, and a neutralising agent then applied.



New technologies and innovation are critical for ballast water management
Images: Damen



CONSISTENCY AND TRANSPARENCY



www.globaltestnet.org

One of the most applauded activities organised under the umbrella of GloBallast and the GIA was the establishment of GloBal TestNet – a network of organisations involved in testing for the type approval and certification of ballast water treatment systems. Global TestNet was a timely response to a growing concern within the shipping industry relating to the harmonisation of testing procedures of treatment systems.

The organisation was formally inaugurated by a Memorandum of Understanding (MoU) signed in October 2013 by representatives of 16 ballast water treatment system testing organisations. The remit was to achieve greater levels of standardisation, transparency and openness in the process of type approvals and thus raise the standards of quality control and quality assurance, in what can be a complex testing process. The signing followed four years of extensive discussion among testing organisations, which met several times under the auspices of GloBallast and the GIA.

Parallel to the activities taking place under GloBallast to prepare countries for implementation of the Convention, commercial manufacturers around the world set about developing shipboard treatment systems for purifying ballast water effectively and in an environmentally friendly manner. Before they can be marketed, these treatment technologies must undergo a rigorous testing and approval process to ensure they fully satisfy the stringent requirements of the Convention. However, concerns were growing within the shipping industry that the testing and approval process, which typically takes place at dedicated test centres, was lack-

ing in consistency. Thus the need for a level-playing field to ensure comparability – regardless of where the approval took place – became an increasingly frequent and heated topic of debate and conversation.

In January 2010, the first ever forum for organisations involved in the testing of treatment systems was held in Malmö, Sweden. This meeting was supported by the GIA and served as a first step towards increased dialogue and harmonisation between test facility operators. Following that breakthrough event, the organisations convened for a second time in 2010 in Singapore where the group agreed to start formalising their commitments to harmonise their approaches to testing under the G8/G9 Guidelines through a Memorandum of Understanding (MoU).

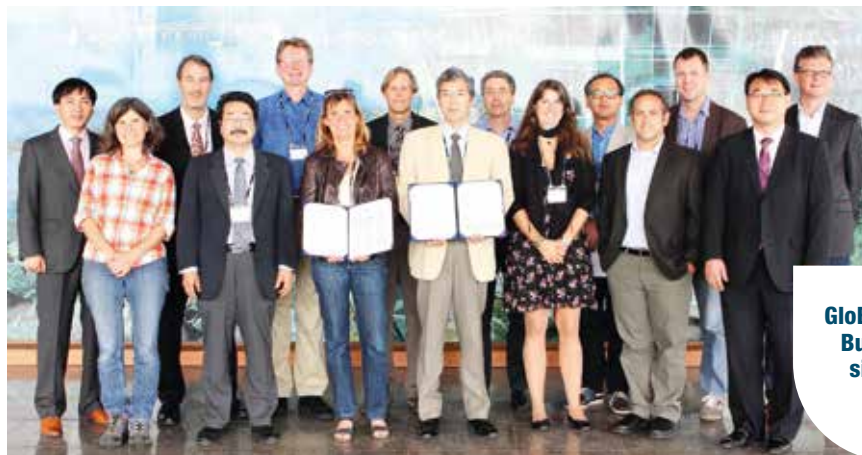
The group met again in Istanbul, Turkey in 2011, Singapore in 2012 and in Busan, Republic of Korea in 2013. It was in Busan during a pre-conference event held as part of the fifth IMO-GloBallast R&D Forum that the MOU was signed.

The sixth GloBal TestNet Forum was held in Plymouth, UK in December

“The remit of GloBal TestNet was to promote comparable and accurate test results on the performance of ballast water management systems for certification, through an open exchange of information, transparency in methodologies and advancing the science of testing.”

2014 with the purpose of establishing a secretariat and to contribute to the IMO debate on improving the G8 Guidelines.

“GloBal TestNet was not among the original objectives of GloBallast. But it wouldn't have happened without GloBallast or without the GIA,” says Tim Fileman, who is currently secretary of the GloBal TestNet. “While driven by necessity, it emerged organically from the wave of momentum that the project was creating more widely across the industry.”



**GloBal TestNet
Busan MoU
signature
(2013)**

Tim Fileman
Secretary of
GloBal TestNet



“The meeting in Malmö in 2010 marked a real turning point. By bringing specialists on the science and technology of ballast water treatment under a single roof, GloBallast played a pivotal role in catalyzing discussions that until then had been taking place informally and in a much more fragmented way,” Fileman says.

Initially some test centres were nervous about becoming involved, due to concerns relating to intellectual property. However, with continuous dialogue over a sustained period of time, this reluctance evaporated. GloBal TestNet has since gone on to form strong ties with several major classification societies and is keen to encourage engagement and form links with other relevant stakeholders.

“Cross-fertilisation between different organisations has been a hallmark of GloBallast since its inception,” Fileman explains. “This strategy has paid tremendous dividends and not just for the 15 Partnering Countries (LPCs). It is something GloBal TestNet has directly benefited from and see immense value in replicating.”

“GloBallast has been incredibly successful in meeting its core objectives. The LPC are developing nations. Yet they have reached a level of readiness for implementing the Convention that exceeds many more developed nations,” Fileman remarks, noting, for instance, that some major European nations are yet to carry out a full-scale Port Biological Baseline Survey.

It is important to remember however that, ultimately, the aim of GloBallast is for the Convention to be a success on a global scale – not just in the countries fortunate enough to have been direct recipients of its support. Its efforts in assisting and facilitating the activities of Global TestNet are a clear example of this broader intention.

And it is definitely not a one-way street, but a reciprocal relationship. The technical expertise collectively possessed by members of the GloBal TestNet is an invaluable resource, which feeds back into other activities carried out in the GloBallast programme. Fileman himself has prepared learning materials, given lectures and practical hands-on training

on ballast water sampling and testing to port State control officers in Jordan during a GloBallast workshop. These unplanned fruits of cross-fertilisation have contributed greatly to the overall scope of capacity building achieved over the duration of the programme.

Today, GloBal TestNet has a membership base of 19 testing organisations. GloBal TestNet has also noted the increased attention being given to hull biofouling – another vector by which invasive species can reach new habitats – and sees a possible future role in the type approval of hull cleaning systems, leveraging the experience and know-how it has accumulated on ballast water treatment systems.

The members of Global TestNet aim to gather annually, with meeting often coinciding with the IMO-Globallast R&D Forum.

1st meeting	January 2010	Malmö, Sweden
2nd meeting	October 2010	Singapore
3rd meeting	October 2011	Istanbul, Turkey
4th meeting	November 2012	Singapore
5th meeting	October 2013	Busan, Republic of Korea
6th meeting	December 2014	Plymouth, UK
7th meeting	March 2016	Montreal, Canada
8th meeting	January 2017	London, UK



BUILDING
REGIONAL
ALLIANCES



As well as participation by individual countries, it was apparent that strengthening cooperation within regions would be essential to maximise the catalytic effect of GloBallast. Enhanced cooperation would assist the implementation process by encouraging and facilitating neighbouring countries to pool common resources and share their experience.

