

From the Editor

As 2003 drew to a close and the foundations were laid for the adoption of the new *International Convention for the Control and Management of Ships' Ballast Water and Sediments* in February 2004, the international community could at last begin to look forward to reduced impacts from aquatic bio-invasions, through improved control and management of ships' ballast water transfers.

This period also marked the end of the 13 year term of Mr William O'Neil of Canada as Secretary-General of IMO, during which time he oversaw the adoption and/or entry-into-force of no less than 15 new IMO Conventions, Protocols and other international instruments on maritime safety, security and environmental protection, as well initiating a vigorous programme for the more effective implementation of IMO instruments by member States.

With the assumption of duties by the new Secretary-General, Mr Efthimios E. Mitropoulos of Greece on 1 January 2004, we are honoured to welcome him as Guest Speaker. In his article, Mr Mitropoulos shares with us his vision for the world's oceans, the role of IMO, the importance of a uniform global approach to the regulation of shipping, the importance of the new ballast water Convention, and our responsibilities and obligations to future generations. The vital need for the new ballast water Convention is highlighted on page 3 with an article outlining the continuing, and alarming increase in the discovery of new invasions, including in areas previously thought to be relatively 'pristine'.

The preparations being made by many countries - especially through cooperative regional arrangements - to implement the new Convention once it is adopted, are explored on pages 4 and 5. Many regions of the world having already developed or are developing regional ballast water management structures (many through the GloBallast programme). Together, they represent more than 100 countries that are already well advanced in their preparations for the rapid implementation of the IMO ballast water Convention.

We also present on pages 5 to 7, an overview of the extensive global network of sites around the world that have been or are being surveyed for aquatic invasive species. Such surveys and monitoring are vital in our efforts to understand the patterns of biological invasions in coastal areas, to devise better control and management measures, and to assess the effectiveness of such measures over time. While the global network that has been established in recent years is indeed impressive, future needs and priorities to ensure a truly effective system are presented.

Our colleagues at IUCN - the World Conservation Union, again provide two very interesting articles, one on the impacts of aquatic invasive species on coral reefs, and the planned response by IUCN and one on the provisions under the international Convention on Biological Diversity relating to aquatic invasive species.

We complete this issue with reports on recent activities in two of the GloBallast Pilot Countries, South Africa and Ukraine, followed by some recent initiatives in the field of ballast water treatment. Adoption of the ballast water Convention will undoubtedly stimulate increased efforts to develop new, more effective ballast water treatment technologies, and we hope to bring you more information on this matter in future issues.



Steve Raaymakers
Contributing Editor

From the Programme

2003 was a productive year for GloBallast with most of the activities reaching their final stages. Some of the technical activities were completed and a number of conclusions emerged. Most of the lessons learnt underlined the principle of addressing the problem of the transfer of harmful organisms in ballast water at the source port. This approach is consistent with modern principles of best-practice in environmental management, where efforts are directed at preventing rather than curing environmental problems.

The programme attempted to capture the lessons learnt in the ten modules of the GloBallast Capacity Building Package, which was successfully validated for the second time in I. R. Iran in December 2003. Four additional deliveries are planned for 2004 in China, India, South Africa and Ukraine. It is hoped that the experience accumulated during this process will be consolidated in a long term strategy for training and capacity building that will ensure the basic knowledge and skills and assist the necessary change in attitudes towards a global problem with sometimes catastrophic and, in most cases, irreversible impacts and consequences.

It is widely accepted that through its technical activities GloBallast has actively contributed to the development of the imminent ballast water Convention and, in particular, to the guidelines attached to the instrument. The Programme Coordination Unit is prepared to continue its support by assisting the proceedings of the coming Diplomatic Conference and is confident that the instrument will be successfully adopted.

Standing by its earlier commitments to set-up and sustain the necessary mechanisms to assist its member States to meet their obligations under the new instrument, IMO has created a solid institutional basis by establishing an 'Office for Ballast Water Management', to act as Secretariat to the new Convention. This, together with the adoption of ballast water as a new priority under IMO's Integrated Technical Cooperation Programme, will ensure at least part of the necessary sustainability after the adoption of the Convention. As newly appointed Head of the Office, I will assume responsibility from 1 March 2004.

The fact that the Organization decided to offer this important position to one of the GloBallast staff has been perceived as an additional recognition of the success of the Programme. To ensure continuity and sustainability of GloBallast, the Programme's current Technical Adviser, Steve Raaymakers, has been promoted to Chief Technical Adviser, and an additional professional will be recruited to fill the resulting gap in the PCU.

With the adoption of the ballast water Convention the international community will take a major step towards sustainable management of marine and coastal resources, although the significance of the ballast water issue will not diminish entirely. The transfer of invasive aquatic species in ships' ballast tanks will remain one of the most serious environmental challenges facing the shipping industry and the world. I am leaving the programme with the hope that IMO, UNDP and GEF will explore all possible roads ahead to find the most appropriate solution to continue their support to address the challenges.



Dandu Pughiuc
Chief Technical Adviser

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Guest Speaker

Mr E. E. Mitropoulos
Secretary-General
International Maritime Organization



Efthimios (Thimio) E. Mitropoulos was born in Piraeus, Greece, in 1939, to a genuinely maritime family, his father being a merchant navy chief engineer and his mother the daughter of a master and owner of brigantines and schooners captained by his sons.

Mr. Mitropoulos graduated with honours from the Aspropyrgos Merchant Marine Academy in 1959 and served on merchant ships on voyages around

the world, until entering the Hellenic Coast Guard Academy in 1962. He graduated in 1964, again as chief of his class with honours, and started his career as a commissioned Coast Guard Officer. He retired from the Hellenic Coast Guard with the rank of Rear Admiral.

Between 1966 and 1977 Mr. Mitropoulos participated in the work of IMO, initially as a member and later as Head of the Greek Delegation. He served as vice chairman and chairman of various committees and sub-committees, in the work of Council and the Assembly, and with the Greek delegation to the UN Convention on the Law of the Sea.

Mr. Mitropoulos joined the IMO Secretariat in January 1979 as Implementation Officer in the Maritime Safety Division. Following several promotions, he was appointed Director of the Division in May 1992. In May 2000, he was designated Assistant Secretary-General, retaining his duties as Director of Maritime Safety, and on 1st January 2004, he took up the position of Secretary-General. He is the sixth Secretary-General of IMO, and the first to have risen through the ranks of the organization itself.

The importance of our duty to protect the marine environment for future generations cannot be over-stated. Oceans and seas cover more than seventy percent of our planet. More than 60% of the world's population lives on the coast, and this is expected to rise to more than 75% in the next 20 years. Fisheries and aquaculture are vital for future global food security, and yet the majority of the world's fisheries are either fully or partly over-fished and require urgent remedial action. The world's oceans continue to be used as sinks for the world's wastes, and are under threat from, amongst other things, marine pollution, over-fishing, global climate change and of-course, invasive species.

And in this marine environment the global shipping industry operates. Shipping is truly global and multi-national, carrying more than 90% of world trade. As such it underpins the continued economic development of human society, and is a vital force for the delivery of improved living conditions through trade and commerce. This highlights the need to balance environmental concerns with economic considerations of world trade, and importantly, safety of life on ships. It is in this context, that IMO is working to ensure that our children and their children, will inherit a world with clean, productive, safe and secure seas. In the last ten years or so, scientists, governments, the community and industry have come to increasingly

recognise the harm that invasive species can cause to marine and aquatic environments. Today, invasive species are considered to be one of the major threats to marine biodiversity, as well as posing significant economic and public health problems. Every major international conference on the environment in the last decade, including the United Nations Conference on Sustainable Development in 1992, the Conferences of Parties to the Convention on Biological Diversity, the World Summit on Sustainable Development in 2002 and the 5th World Congress on Protected Areas in 2003, have highlighted the issue of invasive species, and called upon governments and industry to act. While shipping is by no means the only route through which harmful species may invade new areas, ballast water and hull fouling are both contributors to this global problem, and IMO and the shipping industry have taken concerted action to find ways to address the issue.

IMO has, in particular, been addressing the ballast water issue for more than 10 years. IMO has developed two sets of guidelines addressing the management of ballast water, and has executed a major effort to assist developing countries through the GloBallast Programme. All of this work has now led to the development of the *International Convention for the Control and Management of Ships' Ballast Water and Sediments*, which will be considered for Adoption at the Diplomatic Conference 9-13 February 2004. Adoption of this Convention will mark one of the most significant marine environmental achievements since the MARPOL Convention, by providing a uniform, global regime for the control of harmful species transferred by ships' ballast.

The importance of international standards and a uniform global approach cannot be over-emphasised when dealing with a trans-boundary industry like shipping. The new ballast water Convention will certainly have impacts on the industry, however these will be far less disruptive than the alternative, potentially disparate regional and unilateral responses, which would undoubtedly proliferate in the absence of the Convention.

The new Convention provides flexible options and builds on the complimentary roles of coastal, port and flag States in protecting the marine environment. It retains the current management measure of ballast water exchange at sea, for the foreseeable future, while providing for continuous improvement by setting standards to stimulate the development of alternative, more effective management measures over time.

For the immediate future, it will be important for IMO and the industry to continue to raise awareness of the harm caused by invasive species, and the need to deal effectively with ballast water and sediments to prevent their unwanted proliferation. Adoption of the Convention and clarification of its operational requirements, will allow IMO to develop the standards of competence that are so important to ensure that the seafarers tasked with overseeing the operations, are given the appropriate training in order to develop and maintain the new skills and knowledge that they will require.

In considering the adoption of the new Convention, we will do well to recall that the oceans divide not nations, but rather link us all in a single great continuum of pulsating tides, swirling currents and vibrant trading routes, a superlative unifying force. To the sea we owe so much of our heritage, and from the sea will flow our future. Adoption of this important and vital international legal instrument, will be another major step to ensuring that this future is one for which our children will thank us.

E. E. Mitropoulos

New Invasions on the Rise

Studies in various parts of the world are showing that the incidence of aquatic bio-invasions, including those mediated by shipping, is continuing to increase. This highlights the urgent need for a concerted management response, including the adoption and effective implementation of the International Convention for the Control and Management of Ships' Ballast Water and Sediments.

SW Atlantic No-Longer Pristine

In 2001, Argentinian and Uruguayan marine scientists undertook a review of introduced marine species in the South-western Atlantic, including Uruguayan and Argentinian coastal and shelf waters (Orensanz et al 2002). This area, the so-called Patagonian Shelf Large Marine Eco-system (LME), is generally considered to be one of the remaining, relatively pristine areas of the world's oceans, especially south of Bahia San Blas (south of 40°S). It has sparse human population, very few, industrialised sites, little to no agriculture in the coastal catchments, few major ports, and no offshore oil or gas development. However, the area is a concentration point for international shipping traversing between the Atlantic and Pacific Oceans via Cape Horn. The review found that sadly, below the surface, all is not as pristine as might appear.

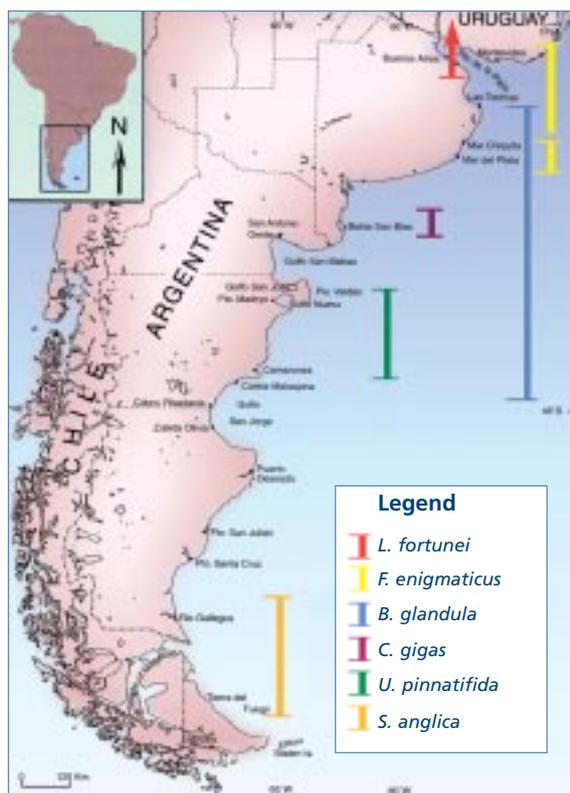


Fig. 1: General ranges of some aquatic invasive species in SW Atlantic (adapted from Orensanz et al 2002).