GloBallast led the way with regards to collective action. The partnerships it fostered resulted in the formation of a Global Project Task Force (GPTF) and regional task forces, and the development of regional strategies and action plans on ballast water management in its five focus regions (i.e., South-East Pacific countries and Argentina, Mediterranean, West and Central Africa, Red Sea and Gulf of Aden, and Wider Caribbean).

A regional dimension was an integral part of the project from the outset, recalls Dandu Pughiuc: “In the conception phase, we took a three-tier pyramid: global, regional, and national. This enabled replication with all benefits filtering from the top to the bottom. It proved a highly successful model to the extent we envisage more GEF projects emulating this architecture.”

COOPERATION IN THE MEDITERRANEAN SEA

A regional tier was needed within GloBallast because in the beginning, a national level capability for tackling aquatic invasive species and promoting ballast water management was almost non-existent. However, a number of well-established regional organisations existed, which were already focussing on other areas of marine environmental protection.

Matheickal explains: “This regional tier delivered two primary benefits. Firstly, it gave us partners in the regions who had already made a commitment to protecting the marine environment, such as the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA) and the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC).

Secondly, we could leverage and capitalise on their structures and experience of engaging with local communities. These partnerships meant communication and consultation could be undertaken more closely and frequently than would have been the case had the GloBallast Project Coordination Unit acted alone.”

These partnerships were also invaluable in opening the regional dialogues necessary for addressing regional requirements. “Aquatic invasive species do not respect national borders, so when dealing with ballast water, national strategies alone – however well-intentioned and enthusiastically pursued – won’t be enough to tackle what is an inherently transboundary problem,” remarks Matheickal.

Regional dialogues were initiated during the pilot phase but were elevated as a priority later on. Testament to the success of this approach, is that in some cases regional strategies were drafted and added to the existing Action Plans.

The Mediterranean Sea has suffered more than other seas from aquatic species invasions. To date scientists have identified over 900 new arrivals in the Mediterranean Basin, which amounts to one new species entering the area every nine days. Of these, 21% are believed to have arrived in ships’ ballast water. Many more likely relied on intra-regional shipping traffic to enable their secondary spread within the region.

All the activities in the region were coordinated by REMPEC and also harmonised with the related activities and initiatives in the adjoining regional areas, namely, the North-East Atlan-

tic (via OSPAR), the Black Sea (via the Black Sea Commission), and the Red Sea and Gulf of Aden (via PERSGA).

This strategy was endorsed in 2011 at the 10th Meeting of Focal Points of the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea and approved by the UNEP/Mediterranean Action Plan Focal Points Meeting.

The Mediterranean Strategy document and its annexes provide an instructive example of how national initiatives can contribute to regional activities and cooperation. Common procedures for Compliance Monitoring and Enforcement were also formulated.



SOME ENDEMIC SPECIES OF THE MEDITERRANEAN SEA:

- Short-snouted Seahorse (*below*)
- Neptune Grass (*below left*)



COOPERATION IN THE RED SEA AND GULF OF ADEN



Dr. Salim Al-Moghrabi
Environmental Expert,
PERSGA

In the Red Sea, the regional strategic action plan was incorporated into the Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment – known as the Jeddah Convention.

PERSGA played a pivotal role in this accomplishment. Additionally, as a GloBallast regional tier partner organisation, it was highly effective in accelerating the implementation of the Convention among its membership, comprising seven countries on two continents. Three of these – Egypt, Jordan and Yemen – were also GloBallast Lead Partnering Countries (LPCs).

“Egypt ratified the Convention in 2007. Jordan followed in 2014, after extensive work through GloBallast. Yemen made lots of progress too. It was on verge of ratifying when, unfortunately, it was overtaken by political events,” summarises Dr. Salim Al-Moghrabi, Environmental Expert at PERSGA.

Work on national economic assessment and legislation was completed in all three LPCs of the region. National strategies were submitted and adopted in both Jordan and Yemen. In Egypt, the national strategy is still in development, whilst the final details and interface with the Mediterranean Strategy are ironed out. It’s worth noting that, thanks to GloBallast, PERSGA has also prepared strategies for some of its other members, notably Djibouti and Sudan, a further example of GloBallast’s catalytic effect.

“Faced with a new international convention, GloBallast was crucial on the road to ratification among our members. Through international workshops, it provided numerous opportunities for them to learn, gain expertise, and take steps to implement,” says Dr. Al-Moghrabi.

Bringing people and expertise together will have long-lasting benefits. Contin-

ues Dr. Al-Moghrabi: “Through the meetings, we met with some young geneticists and other specialists in biology from Egypt and Jordan. Their skills will be imperative in studying and classifying suspected aquatic invasive species. To put it simply, GloBallast has allowed us to recruit a new generation of experts, ensuring that efforts to tackle aquatic invasive species will continue for years to come.”



SOME ENDEMIC SPECIES OF THE RED SEA:

- Masked butterfly fish (*left*)
- Red Sea pipefish (*below*)



COOPERATION IN THE WIDER CARIBBEAN REGION



The coordinating organisation for GloBallast in the wider Caribbean region was the Regional Marine Pollution Emergency Information and Training Centre (RAC/REMPEITC-Caribe) whose contracting states represent around 23% of tonnage in the global fleet. Among them, the Bahamas, Jamaica, Panama, Trinidad and Tobago and Venezuela are GloBallast LPCs.

Since 2008, REMPEITC has coordinated 15 training courses on ballast water management, as well as taking part in 26 meetings and conferences. Recent highlights include a regional consultation to develop an action plan on invasive aquatic species for the Organisation of East Caribbean States (OECS); a 'train-the-trainer' workshop for port State control officers on sampling and analysis; and a regional workshop on Port Biological Surveys and risk assessment.

Over the duration of GloBallast, it has helped complete national assessments in all five member LPCs; build capacity in the region on Compliance Monitoring and Enforcement; and develop BWM strategies in partner countries such as Honduras and Nicaragua.

Another important achievement was the development in 2012 of a regional strategic action plan to minimise the transfer of aquatic invasive species. Going forward, in addition to discussing ways of harmonising national strategies, the organisation plans to review and revise its regional action plan in the light of GloBallast coming to an end and the imminent entry into force of the Convention. It will also consider the possibility of establishing a framework for regional ballast water reporting via the Caribbean MOU, as well as assess the scope for regional agreements on ballast water exchange and shared reception facilities.

COOPERATION IN THE SOUTH EAST PACIFIC AND ARGENTINA REGION

Regional coordination in the SE Pacific and Argentina was undertaken by the Permanent Commission for the South Pacific (CPPS), an intergovernmental organisation created in 1952 to coordinate the maritime policies of Chile, Colombia, Ecuador and Peru. Within GloBallast it also includes Argentina, making it three LPCs in its region (Argentina, plus Chile and Colombia). CPPS has supported countries through activities such as the participation of technicians



in training activities and promoting the exchange of experiences. It has been hugely successful in facilitating knowledge exchange between the LPCs and other countries in the region, including supporting training in Ecuador on National Strategy with trainers from Colombia, training in Peru on Compliance Monitoring and Enforcement and also sampling using a trainer from Argentina and assisting partner countries such as Ecuador and Peru in the development of National Ballast Water Strategies.