Orensanz et al (2002) found 31 species that can confidently be classified as alien, and a further 46 species that may be introduced, although this is not certain from

existing knowledge. Five of these invasions (Figure 1) have already caused significant ecological impacts:

- the barnacle *Balanus glandula*, an invader from the North-eastern Pacific, has developed inter-tidal belts along all South-west Atlantic rocky shores;
- the Asian mussel *Limnoperna fortunei* has established via the Rio de la Plata, well into the Plata and linked river catchments, potentially threatening the entire Amazon and associated river basins;
- the reef-forming marine worm *Ficopomatus enigmaticus* has strongly modified estuarine systems in Uruguay and Argentina;
- extensive reefs of the Pacific oyster *Crassostrea gigas* are expanding rapidly in shallow bays in the region; and
- the northern Asian giant kelp *Undaria pinnatifida* is spreading rapidly across the near-shore seabed of central Patagonia.

Zooplankton invaders cause concern

Many studies of aquatic bio-invasions tend to highlight larger, more obvious organisms, especially benthic species in inter-tidal and coastal waters, such as those reviewed above. However, a recent article in the newsletter of the NIWA Centre for Aquatic Biodiversity and Biosecurity in New Zealand, suggests that micro-scopic alien zooplankton may well also be of concern (Bradford - Grieve 2003). While there have long been concerns about the transfer of toxic phytoplankton in ships' ballast water and sediments, planktonic animals such as small copepod crustaceans are now also being assessed.

Bollens et al (2002) reviewed zooplankton introductions and found that 68 species of aquatic zooplankton have been recorded in new areas outside their known ranges. Of particular note are documented changes in the species composition of zooplankton communities in west coast estuaries of both North and South America. North-east Asian species have appeared in recent years and some bays, such as San Francisco, have experienced dramatic changes in their zooplankton communities, suggesting far-reaching changes in the entire eco-system.



Some recorded invasions by planktonic copepods in North and South America. Without proper ballast water treatment, similar transfers may occur between other regions (from Bradford-Grieve 2003).

Regions Prepare for Convention

In previous issues of Ballast Water News we have reported on efforts by several of the GloBallast Pilot Countries to establish cooperative regional arrangements, to support uniform implementation of IMO ballast water management arrangements and provide for regional replication of technical activities carried out at the initial Demonstration Sites.

Regional initiatives carried out or supported by GloBallast up until the end of September 2003 include:

- **South East Pacific:** A meeting of experts from member countries of the Permanent Commission for the South Pacific (CPPS), comprising Columbia, Chile, Ecuador, Panama and Peru (BW News 14).
- **Southern & East Africa:** The 1st meeting to form the GloBallast Regional Task Force (RTF) and develop a draft Regional Strategic Action Plan (SAP) for Southern & East Africa, comprising Angola, Comoros, Kenya, Madagascar, Mauritius, Mozambique, Namibia, Seychelles, South Africa and Tanzania (BW News 12).
- **East Asia:** The 1st East Asia Regional Workshop on Ballast Water Control and Management, which formed an RTF and developed a draft Regional SAP (comprising PR China, DPR Korea, Japan, the Republic of Korea, the Philippines, Singapore and Vietnam) (BW News 11).
- **ROPME Sea Area (Gulf):** The 1st Regional Conference on Ballast Water Control and Management in the ROPME Sea Area, which developed a draft Regional SAP (comprising the Kingdom of Bahrain, Kingdom of Saudi Arabia, Islamic Republic of Iran, State of Kuwait, State of Qatar, Sultanate of Oman and the United Arab Emirates) (BW News 9).
- **Baltic:** The 1st Baltic Regional Workshop on Ballast Water Management (involving Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden, the Helsinki Commission, the European Commission and others), which developed project proposals for Eastern Baltic countries (BW News 7).
- **Black Sea:** The 1st Black Sea Conference on Ballast Water Control and Management, which adopted a Regional SAP (comprising Bulgaria, Georgia, Romania, Russian Federation, Turkey and Ukraine) (BW News 7).

In addition, GloBallast Pilot Countries Brazil and India have undertaken consultation missions to their neighboring countries and are planning to initiate similar RTFs and Regional SAPs, China has shared its experiences under GloBallast with Pacific Island countries through the South Pacific Regional Environment Programme, and the GloBallast Programme Coordination Unit has been advising regional activities in the Baltic, Mediterranean and Adriatic Seas.

A central function of these regional initiatives is to assist the countries in each region to cooperate to ensure uniform application of standardised IMO ballast water management measures, including the forthcoming Convention. Uniform application is vital when addressing a transboundary issues such as invasive species and regulating an international industry such as shipping.

In the last quarter of 2003 several regions continued with developing and cementing their cooperative ballast water management arrangements, as follows:

ROPME Sea Area



On 21 and 22 October 2003 members of ROPME (Regional Organization for the Protection of the Marine Environment), under the leadership of GloBallast Pilot Country Islamic Republic of Iran, held their second regional conference in Tehran. At this high-level meeting the regional SAP that had been drafted at the 1st meeting in 2002, was formally adopted by all member States, and the ROPME Secretariat announced a budgetary allocation to support ballast water activities under its workplan.

East Asian Seas

Similarly, from 5 to 7 November 2003 the Peoples' Republic of China convened the second meeting for East Asia in Dalian, at which the East Asian Regional SAP that was drafted at the 1st meeting in 2002, was formally adopted by PR China, DPR Korea, Japan, the Republic of Korea, the Philippines, Singapore and Vietnam.



The meeting also adopted a Resolution inviting Brunei Darussalam, Cambodia, Indonesia, Malaysia, Russian Federation and Thailand to join future RTF meetings and to participate in the Regional SAP. The Resolution also calls for cooperation and coordination of ballast water activities with the Sustainable Development Strategy for the Seas of East Asia, as considered at the East Asian Seas Congress held in Malaysia, 8-12 December 2003, and with relevant activities under Asia Pacific Economic Cooperation (APEC).

Other regions outside of the current focus of the GloBallast Programme also initiated a cooperative approach to the ballast water / invasive species issue in the last quarter of 2003.