FORGING NEW GLOBAL RELATIONSHIPS

The regional cooperation facilitated by GloBallast was invaluable for another LPC. Croatia already worked closely with Montenegro, Slovenia, Italy, Bosnia and Herzegovina and Albania, its neighbours bordering the Adriatic Sea, in various activities to safeguard their shared marine environment.

Adding GloBallast to this framework was a natural course of action. As Maja Markovic, State Secretary at the Ministry of the Sea, Transport and Infrastructure (and the GloBallast national focal point for Croatia), points out: “Cooperation at the regional level often provides opportunities for cross-fertilisation. Linking GloBallast with other projects already underway resulted in a better use of finite resources and often generated a positive feedback loop where the outcomes of one project contributed to the others”.

Of course regional strategies can present their own complications. The Adriatic regional strategy is nestled within a wider Mediterranean strategy, and care needs to be taken to ensure that all of these strategies - including the national ones - fit together, so they do not overlap or conflict with each other. “It is for this reason that regional dialogue is so vital,” stresses Markovic.

But, GloBallast was about more than simply providing practical tools and guidance to regions. There were countless intangible benefits and achievements that merit praise, as Markovic explains: “We developed a much more detailed understanding of the issues surrounding ballast water management as a result of our participation. However, an equally valuable outcome were the great networking opportunities that GloBallast gave rise to.”

When Croatia became one of the first European countries to ratify the Convention in 2008, it immediately found

itself on the receiving end of numerous requests for more information. “We were suddenly connecting with people from around the world and that taught us how to look beyond our small ports. GloBallast both encouraged and enabled us to work with colleagues from different backgrounds, with different ways of thinking, both on the national, regional and international levels”, Markovic enthused.

Markovic emphasises that the connections made can help countries - even from completely different parts of the world, and with different backgrounds, economies, and experiences - discuss and address a range of marine environmental issues. “I know that if I need to discuss or obtain clarification on some detail regarding maritime matters, I could easily call my friends and colleagues from GloBallast. We become friends, we become family. This is very important”.

GloBallast began an organic process that continues to grow. In Croatia, ratification of the Convention was, as Markovic puts it, “not the end of the journey, but a new beginning”. For example, following ratification, Croatia found it needed to amend its national strategy. Whilst some of these amendments were made to meet the requirements of the Convention, others were in response to new knowledge gained from working with other countries through GloBallast and capitalising on the shared expertise and experience.

Regional cooperation made a valuable contribution in West Africa too, thanks to the International Ocean Institute (IOI), whose involvement as a GloBallast supporting organisation emerged from South Africa’s participation as a pilot country in the first

phase of GloBallast. IOI contributed considerably to the drafting of a regional strategy, which helped facilitate capacity-building activities in both Ghana and Nigeria, LPCs of the second phase.

In the South Pacific countries are represented by the Secretariat of the Pacific Regional Environment Programme (SPREP) which has the mandate to promote cooperation in the Pacific islands region and to provide assistance in order to protect and improve the environment and to ensure sustainable development for present and future generations. Although no LPCs are situated in the region the lessons learnt from other countries and within other regions have been invaluable. Achievements have included the development of a regional strategy for ballast water management and hull fouling, introductory workshops, PBBS training, model legislation completed, NTF meetings held in Fiji, Tonga, Samoa, Papua New Guinea, Tuvalu and the Republic of the Marshall Islands, national strategies completed in seven countries, and national Compliance Monitoring and Enforcement training completed in three countries.

The extent to which countries have come together at a regional level to enhance capacity building efforts and awareness-raising, as well as to develop a harmonised regional approach to ballast water management is a shining example of the transformative impact GloBallast has had.

Shared next are a selection of achievements from LPCs, which benefited in numerous respects from the productive exchange of information fostered by regional organisations and cooperation.

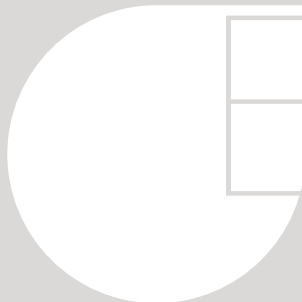


**LEAD
PARTNERING
COUNTRY:**

TRINIDAD & TOBAGO

Successful relationships

The transformative impact of GloBallast in Trinidad and Tobago helped strengthen links with neighbouring countries and sparked new collaborations



Ensuring the sustainability of the marine environment is critical for the future economic prosperity of Trinidad and Tobago. The island state is comparatively more industrialised than its Caribbean neighbours and uses seawater readily for industrial purposes. Aquatic invasive species first came to prominence in the 1990s when Asian green mussels started to clog the pipe filters used in industrial cooling systems.

In addition, Trinidad and Tobago has more recently fallen victim to lionfish invasions, which have had a profound effect of raising the issue of aquatic invasions amongst islanders. As such, gaining a fuller understanding of the detrimental effects of aquatic invasions provided Trinidad and Tobago a clear incentive to join GloBallast.

Trinidad and Tobago ratified the Convention in 2012 after becoming an LPC in 2006. A year after ratification, they invited consultants to perform a legal review and economic assessment in order to develop a national ballast water plan. GloBallast provided a template for setting up a National Task Force to support the follow-up actions from these activities, and to engage in initiatives aimed at raising awareness.

Industry, the academic community (University of the West Indies, University of Trinidad and Tobago), the ministries of Foreign Affairs, Immigration, Customs and Health, and the port authorities were among the numerous stakeholders represented within the NTF. Together they worked to review the proposed national plan in order to reach the optimal implementation strategy. The contribution of the academic community in this process deserves particular mention for helping communicate the more complex aspects of marine biology and the implications of the Convention in a way that could be understood and appreciated by other parties.

Trinidad and Tobago implemented a variety of training exercises, including a ‘train the trainer’ workshop to help build capacity at a national level. In a move aimed at ensuring continuity, the University of Trinidad and Tobago ran a pilot course on ballast water based on a curriculum provided by GloBallast. This will soon be made available ‘on demand’ to maximise the size and reach of the potential audience – both nationally and at a regional level.

In fact, the island state has already fortified its links with neighbour-



ing St. Kitts and Nevis and Dominica as a result of carrying out joint training and other activities aimed information exchange – a vivid example of the catalytic impact that has permeated so much of GloBallast. Moreover, such relationships will be essential to pushing forward the development of a workable regional strategy for coordinating and integrating national plans.

According to Ronald Alfred, the Director of Maritime Services Division at the Ministry of Works and Transport, one important lesson learned was that there is a lot of potential within the current legal framework without having to introduce new legislation. For example, national guidelines already existed, based on the precautionary principle, which required ships to exchange ballast water 200 nautical miles from the coast. Additionally, regional guidelines prohibit exchange in waters less than 18m deep.

From the outset, it was clear that a focus at a port State control level would be required, and while Trinidad and Tobago doesn't yet have a legal instrument for ballast water procedures, it has drafted guidelines with which vessels are complying. Alfred goes on to explain that ultimately a



Ronald Alfred

Director Maritime Services
Division, Ministry of Works
and Transport

“ We are keen to maintain the momentum and continue to demonstrate our leadership by getting involved in similar projects in the future ”

law will be passed, and that work on the preparation of this legislation is already underway.

Government commitment, stakeholder and institutional engagement, international and regional support, timely planning were all vital components for achieving the desirable outcomes of GloBallast. “It has been an important initiative with transformative impact,” summarises Alfred. “Having reached this far, we are keen to maintain the momentum and, if an opportunity arises, continue to demonstrate our leadership by getting involved in further similar projects.”

A MORE DETAILED PICTURE

The Environmental Management Agency in Trinidad and Tobago already collates a host of information on marine ecology from the assessments that oil and gas companies operating from the islands are required to submit. It is now adding to this repository data from ports, which will be employed to create a biological baseline picture of organisms already present in the local ecosystem. By combining these resources, it will be possible to target limited resources in the most productive manner.



**LEAD
PARTNERING
COUNTRY:
CHILE**

Awareness-raising and overcoming some significant logistical challenges were key items on the agenda on the road to national implementation in Chile



stretching over 4,200km from north to south, a particular challenge for Chile is its long coastline, which is dotted with around 100 ports, handling 113 million tonnes of cargo from more than 7,000 international ships visiting each year with the greatest amount of ballast water reaching the ports from the Asia-Pacific region, particularly Japan and the People’s Republic of China which between them represent about 50% of the total of national exports.



**Commander
Enrique Vargas**

Head of Marine Environment
Preservation, Marine Pollution
and Climate Change
Department

“GloBallast was essential in our efforts to bridge these gaps in understanding and demonstrate the benefits of tackling aquatic invasive species. The trick was to turn an invisible problem into a visible one.”

The importance of Compliance Monitoring

Enrique Vargas, Chile’s national focal point for GloBallast, reports that while staff at the maritime authority quickly grasped the implications of carrying aquatic organisms in ballast water and the potential risk they pose to the marine environment, it was a very different story when it came to communicating the importance of the issue to government departments and other stakeholders less familiar with the shipping industry.

He elaborates: “For example, it was difficult at first for officials at the Ministry of Health to make the connection between microscopic organisms floating in the ocean and the wellbeing of Chile’s population.

“So the awareness-raising resources and strategies offered by GloBallast were essential in our efforts to bridge these gaps in understanding and to demonstrate the wider and longer term benefits of tackling aquatic invasive species. The trick was to turn an invisible problem into a visible one.”

Sadly one kind of marine pollution has already made itself highly visible in Chilean waters. In recent years, marine scientists have observed a marked increase in algal blooms. Various hypotheses such as climate change and El Niño have been put forward, but the underlying reasons are still not fully understood. It is possible that aquatic invasive species are somehow playing a role in causing or exacerbating the phenomena.

AQUATIC INVASIONS IN THE CONTEXT OF BROADER ENVIRONMENTAL STRESS

Chile, like many of its neighbours in South America is highly impacted by a global phenomenon: the El Niño-Southern Oscillation (ENSO). Normally, the oceans of the coast of Chile are characterised by a northward flowing, normally cold, current which flows along the coast of South America and produces the upwelling of cold waters rich in oxygen and nutrients, the properties for dense concentrations of marine life. However, under conditions of ENSO, a weakening of the trade winds occurs bringing warm waters to the surface of the sea. These warm waters can not only decimate marine life but also lead to mass mortality resulting in drastic reductions of abundance that in extreme cases can lead to local extinction. However, sea water temperature is a critical factor in whether aquatic invasive species will survive and adapt or not. As such for Chile, one challenge is to not only understand the biological baseline under normal conditions but also under ENSO conditions.

Four of Chile's ports are due to be selected for biological baseline surveys. When these take place, marine scientists will have a much richer body of information to explore this angle and develop their theories. Irrespective of the blooms, the baseline surveys will provide the national maritime authority a clearer picture of the aquatic invasive species that may be threatening the health of the country's marine and coastal ecosystems.

The long coast line also presents challenges of a more pragmatic nature. The country's port State control officers are based at 16 major marine stations and they sometimes have to travel considerable distances – at very short notice – to inspect vessels arriving in Chilean waters.

For this reason, the assistance delivered by GloBallast in building capacity to run training courses related to Compliance Monitoring and Enforcement was particularly welcome. Chile

has now reached a position where it can educate and offer practical training to both port State control officers and environmental advisors with national expertise. The next step, says Vargas, will be to adapt and extend the scope of this training to shipowners. Another issue is that the equipment available for sampling and analysis varies from area to area. Work is now underway to establish common procedures and, where possible, push out resources, in order to ensure consistency in the sampling and analysis process.

Getting port State control officers to vessels is not the only difficulty caused by distance. Sending samples back to a laboratory for further analysis can also

be problematic. Whilst a protocol is in place for preserving samples, sometimes practical considerations have to take precedence, meaning it cannot be fully adhered to. Chile aspires to expand the number of sites capable of carrying the necessary sample analysis, but, says Vargas, the introduction of global standards for portable equipment to carry out indicative sampling would offer another solution.

Thanks to the various capacity building activities afforded by GloBallast, Vargas is optimistic the Convention implementation process will be a smooth one. "Considerable progress has been made in preparing the national legislation thanks to GloBallast."



THE RED SEA AND GULF OF ADEN

The Red Sea is a seawater inlet of the Indian Ocean, lying between Africa and Asia. The connection to the Indian Ocean is in the south through the Bab el Mandeb strait and the Gulf of Aden. In the north it is connected to the Mediterranean Sea by one of the busiest shipping routes in the world. Regional coordination in the area is undertaken by PERSGA which counts Egypt and two other Lead Partnering Countries (Jordan & Yemen) as members as well as Djibouti, the Kingdom of Saudi Arabia, Somalia and Sudan. All countries on the Red Sea have the potential to be impacted by aquatic invasive species, particularly through ships transiting the east-west shipping route and this was recognised early on by Egypt who ratified the Convention in 2007.

The economic assessment that Egypt carried out under GloBallast, working with PERSGA, was particularly important for all the Red Sea nations as it highlighted the potential losses that could be suffered as a result of an aquatic invasion and raised the importance in the eyes of policy makers. Losses that might be incurred

A strong commitment to regional cooperation proved highly effective in accelerating the implementation of the Convention in the Red Sea and Gulf of Aden region



for Egypt were based on the loss of fisheries resources, loss of natural capital, loss of income from marine recreational activities (including tourism) and cost of shoreline protection (where an artificial barrier might need to be built to replace a damaged coastal reef. The factors identified by Egypt could affect many GloBallast LPCs and IMO Member States but particularly those surrounding the Red Sea. The economic study concluded that the possible economical effect of aquatic invasive species to Egypt (worst case scenario) could be as much as \$2.6 billion compared to a

total annual operating cost of ballast water management of only \$4.5 million. This information provided both Egypt and the PERSGA countries with a profound reason to consider ballast water management options and to escalate national and regional initiatives.

Egypt has developed significant capacity under GloBallast undertaking not only an economic assessment but also a national ballast water assessment, a national legal review and a training capability with over 125 national and over 30 regional training workshops delivered and a training institution established at the Arab Academy for Science, Technology & Maritime Transport.