Adriatic-Ionian Seas

On 27 and 28 October 2003 the Adriatic Ionian Initiative, comprising Bosnia-Herzegovina, Croatia, Greece, Italy, Serbia-Montenegro and Slovenia, under the Presidency of Slovenia, held a Round Table on Environmental Protection and Sustainable Development in Portoroz, Slovenia. Under the Adriatic Action Plan,

there are three priority projects:

- A sub-regional marine pollution contingency plan
- A strategic environmental assessment (SEA) for ballast water introductions
- A coastal area management plan

The round-table in Portoroz agreed to form an Adriatic Sea Ballast Water Task Force. The first action to be taken by individual countries is to designate Lead Agencies and form National Task Forces, begin requiring visiting ships to submit the IMO ballast water reporting forms, and work through the Regional Task Force to ensure uniform application of measures by neighbouring countries. It was recommended that countries begin to review their legislative structures to support rapid adoption and implementation of the IMO Convention.

North Sea

At the Fifth International Conference on the Protection of the North Sea, held in Bremen on 20-21 March 2002, Belgium, Denmark, France, Germany, the Netherlands, Norway, Sweden, United Kingdom and the European Commission made The Bergen Declaration, which addresses the issue of alien species invasion through ballast water in Section IV - Reducing the Environmental Impact from Shipping.

The Committee of North Sea Senior Officials (CONSSO) was also formed with the main task of organising the work necessary to follow up each North Sea Conference. Under the CONSSO Issue Group on Sustainable Shipping, a draft Ballast Water Strategy Paper for the North Sea has been developed. The role of this draft strategy is to:

- Work towards the implementation of the forthcoming IMO Ballast Water Convention and the existing Guidelines (A.868 (20)); and,
- Identify a work programme for the CONSSO countries to enable these guidelines to be implemented in the most efficient and sustainable way.

Cooperation under the Convention

Under the draft ballast water Convention, Article 13 on Regional Co-operation currently states: "In order to further the objectives of the Convention, Parties with common interests to protect the environment, human health, property and resources in a given geographical area, in particular, those Parties bordering enclosed and semi-enclosed seas, shall endeavour, taking into account characteristic regional features, to enhance regional co-operation including the conclusion of regional agreements consistent with the Convention. Parties shall seek to co-operate with the Parties to regional agreements to develop harmonized procedures."

The regional preparations developed under the GloBallast Programme to date, are an important foundation for regions to meet Article 13, and when combined with similar initiatives in non-GloBallast regions, represent a total of more than 100 countries that are already well advanced in their preparations for rapid implementation of the IMO ballast water Convention, including through harmonized regional cooperation.

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AIS Survey Network Spreads

Both the IMO ballast water Guidelines (A.868(20)) and the draft International Convention for the Control and Management of Ships' Ballast Water and Sediments, include the principle of addressing the problem of the transfer of harmful species in ballast water at the source port, by preventing the uptake of organisms during ballasting.

In order to help achieve such prevention, both the Guidelines and the draft Convention recommend that port States should undertake biological surveys and monitoring in their ports, and alert shipping and other parties to 'outbreaks' of harmful aquatic organisms and areas or times to be avoided in taking on ballast.

In recent years, initiatives by a number of countries and organizations, including the GloBallast Programme, has seen the development of an extensive global network of a large number of sites where surveys and monitoring for aquatic invasive species (AIS) have been carried out (see map page 7).

Australia pioneers standard methods

Australia, through its Centre for Research on Introduced Marine Pests (CRIMP), established by the Commonwealth Scientific and Industrial Research Organization (CSIRO), pioneered the development of standard protocols for surveys and monitoring of AIS in port areas (Hewitt & Martin 1996, 2001). Conducting AIS surveys according to uniform methods, helps to ensure quality control and a basic minimum standard, and allow inter-comparability of data between sites across the globe.

In 1996 CRIMP together with other Australian marine science bodies, various State agencies and port authorities, commenced the Australian National Port Survey Programme, which by the end of 2003 had completed surveys using the standard CRIMP protocols, in 36 ports around the country, with many more planned (see map page 7).

GloBallast port surveys

The GloBallast Programme has also supported each of its six Pilot Countries to conduct biological baseline surveys and ongoing monitoring programmes for AIS. In 2001 GloBallast selected the CRIMP protocols for application at its six Demonstration Sites (see map). This included training national AIS survey teams, and the provision of technical advice, assistance and funds to design and conduct baseline surveys. All six Pilot Countries have completed field sampling and final reports are under preparation. This initiative has been reported previously in Ballast Water News No.s 4, 6 & 13.



Port biological baseline surveys and AIS monitoring at two of the GloBallast Demonstration Sites (images courtesy M Campbell).

(Continued from page 5)

Regional replication

The establishment AIS survey capabilities at six major ports in the main developing regions of the world, represents a major step. It is important that the momentum generated is capitalized, through long-term monitoring at existing sites and replication at additional sites. Towards this end, GloBallast Pilot Country South Africa, has carried out additional surveys at Port Elizabeth and Richards Bay using its own resources, and with GloBallast funding, is working with the Kenya Marine & Fisheries Research Institute (KEMFRI), Kenya Ports Authority and other agencies to survey the port of Mombasa.

A planning meeting was held with the Kenyans in December 2003, with additional training and the first baseline survey planned for in June 2004. The Mombasa project is also being supported by the Great Barrier Reef Cooperative Research Centre (CRC) in Australia. The CRC is providing a port survey expert free-of-charge as an adviser, and will be hosting two African scientists at an Australian survey in March 2004.



Members of the GloBallast – South Africa / Kenya team undertake reconnaissance of the port of Mombasa as part of survey planning

The training workshop planned for Mombasa in June 2004 will include other countries in East Africa, including the Indian Ocean islands, thereby further stimulating replication of AIS surveys at additional sites. Discussions are underway with IUCN - The World Conservation Union, to coordinate this activity with their related initiative in the region (see article page 8). South Africa is also exploring the possibility of assisting Namibia to initiate AIS surveys at Walvis Bay, in cooperation with the Benguela Current GEF project, and GloBallast is considering a request from Vietnam to do the same at a new port site near Nha Trang, and from India and Sri Lanka to survey Colombo.

Other regions

The CRIMP protocols have also been adopted/adapted by other countries and regions. The New Zealand Ministry of Fisheries has implemented a comprehensive series of surveys at more than 13 sites, and in the UK the University of Wales has carried out surveys using a reduced version of the CRIMP protocols at 6 ports, on contract to the UK Department of Environment, Food and Rural Affairs. In the Mediterranean, the International Commission for the Scientific Exploration of the Mediterranean Sea (CIESM), is developing the PORTAL programme, under which CRIMP-style surveys will be undertaken in at-least 9 ports and several marinas (see map).