However, some challenges do still exist and Egypt and PERSGA are well placed to address them. Due to high vessel traffic, so far it has proved difficult for LPCs along the Red Sea to gain access to ports and carry out Port Biological Baseline Surveys (PBBS). However, Dr. Al-Moghrabi, Environmental Expert at PERSGA is optimistic that PBBS will take place in the near future: “Discussions and meetings are ongoing at various levels, and there is growing momentum for them to happen.”

A more immediate solution in the meantime is to seek the cooperation of another local stakeholder. “Fishermen are out at sea on a daily basis and understand the marine environment more than most. They are naturally quick to notice any new species arriving. We are developing a framework that would allow them to report anything unusual so that any observation isn’t lost.”





For Jordan the involvement in GloBallast was critical in enabling the country to ratify the Convention in 2014. Jordan, like its neighbour Egypt, made significant steps in its understanding of ballast water management and aquatic invasive species. In particular related to the Port of Aqaba, the only major port in Jordan which lies at the top of the Red Sea and welcomes 1,650 commercial ship-calls annually. Jordan quickly established a National Committee and held a Regional Task Force meeting in June 2009 and three subsequent workshops with PERSGA as well as enabling training institutions to deliver GloBallast specialised training.

Most importantly Jordan made significant steps towards being able to implement the Convention – steps it can share with its neighbours. These included the adoption of national regulations, preparation of a Ballast Record Book to be used on board all Jordanian ships and training port State control officers from the Jordan Maritime Commission to be able to perform inspections on board foreign ships calling at the Port of Aqaba, enabling them to enforce the requirements of the Convention.

As Chief Engineer Mohammad Salman, Director of Technical and Maritime Safety Affairs at the Jordan Maritime Commission elaborates:

“GloBallast helped our country to shine a light on the expected dangers that may occur within the Gulf of Aqaba if we neglect to deal with the issue of aquatic invasive species. GloBallast has allowed us to become familiar with the correct ways of sampling and analysing different types of potentially harmful organisms found in ballast water and in our marine waters. We believe that we have succeeded in making the first steps on a long journey to achieve our goal of protecting our Gulf in efficient ways, and that is the best lesson learned from the project.”

The challenge now for Jordan is to maintain and strengthen the cooperation and relationships with neighbouring countries and regional organisations in order to keep the water of the Red Sea, and thus the Gulf of Aqaba, free of any harmful aquatic organisms.

HIGH STAKES IN THE RED SEA

As a semi-enclosed body of water, the Red Sea has some notable hydrological and ecological characteristics, which result in some unique challenges. It is home to three kinds of sensitive habitats: coral reefs, mangroves and seagrass beds. These are all vulnerable to pollution and aquatic invasive species. The Red Sea sits on the major east-west route for shipping trade. Almost one-third of the world's crude oil is transported along this waterway. Consequently, large volumes of ballast water are discharged into the Red Sea.

In some places, the Red Sea is up to 2,200m deep, while at its connection with the Indian Ocean at the Gulf of Aden it is only 300m deep. This unusual geography means it would take around 20 years for its water to fully exchange naturally. Due to this slow circulation, about 30% of species are endemic, that is to say, cannot be found anywhere else in the world. If an invasive species establishes itself and disturbs the balance of this ecosystem, these endemic species will be lost not only from the Red Sea, but from the planet.

The stakes couldn't be higher.



THE WIDER CARIBBEAN REGION

The adoption of the Convention in 2004 woke Venezuela up to the potential threat and challenges posed by aquatic invasive species along its coast. Venezuela quickly established a Technical Support Group to explore the issue further and became a GloBallast LPC in 2006, upon which the National Institute of Aquatic Species (INEA) became the lead institution.

A National Task Force was formally inaugurated in 2008, which set about preparing a national program for managing and controlling ballast water from ships. It also started pre-



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Querales Rivero**

Instituto Nacional de los
Espacios Acuáticos
(INEA)

Two LPCs, Venezuela and Panama, benefited in numerous ways from the productive exchange of information and collaboration fostered by RAC/REMPEITC-Caribe



liminary work analysing the environmental characteristics at four ports known to receive ballast water, which will pave the way for more detailed biological surveys in the future.

Legislation on the documentation requirements related to ballast water management and inspection for ships in Venezuelan territorial water was enacted in 2012. In the same year, the country held a national forum on the subject.

In 2016, representatives from Venezuela participated in a regional training workshop on risk assessment and Port Biological Baseline Surveys organised under GloBallast and hosted by Jamaica.

Substantial progress has been made in preparing a proposal to amend the national law on marine and related activities to incorporate the provisions of the Convention. However,

there are a number of key details that still have to be resolved. The location of ballast water exchange zones is also under active consideration.

During its participation in GloBallast, Venezuela realised the importance of effective mechanisms for communication - at regional and global levels - to make best use of technical and financial resources, as well as to publicise the outcomes of activities to assist in advocacy efforts to different stakeholders. A good example of this was the broad and multidisciplinary approach when it organized a National forum on ballast water management in Caracas in 2012, attended by academia, the national shipping industry, government representatives and other stakeholders. This was replicated at four regional forums and nine informative workshops in its main coastal areas. Equally it found the National Task Force model - with broad and multidisciplinary participation - to be an effective mechanism for dealing with a complex environmental problem and plans to replicate this in tackling similar challenges in the future.

Thanks to the support of GloBallast, these efforts have contributed significantly to the preparation of national institutions for when the Convention enters into force. In the near future, Venezuela aspires to complete its economic assessment of ballast water impacts and do further technical training related to Compliance Monitoring and Enforcement for port State control officers.

Because of its geographical position between the Atlantic and the Pacific oceans, Panama is highly exposed to the risks of aquatic invasive species carried in ships' ballast water. The lead agency for its participation was the Panama Maritime Authority.

In the summer of 2016, a seminar was held by the country's maritime university to train national personnel on the technical requirements of the Convention and what implementation would mean for their roles. It was realised early on that the training of technical personnel and awareness-raising among different stakeholders and audiences would be vital components to bring about a positive change. Panama also completed an economic assessment measuring the potential impact of ballast water management on the national economy.

Recognising the scale of the ballast water issue and the importance of addressing it at global, regional and national levels in order to mitigate potential impacts, the Convention was successfully adopted into national law in September 2016.

Panama hosted the final meeting of the GloBallast Global Project Task Force (GPTF). The gathering held in Panama City in the spring of 2017, offered an opportunity to share the successes and celebrate the significant efforts all the stakeholders along their journey of preparing the implementation of the Convention.

The final meeting also put the spotlight on the legacy of GloBallast, with fruitful discussions taking



**Lic. Jose
Manuel Bosquez**

Deputy Head of the
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Authority, GloBallast
National Coordinator

place on how the many and varied benefits of the programme can be sustained into the future following its official conclusion. In particular, there was broad agreement that the regional level cooperation established by GloBallast offers a solid foundation for ensuring that momentum for ongoing activities is not lost. The fact these regional alliances and global partnerships exist at all is arguably one of the most important legacies of GloBallast.

The GloBallast
Family met in
Panama for the
final GPTF
meeting



WEST AND CENTRAL AFRICA

Although not formally constituted under a regional organisation, but with the support of the IMO regional office, GloBallast provided a route for two of the countries in West and Central Africa most likely to be affected by aquatic invasive species to collaborate and share expertise



Nigeria is a West African country situated on the Gulf of Guinea. The Gulf of Guinea and particularly the Nigerian coast are considered sensitive marine areas because of the intensive oil and gas exploration and exploitation, combined with the associated maritime traffic that supports these activities.

Nigeria has the longest coastline among the countries in West and Central Africa and therefore plays a leading role in ensuring cleaner seas through the prevention of ocean degradation from numerous sources, including ballast water. The country was one of the first IMO Member States to ratify the Convention and has since, through GloBallast, been actively working towards the development of a roadmap for implementing ballast water management at a national level.

Following a national workshop in 2010, the Nigerian Maritime Administration and Safety Agency (NIMASA) established a National Task Force (NTF) – a collaboration involving 16 relevant governmental and non-governmental organisations. All have since formally committed to the im-

plementation of the Convention. The NTF has been responsible for several major developments for ballast water management including a management roadmap, running pilot training courses for marine institutes, compiling an enforcement manual for the control and management of ballast water and the development of related regulations which will hopefully act as basis for new legislation in the future.

Nigeria is committed to raising awareness of ballast water management initially through engaging with locally operating shipowners, with a view to widening this to reach international shipping. Sussana Asagwara, director at the Marine Environment Management Department and national focal point remarks: “Before GloBallast, few people outside NIMASA - or even outside my department within NIMASA – had ever heard of aquatic invasive species. Awareness has improved dramatically thanks to the resources

and guidance delivered through the programme. It means we can have constructive conversations with shipowners, oil companies and other stakeholders.”

Nigeria intends to accelerate its initiatives on ballast water management through the development of new facilities including a test laboratory and designated reception sites for discharge and ballast water exchanges. It is also committed to bolstering its training capability with representatives participating in training related to Port Biological Baseline Surveys (PBBS). National training will be further ramped up with plans focusing on type-approvals, challenges associated with retrofitting, and periodic research to investigate aquatic invasive species, among other topics.



Sussana Asagwara
Director, Marine Environment Management Department
Nigerian Maritime Administration and Safety Agency (NIMASA)

Ghana is also situated on the Gulf of Guinea and faces a broadly similar range of potential impacts as a result of aquatic invasive species as its near neighbour Nigeria, with concerns surrounding the repercussions on fisheries, tourism, aquaculture and human health.

When Ghana first joined GloBallast an immediate priority was to identify key stakeholders that would go on to form the National Task Force. In its capacity as the lead agency for ballast water management, the Ghana Maritime Authority (GMA) approached and enlisted the participation of the Environment Protection Agency, the Ministry of Science and Technology, the Water Resources Institute and the Public Health Institute and the Navy (as an observer). It also brought on board the University of Ghana's Department of Marine Science, representatives from ports and harbours, the fisheries and aquaculture sectors, and the national oil company.

Under GloBallast, Ghana organised a National Task Force meeting and a forum for stakeholders. It also organised and ran a series of education and awareness exercises aimed both at industry and the general public in order to deepen their understanding of the ballast water issue.

With responsibility for developing of national legislation to implement the Convention, the GMA took advantage of a GloBallast 'train-the-trainer' workshop on sampling and analysis in Turkey and a workshop on risk assessment and PBBS in Croatia. In addition, it has undertaken training in Compliance Monitoring and Enforcement and in legal implementation.



Joining GloBallast provided Ghana the support it needed to perform a National Rapid Status Assessment and Economic Assessment, to develop a draft Ballast Water Management Bill, and to carry out a PBBS for the Port of Tema. These and other capacity building initiatives led to Ghana ratifying the Convention in July 2015.

GMA's Director of Technical Services Adaangiak Akanteyam says that bringing all the parties on board at an early stage was a key enabling factor in the progress made by the country. He also explains that Regional Coordinating Organisations (RCOs) have greatly assisted in project implementation. He continues: "The education provided by GloBallast in the form of the workshops and seminars, together with awareness-raising initiatives were highly beneficial in our progress." He also gives special praise to the 'train-the-trainer' workshop delivered towards the end of the project, which he believes will ensure that the outcomes of the capacity building activities are sustained going forward.

"The resources offered by GloB-

allast were essential in the development of strategies and assessments and legal reviews," he states, adding that the country is now in a good position to continue its work and accomplish the outstanding tasks needed to integrate the Convention into national law. If sufficient momentum can be found to re-establish regional cooperation, he reports Ghana is keen to share the experience it gained through GloBallast with its neighbours.



Adaangiak Akanteyam

Director, Technical Services
Division, Ghana Maritime
Authority



CONTINUING THE
TRANSFORMATIONAL
IMPACT



2017 is likely to be remembered as a turning point in the protection of the marine environment. World leaders will convene at the United Nations in New York, for what is being described as ‘the opportunity of a generation’ to pledge support for the implementation of Sustainable Development Goal 14 (SDG 14), which calls for a concerted global effort to ‘conserve and sustainably use the oceans, seas and marine resources’. The UN Ocean Conference will set about initiating concrete actions to reverse the decline in the ocean health – thus ensuring a sustainable future for the planet, its population and their prosperity. Achieving such an ambitious goal will doubtless require actively engaging with and building new collaborations between multiple stakeholders – an approach closely mirroring the strategies employed by GloBallast.

As GloBallast reaches its conclusion, the untiring efforts and unwavering dedication of everyone involved over its 17 years duration, whether at local, regional or global level, have already made – and will continue to make – a substantial contribution to this objective. The entry into force of the International Convention for the Control and Management of Ships’ Ballast Water and Sediments in September 2017 will significantly lessen the risk to ocean health caused by aquatic invasive species. Through its extensive capacity building actions, GloBallast has laid the foundations for its swift integration into national legislation around the world.

Director of IMO’s Marine Environment Division Dr Stefan Micallef believes GloBallast was an exceptional example of direct, large-scale action brought about with the support of IMO, GEF and UNDP. “Through GloBallast, governments, industry



Dr Stefan Micallef
 Director of IMO’s
 Marine Environment
 Division

and other numerous stakeholders have contributed to address one of the key marine environmental challenges” The pioneering work of the GEF, UNDP and IMO, together with the exemplary efforts of participating governments and industry stakeholders, has also won GloBallast international acclaim, with the programme receiving several prestigious awards over the course of its duration. In the spirit of SDG 14, it is imperative the ‘GloBallast family’ continues on this journey of collaboration to protect our ocean.

In 2003, towards the end of the pilot phase, GloBallast won the Institute of Marine Engineering, Science and Technology (IMarEST)’s Queen’s Golden Jubilee Marine Environment Award. In 2007, “Invaders from the Sea”, the documentary film produced in association with the BBC as an exercise to raise awareness of the ballast water problem among a wider audience, won the gold award for the Best United Nations Feature Film at the third annual UN Documentary Film Festival.