North America

Further complementing this extensive global network, in the USA the Smithsonian Environmental Research Centre (SERC), has established an AIS survey programme at 21 sites throughout the continental USA and Alaska, plus two sites in Australia for comparative purposes, with plans for a further 9 sites, including one each in Hawaii and North East Canada (see map page 7). The SERC programme is based on passive settling plates, and therefore samples benthic species only. They have elected not to

use the CRIMP approach, which involves active (and intensive) collection of all biota types in all habitats, by field teams using a wide range of methods.

The global effort is even further enhanced by the activities of the Bishop Museum in Hawaii, which has undertaken surveys using their own methods, at many sites throughout Hawaii, Johnston Atoll, Midway Is. and American Samoa (see map).

Unknown activities

There are certainly other groups undertaking similar activities, which IMO/GoBallast is not aware of. Readers are urged to advise the GloBallast PCU of such, so that they might be invited to share information and join a global network.

Benefits for both management & science

In order to solve any problem, it is first necessary to understand the problem, and researching and documenting the patterns of biological invasions in coastal waters is fundamental to gaining this understanding. It is not possible to manage and control AIS unless you know what they are and where they are, and these cannot be achieved without an organised survey, monitoring and surveillance effort.

Port surveys and monitoring programmes are needed to assist port States to meet their obligations to alert shipping and other interested parties to 'outbreaks' of harmful aquatic organisms, to assist in preventing their uptake, and to detect invasions as early as possible, thereby increasing the chances of successful response, control and mitigation actions.

Surveys and monitoring are also needed to assess the effectiveness of management responses, including the IMO ballast water Convention, by providing data on changes in the rates and patterns of invasion over time. Establishing a comprehensive, global network of AIS survey and monitoring programmes, is an essential part of the broader efforts to reduce the spread of AIS through all vectors, not only ships' ballast. These surveys also bring huge benefits to science and the general understanding of aquatic biodiversity and ecology.

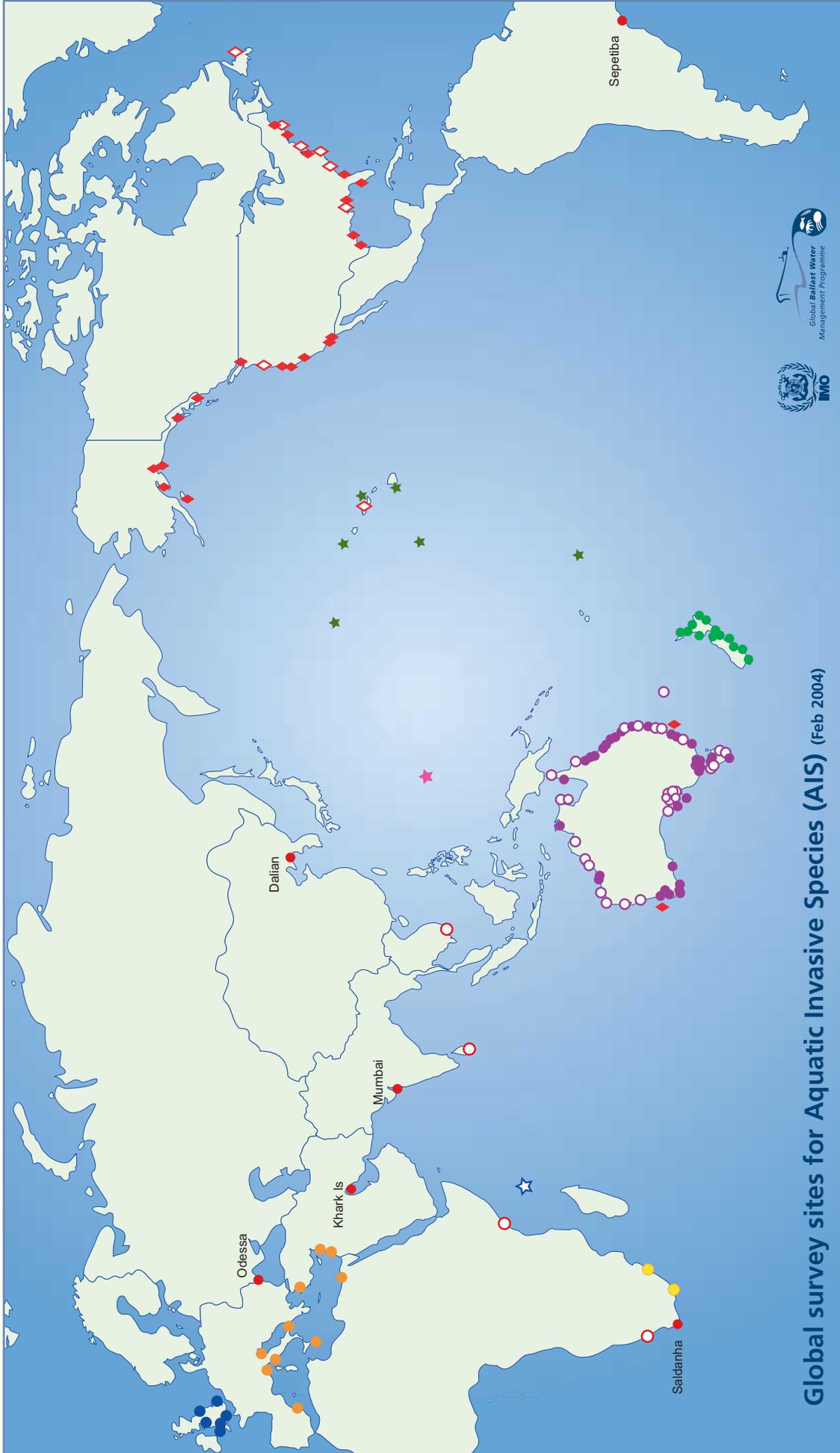
The future

While the various activities described above and presented on page 7 appear to provide a comprehensive, global network, they are largely unrelated, uncoordinated initiatives, with no formal global mechanism for the systematic analysis, management and reporting of results and data. Many of the surveys to date are 'one-off' activities, providing a 'baseline' or 'snap-shot' of the situation at the time of the survey only.