In 2013, the Programme was the recipient of the Marine BizTV International Maritime Award for “Best Innovative Project” and most recently, in 2016, the Project Coordination Unit won the best Portfolio Solution Award in the 8th International Waters Conference (IWC8) for the Glo-X partnerships model which embraces both GloBallast and its sister project GloMEEP – the Global Maritime Energy Efficiency Partnerships Project.

“These awards recognise the innovative and championing efforts of our lead partnering countries, regional coordination partners, global strategic partners, including GEF and UNDP and members of the Programme Co-

CATALYZING FINANCE

The three-pronged GEF-UNDP-IMO intervention strategy supported both the development of a global regulatory framework and provided an enabling environment for technological developments leading to significant private sector participation.

Private sector companies, shipowners and related stakeholders around the world collectively invested at least \$100 million in research and development, which culminated in a variety of technological solutions to satisfy the demanding requirements of the Convention. It is projected that the shipping industry will invest at least \$35 billion installing this technology on around 60,000 vessels over the next decade.

In summary, the GEF-UNDP-IMO intervention through GloBallast mobilised a total of \$14 million in GEF grant financing which was matched by at least \$50 million in co-financing commitments from governments and other partners. This, in turn, will catalyze an estimated \$35 billion in private sector investment to address one of the most serious transboundary marine environmental issues facing the international community.



Chris Severin
 International
 Waters Coordinator,
 GEF

ordination Unit at IMO. They each played a role in making this global project a true success story,” says Dr. Jose Matheickal, Chief Technical Adviser of the Project at IMO.

The GEF provided two grants, totaling \$14 million, supporting the 17-year process leading up to today. Chris Severin, the organisation’s International Waters Coordinator, says the implementation of the Convention will not only assist nations in their pursuit of SDG 14, but that globally it will stimulate private-sector investment of what is approximated as \$35 billion. “It is an unprecedented opportunity unlocking the potential of the so-called ‘blue economy’,” Severin said.

The final meeting of the GloBallast Global Project Task Force (GPTF) was hosted by Panama, a Lead Partnering Country that ratified the Convention in 2016 and had taken a number of significant steps to promote ballast water management inspired by GloBallast. The meeting, held in Panama City, promoted the role that the GloBallast LPCs are playing within their respective regions to bring about an effective and sustainable response to the ballast water management challenge. This was the 5th and final GPTF, which has convened every two years and was at the heart of the GloBallast achievements: the stakeholders, and most importantly the recipient countries, were directly indicating the Project Coordination Unit (PCU) their needs in terms of training. The PCU could then adapt the budget and activity-planning for the coming biennium accordingly to address the direct needs of the countries.

One reason behind the unique success of GloBallast was the model it created for establishing a network of

COUNTRIES EMPOWERED ALSO WITH THE CAPACITATED TRAINING INSTITUTES



ARGENTINA

Escuela Superior de la Prefectura Naval Argentina <http://www.prefecturanaval.edu.ar/esup/>



BAHAMAS

LJM Maritime Academy <http://ljmma.edu.bs/>



CHILE

Centro de Instrucción y Capacitación Marítima (CIMAR) <http://www.cimar.cl/es/>



CROATIA

University of Rijeka. Faculty of Maritime Studies <http://www.pfri.uniri.hr/hr/>



COLOMBIA

Escuela Naval de Cadetes “Almirante Padilla” <http://www.escuelanaval.edu.co/index.php>



JAMAICA

Centre for Marine Sciences

The University of the West Indies, at Mona, Jamaica <https://www.mona.uwi.edu/cms/>



PANAMA

Universidad Marítima Internacional de Panamá (UMIP) <http://www.umip.ac.pa/>



TRINIDAD AND TOBAGO

University of Trinidad and Tobago

Faculty of Maritime Studies <https://u.tt/>



GHANA

Regional Maritime University <https://www.rmu.edu.gh/pages/>



NIGERIA

Maritime Academy of Nigeria, Oron <http://www.maritimeacademyportal.org/>



EGYPT

Arab Academy for Science, Technology and Maritime Transport <http://www.aast.edu/en/>



JORDAN

Aqaba Marine Science Station

University of Jordan <http://ju.edu.jo/home.aspx>

ADAPTIVE MANAGEMENT

GloBallast had to embrace an adaptive management style, not often seen in other projects. Much of the information that needed to be disseminated – and possibly absorbed into training materials or other capacity building tools – was based on the outcomes of discussions taking place in committees and subcommittees at IMO.

The difficulty was that sometimes it was often hard to predict precisely when those discussions might finish or when a decision might be reached and what those decisions might be. Having sufficient flexibility to respond quickly to new developments was vital for ensuring that GloBallast remained relevant and could fulfil its objectives.

This agile and flexible framework for responding to changing needs, coping with unanticipated circumstances, learning from past experience, and heading in new directions was helpful to all IMO Member States and GloBallast beneficiaries. Furthermore, it now offers a proven platform for ensuring the success of similar future projects aimed at facilitating significant legislative changes on a global scale.

partnerships. These partnerships joined the LPCs the shipping industry and academia, among many others, to catalyze knowledge sharing, training and capacity building. The breadth of these partnerships was further extended through the establishment of regional task forces in 12 developing sub-regions, resulting in regional strategies and action plans on ballast water management which altogether involved more than 100 countries.

GloBallast also facilitated capacity building at the national level, helping to establish national task forces and assisting with drafting and adopting the national legislation in 80% of its LPCs. Finally, a network of 12 training institutions will continue to train stakeholders with the implementation of the Convention from port State control officers through to shipowners and operators, ensuring the sustainability of the Project's capacity building and technical cooperation efforts.

GloBallast catalyzed the development, adoption and ratification of an extremely complicated international

Award-winning project



Convention, and supported national and regional governance reforms in many countries including Small Island Developing States and Least Developed Countries.

Additionally, it has created substantial economic benefits by spurring technological research and development promoting the creation of a sizeable ballast water treatment industry valued at over \$35 billion. These solutions could not have materialised without GloBallast's novel and innovative approach which included not only partnership at national and regional levels but also a ground breaking public-private sector partnership – the Global Industry Alliance for Marine Biosecurity (GIA).