In order to provide a much-needed, truly effective global monitoring and early-warning system, AIS surveys and monitoring should be 'mainstreamed' into the routine environmental management activities of all ports, harbours and marinas; as well as aquaculture sites and marine protected areas. They should also be carried out as ongoing, long-term monitoring programmes; and linked into a global AIS information system (GAISIS).

As IMO develops plans and proposals for follow-up activities to the current phase of GloBallast, ways of supporting these various regional initiatives and of continuing the replication of a global AIS survey network in all regions, are high on the agenda. However, IMO has neither the resources nor the mandate to assume responsibility for this effort, and global partnerships are essential.

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Global survey sites for Aquatic Invasive Species (AIS) (Feb 2004)

Sites using CRIMP Protocols (or similar)	Sites using SERC settling plate method
<ul style="list-style-type: none"> ● Implemented under GloBallast programme ○ Planned under GloBallast programme ● Implemented with assistance from GloBallast programme ● Implemented under Australian National Port Survey ○ Planned under Australian National Port Survey 	<ul style="list-style-type: none"> ◆ Implemented ◆ Planned
<ul style="list-style-type: none"> ● Implemented under NZ Ministry of Fisheries programme ● Implemented under UK DEFRA programme ○ Planned under CIESM PORTAL programme 	<p>Sites using other survey methods</p> <ul style="list-style-type: none"> ★ Bishop Museum (implemented) ★ University of Guam (implemented) ☆ IUCN (planned)

IUCN Acts on Aliens & Reefs

Coral reefs are one of the most diverse and the most vulnerable shallow-water marine habitats. The faunal and floral richness of reefs, like that of other highly diverse habitats, is still poorly documented. However, from the existing literature, it appears to be at least in the many hundreds of thousands of species. The vulnerability of reefs to anthropogenic disturbances is being increasingly realized with the spread of coral bleaching, the emergence and spread of numerous coral-reef diseases, and the large-scale reef destruction that has resulted from a wide range of human activities. Recent studies begin to highlight non-indigenous species as one of the main threats to reefs, particularly disturbed ones.

Although terrestrial introductions have received much attention, marine introductions have been little studied until now. Moreover, most of the available information for marine and brackish-water introductions comes from studies in temperate regions. These surveys have been concentrated in areas of substantial shipping activity most likely to receive species introductions from ballast water discharge or hull fouling.

All existing environmental conventions (e.g. CBD, RAMSAR, Barcelona convention) and international recommendations on invasive species prevention and management, stress the importance of surveys and monitoring in both high risk entry points and hot spots of biodiversity, particularly protected areas. So far, very few surveys have been set-up in marine protected areas and much less have been realised in high spots of marine biodiversity, especially in tropical areas.

One of the rare studies on the diverse assemblage of marine species introduced to reef communities by human-mediated transport has been realised in Guam. The study shows that sessile species dominate the non-indigenous biota. Ship hulls are the major vector of introduction of alien species into Guam's water because of the islands tourism-based economy. The study highlights that several non-indigenous species are now well established and that major impacts to reefs on Guam remain to be identified (Paulay et al 2002).

A similar study realised in Hawaii concluded that alien species and invasive native species have become a major threat to the health of coral reef ecosystems in the region, particularly within the past twenty years. Five species of algae, a soft coral, some crustaceans, sponges and fishes have been identified as alien and invasive. Some of these are causing major ecological damage by out-competing native reef organisms for space or food, displacing native species and upsetting the balance of organisms in Hawaii's coral reef ecosystems. The economic impacts particularly from the excessive growth of some of the invasive algae are very significant (Eldredge & Carlton 2002).

Research and monitoring efforts are essential to provide early warning of arrivals of alien species, and to equip managers with a better understanding of their impacts on coral reef ecosystems. Monitoring is needed to enable the development of management measures for controlling the populations of alien species (Coles & Eldredge 2002).

Invasion of reef communities by alien species is one of the least understood threats to coral reefs, but one that will

occur increasingly with increasing levels of commercial shipping and small boat recreation.

Responding to this emerging need, IUCN is initiating a programme of monitoring and investigation of invasive species on coral reefs of the Indian Ocean. Many countries of the Indian Ocean currently have coral reef monitoring programmes that focus on marine protected areas, fishing threats and coral bleaching. The project aims are to

- improve these existing programmes by the addition of protocols for detecting and monitoring alien species,
- enhance capacity of the staff and institutions involved in monitoring, and
- improve awareness of local communities on the threats posed by alien invasive species and their impacts on local economies.

This project will start with the Mahe Island in the Seychelles. The Seychelles Government, scientific community and general public are already aware about the threats posed by alien invasive species in the terrestrial environment (especially birds and plants). This level of awareness has been an important asset in starting the work on marine introductions.

This project is supported by the TOTAL Corporate Foundation for biodiversity and the sea, and is implemented in collaboration with the Coral Reef Degradation in the Indian Ocean (CORDIO) programme and the Global Coral Reef Monitoring Network (GRCMN).

Experience from this project will be taken to a regional level and lessons learned will be disseminated to other islands and coastal countries in the Indian Oceans and beyond. In particular, IUCN may consider to collaborating with the GloBallast Programme, which in this region has already undertaken surveys for aquatic alien species at the ports of Mumbai and Jawaharlal Nehru in India, and is currently planning a survey for Mombasa in Kenya, including training and capacity building of personnel from East African and Indian Ocean countries (see page 6)

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Coral reefs are being degraded by many human-mediated activities, including invasive species (image credits: C Halloway - top, and R Baldwin)

CBD Also Covers Marine Invasives

During the same week as the Diplomatic Conference on the International Convention for the Control and Management of Ships' Ballast Water & Sediments at IMO in London, the 7th Conference of the Parties (COP 7) to the Convention on Biological Diversity (CBD), will be held in Kuala Lumpur, and will also have invasive alien species as an important agenda item.

The CBD recognizes invasive alien species as being an important threat to biological diversity, a serious impediment to conservation and sustainable use of global, regional and local biodiversity, with significant undesirable impacts on the goods and services provided by ecosystems.

The CBD also recognizes the urgent need to address the impact of invasive species on native ecosystems. Eradication, control and mitigation of their impacts combined with legislation and guidelines at national, regional and international levels are some of the ways in which the Convention is addressing this issue. Article 8(h) of the Convention states that Contracting Parties to the Convention should, as far as possible and appropriate, prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species.

In the programme of work of the Convention, invasive alien species are a key cross-cutting issue of relevance to all five thematic areas; addressing marine and coastal biodiversity, agricultural biodiversity, forest biodiversity, the biodiversity of inland waters, and dry and sub-humid lands.

The programme of work of the CBD's 'Jakarta Mandate on Marine and Coastal Biological Diversity' identifies key operational objectives and priority activities within five key programme elements, among them 'alien species and genotypes'. The three operational objectives identified under programme element five on alien species and genotypes, aim to:

- achieve better understanding of the causes of the introduction of alien species and genotypes and the impact of such introductions on biological diversity;
- identify gaps in existing or proposed legal instruments, guidelines and procedures to counteract the introduction of and the adverse effects exerted by alien species and genotypes; paying particular attention to transboundary effects;
- collect information on national and international actions to address these problems, with a view to prepare for the development of a scientifically-based global strategy for dealing with the prevention, control and eradication of those alien species which threaten marine and coastal ecosystems, habitats and species; and
- establish an 'incident list' on introductions of alien species and genotypes, through the national reporting process or any other appropriate means.

The actors identified to collaborate in achieving these objectives include IUCN and the IMO.

During its 8th meeting, the CBD's Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), recognized that some refinement to the programme of work was needed as a result of recent developments and

new priorities, and taking into account the Plan of Implementation of the World Summit on Sustainable Development and the Strategic Plan of the CBD.

In regard to invasive alien species, the target set for marine and coastal ecosystems is "All major pathways for potential alien invasive species in the marine and coastal environment controlled". Certainly, the adoption and effective implementation of the IMO ballast water Convention, will be a key contribution to this target.

SBSTTA 8 also reviewed and further refined the programme of work on inland water ecosystems, and invasive alien species are strongly present in the new proposed programme. Some of the most devastating impacts of ballast water introductions have occurred in inland water ecosystems, such as the North American Great Lakes and the Black and Caspian Seas.

The fourth goal of the CBD's programme of work on inland water ecosystems is; *'To prevent the introduction of invasive alien species that potentially threaten the biological diversity of inland water ecosystems, and to control and, where possible, eradicate established invasive species in these ecosystems'*.

Invasive alien species will be on various agenda items at COP 7 of the CBD, and interest in this issue was reiterated at SBSTTA 9, which welcomed the progress being made on the IMO ballast water Convention. During COP 6, the parties to the CBD (the vast majority of whom are also IMO member States), urged IMO to complete the preparation of an international instrument on ships' ballast water, and to develop as a matter of urgency, mechanisms to minimize hull-fouling as an invasion pathway. COP 6 also called on governments and relevant organizations to urgently act to ensure full implementation.

The parties to the CBD would certainly follow with interest and great expectation the development of the Diplomatic Conference for the adoption of the new ballast water Convention in February 2004. The adoption of a legally binding treaty and relevant standards and commitments for the control and management of ships' ballast water and sediments is now an urgent and critical step. Given the degree of commonality between the parties to the CBD and IMO membership, there is considerable scope for coordination and synergies between activities relating to alien invasive species under the CBD and the IMO ballast water Convention, including in part to achieve WSSD marine objectives.

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The effects of shipping on marine biodiversity, including impacts from ballast water discharges, are an important issue under the Convention on Biological Diversity (CBD)

Ukraine Spreads the Message

Under the communication and awareness component of the GloBallast National Workplan for Ukraine, from March to August 2003 the State Department of Maritime and Inland Water Transport, as GloBallast Lead Agency in Ukraine, organized a series of four seminars at the Eastern European Demonstration Site in Odessa. Each one-day seminar was attended by 30-40 representatives from commercial seaports, the maritime industry, marine science community and educational institutions, significantly raising awareness of the ballast water problem across a broad-spectrum of stakeholders in the country.



One of the Ukraine awareness seminars

Each seminar was opened by senior officials from the Ministry of Transport of Ukraine, and included a special report on progress and recent activities under GloBallast, presented by the Programme's Country Focal Point.

Lectures and special reports were also given on recent developments with the ballast water issue both nationally and internationally.

Latest results from the work by the Transzvuk Engineering Center in Odessa to develop ballast water treatment technology using cavitation and filtration, and progress with the Shipboard Ballast Water Exchange Monitoring System (BWEEMS), were also discussed at the seminars.

The last seminar was followed by one day National R&D Workshop. Scientists from Kiev, Sevastopol, Odessa and other regions presented their scientific results and exchanged views on the problem of transfer of unwanted aquatic species. The administration of the National Academy of Sciences expressed their appreciation for the assistance being provided by GloBallast to address the problem.



In addition to the seminar series, GloBallast-Ukraine is also enhancing communication and awareness by launching its own Odessa Demonstration Site Monograph Series.

These are published in Russian and follow the standard GloBallast report template. First issues are already published and widely disseminated among interested parties. Issue No. 1 is the Report from the 1st Black Sea Conference on Ballast Water Control and Management. Integrated issue No. 2-3 contains the report on the 6th Ukraine Country Task Force meeting and Proceedings of the Special Panel of Experts Meeting to Assess National Technologies on Ships' Ballast Water Treatment. Reports

on the communication and awareness seminars are being prepared and future issues will include Russian reports on the Legislative Review Project, Port Biological Baseline Survey and Risk Assessment in Ukraine.

The Odessa Monograph Series are available at <http://www.globallast.od.ua/library/monograph.asp>

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S. Africa Develops Port Plan

Through the GloBallast Programme South Africa produced a Draft National Policy on Ballast Water Management in 2002. This is still in the process of being considered for adoption by the Ministry of Environmental Affairs & Tourism. In anticipation of the pending policy, and of the new IMO ballast water Convention, the South Africa has continued its momentum towards developing specific ballast water management regulations. This has included the development of a port-specific management plan for the Demonstration Site of Saldanha.

In November 2003 a workshop was held in Saldanha to develop a draft port-specific management plan. As there has been much interest in this issue at a national level, the workshop included stakeholders from all major ports in South Africa, as well as those from Saldanha and the relevant Ministries. A consultant was contracted to produce a working draft for consideration at the workshop, and to consolidate workshop outputs in a final document.



The port of Saldanha: sensitive mari-culture rafts adjacent to main port facilities where ballast water is discharged

The workshop focussed on developing a practicable management plan that can be implemented within available resources and limitations. It also aimed to delineate and clarify the roles and responsibilities of all stakeholders involved. The presence of Harbour Masters from the other South African ports allowed for some further discussion on the future replication of this plan around the country.