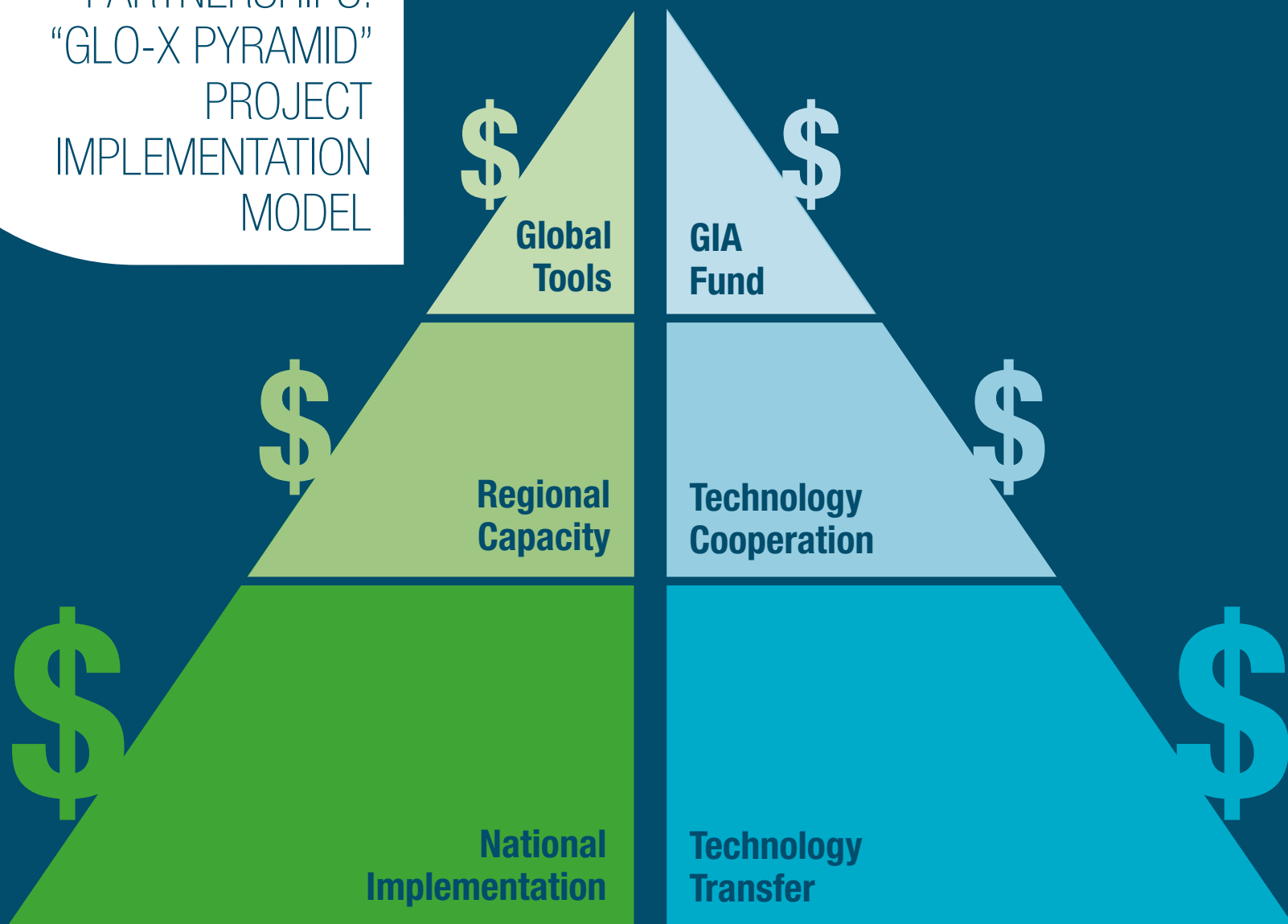
GloBallast's transformation from a stand-alone programme focused exclusively on ballast water management to what has become a model for innovative global, regional and national partnerships including private sector partnerships to support the conservation of oceans and seas and in particular the implementation of SDG 14 is likely to remain as a lasting legacy. As Dr Andrew Hudson, Head of the Water & Ocean Governance Programme at UNDP explains: "GloBallast has pioneered a successful model for collaboration, cooperation and capacity-building, which is now being emulated through other 'Glo-X' projects."



Dr Andrew Hudson

Head of the Water & Ocean Governance Programme at UNDP

BUILDING
PARTNERSHIPS:
“GLO-X PYRAMID”
PROJECT
IMPLEMENTATION
MODEL



The Glo-X model itself is again a legacy of GloBallast and recognises more broadly that maritime transportation is an essential component of sustainable development because the world relies on a safe, secure and efficient international shipping industry which cost effectively transports 80 percent of internationally traded goods and commodities. As well as contributing to SDG 14 the Glo-X model also contributes to two further SDGs – SDG 9 and SDG 17. SDG 9 focusses on building resilient infrastructure, promoting sustainable industrialisation and fostering

innovation which has been exemplified by GloBallast through the R&D Forums, the GIA, the establishment of GloBall TestNet and the significant developments in the commercialisation of ballast water management technologies. SDG 17 focusses on revitalizing the global partnership for sustainable development again exemplified by GloBallast the success of which has been a result of partnerships at a three tier level: Global with UN, multi-lateral, non-governmental organisations and academic institutions, regional with the regional coordinating organi-

zations (RCOs) and national with the lead agencies of the Lead Partnering Countries and national task forces.

In the context of GloBallast, the Glo-X model has successfully addressed the threat of aquatic invasive species carried in ships ballast to marine and coastal ecosystems. The same model is now helping minimise the shipping industry’s contribution to greenhouse gas emissions that contribute to ocean acidification through the Global Maritime Energy Efficiency Partnerships Project (GloMEEP).

Furthermore, a proposal is currently under discussion to wrestle with the issue of biofouling, which some experts consider a vector for the transportation of aquatic invasive species as, or possibly more, important than ballast water.

It is too soon to contemplate measuring any reduction in aquatic invasions as the Convention is still on the verge of entering into force at the time GloBallast ends in June 2017. Even when it does in September 2017, it will take years, if not decades, to detect a measurable change in the incidences of aquatic invasions caused by ships' ballast water.

But what we can be certain about is that many countries, and in particular developing countries who are often most impacted by aquatic invasions, are now armed with a wealth of expertise putting them in a much better position to implement the Convention. In turn the world as whole is now better equipped to reduce the unintended migration of aquatic invasive species. There could not be a more fitting testament to GloBallast and the efforts of each and every member of the 'GloBallast family'.

As Dr Hudson so eloquently puts it: "The GEF-UNDP-IMO GloBallast Partnerships Programme has played a key catalytic role in preparing countries and the shipping industry for the implementation of the Convention, which will reduce the significant ecological and economic damage, lost livelihoods and human health impacts often caused by invasive species. As Dr. Hudson puts it, "GloBallast was a transformational project in building capacity and partnerships – there could not be a more fitting testament to GloBallast and to the efforts of each and every member of the 'GloBallast family'.



HULL BIOFOULING

Ballast water is just one of the major vectors for the transfer of invasive species. Another common vector is hull fouling, whereby harmful organisms attach themselves to the outer hulls of ships and are carried and released into new environments. Because of these parallels, a strategy which tackles threats posed by both ballast water and hull fouling would certainly minimise the future risk of aquatic invasions and subsequent impacts on natural ecosystems and local economies across the globe.

In addition, better management of a ship's hull condition could improve its hydrodynamic performance, as fouling significantly increases resistance through water, which in turn increases fuel consumption and emissions of air pollutants and greenhouse gases. Therefore, enhanced biofouling management is likely to be as effective for boosting energy efficiency and reducing air emissions from ships as it is at preventing the spread of aquatic invasive species.



GLOBALLAST PCU TEAM MEMBERS, PAST AND PRESENT

1st PHASE PCU

From left to right: Dandu Pughiuc, Steve Raaymakers, Christine Gregory and Jose Matheickal



2nd PHASE PCU

From left to right: John Alonso, Fredrik Haag, Antoine Blonce, Jose Matheickal and Aicha Cherif

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