The final draft of the Ballast Water Management Plan for the Port of Saldanha is due to be finalised in early 2004. It is being drafted in a strategic management plan format, similar to that already being used by the National Ports Authority for their ISO 14001 Environmental Management System. Although the supporting legislative framework still needs to be finalised, considering developments with the new ballast water Convention, the enthusiasm from all workshop participants reinforced local commitment to addressing ballast water issues.

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BW Treatment Update



The current practice of ballast water exchange at sea has many limitations, including implications for the structural integrity, stability and safety of vessels (see above), highly variable biological effectiveness and geographical restrictions (image C Keijser)

The development of alternative ballast water treatment methods that are safer, more effective and more broadly applicable in all geographical regions, is vital if the transfer of harmful organisms is to be reduced.



STEP Boosts Treatment R&D

The U.S. Coast Guard has announced an innovative program that will allow vessel owners/operators to apply for acceptance of vessels, permitting them to install and test experimental ballast water treatment systems. The Shipboard Technology Evaluation Program (STEP), will facilitate the development of effective ballast water treatment technology, which will create more options for vessels seeking alternatives to ballast water exchange. Details of the program are published in Coast Guard Navigation and Vessel Inspection Circular (NVIC) 01-04.

NVIC 01-04 is available at www.uscg.mil/hq/g-m/nvic and in the public docket (USCG-2001-9267) at <http://dms.dot.gov/>

STEP will facilitate the development of experimental ballast water treatment technologies, and allow the US Coast Guard to evaluate these technologies. It represents a significant boost for both US and global efforts to find alternative, more effective ballast water treatment options.

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BenRad Claims Success

BenRad AB of Sweden, a subsidiary of Wallenius Lines shipping company that specializes in water purification equipment with broad applications, recently engaged Norén Research to test their developmental ballast water purification system. The tests were conducted at the University of Gothenberg's Kristinebergs Marine Research Station.

The BenRad ballast water treatment concept is based on a combination of primary filtration followed by the BenRad patented advanced oxydation process. Norén Research conducted tests using both a standard input water, containing the test phytoplankton species *Tetraselmis suecicae* added at known concentrations, as well as natural sea water containing a wide range of native phyto- and zoo-plankton. Flow rates were

20 to 30 cubic metres per hour.

BenRad says that the preliminary results indicated an extremely high kill-rate, with more than 90% mortality of most taxonomic groups. Further tests, including shipboard experiments, are being planned.

It should be noted that these claimed results are from an internal, preliminary testing programme, and that the testing protocols / experimental design and resulting data have not been subject to independent peer review or statistical power analysis.



A full-scale BenRad water purifier aboard ship

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Dutch Develop Treatment Project

The Royal Netherlands Institute for Sea Research (NIOZ) is developing a project to evaluate ballast water treatment methods as to performance and efficacy. The Netherlands Ministry of Transport, Public Works and Water Management is supporting the project.

The NIOZ project includes a consortium of developers of treatment methods and analytical instruments of predominantly (but not exclusively) Netherlands background, while Dutch shipping companies will participate as well.

The project aims to stimulate industries to optimise their potential to play an active role in developing ballast water treatment technologies. Royal Haskoning - a consultancy company - is also involved, and estimates that global market potential amounts to 8 billion Euro's (billion in US-English).

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Warning to Shipowners / Operators

As adoption of the IMO ballast water Convention approaches, the GloBallast Programme at IMO has noticed an intense (and understandable) increase in marketing by vendors of ballast water treatment equipment.

Shipping companies should be strongly encouraged to fit and test alternative systems in real-life operational situations, as an essential part of the R&D effort. However, they should also be extremely cautious of vendors' claims. Test protocols and scientific rigour of supporting data vary widely, and there is a danger shippers may invest in systems that may be of limited usefulness in actually killing organisms, and which may become redundant once international treatment standards are set under the new Convention.

Until these systems are proven effective and formally approved by relevant jurisdictions, they are experimental only. Shipping companies would therefore be well advised to only consider installation of developmental systems, under official, government approved or endorsed programmes.



Progress Report

Activities Undertaken Oct - Dec 2003

- ✓ Edited proceedings of 2nd International Ballast Water Treatment R&D Symposium
- ✓ Edited final reports on Risk Assessments for each Demonstration Site and progressed same for Port Biological Baseline Surveys and other activities.
- ✓ Convened 2nd Regional Meetings for ROPME Sea Area (Tehran, I.R. Iran) and East Asia (Dalian, P.R. China) to adopt Regional Strategic Action Plans.
- ✓ Held planning meeting for 1st regional replication of port surveys in Mombasa, Kenya. (South Africa lead)
- ✓ Progressed regional replication and cooperation activities for South Asia (India lead) and South America (Brazil lead).
- ✓ Attended / supported ballast water treatment system type-testing workshop, IMO London 10-12 Nov.
- ✓ Attended and presented at Global Conference on Oceans, Coasts and Islands, Paris, 12-14 Nov.
- ✓ Validated modular ballast water management training course in I. R. Iran.
- ✓ Attended and presented at East Asian Seas Congress, Malaysia, 8-12 Dec (P.R. China lead).
- ✓ Planned and prepared 5th Global Task Force meeting for Feb 2004, including review of proposed amendments to Pilot Country workplans and extension of project.
- ✓ PCU staff annual leave
- ✓ Produced 15th issue of Ballast Water News.



Image credit: BenRad AB



Activities Planned Jan – March 2004

- Brief HELCOM Maritime Committee on new BW Convention, Stockholm, 22 Jan.
- Convene 2nd Regional Task Force meeting for Black Sea, Constanza, Romania 28-30 Jan (Ukraine lead).
- Convene 5th Global Task Force meeting, IMO London, 2-6 Feb 2004.
- Attend/support Diplomatic Conference to adopt BW Convention, IMO London, 9-13 Feb.
- Convene 1st Regional Task Force meeting for South Asia, Goa, India, 11-12 March (India lead).
- Co-chair ICES/IOC/IMO WGBWOSV, Italy 22-24 March.
- Present at HELCOM 10 year Conference, Riga, Latvia, 22-24 March.
- Participate in White Water to Blue Water planning/funding conference, Miami, 24-26 March
- Publish proceedings of 2nd International Ballast Water Treatment R&D Symposium.
- Complete publication of final reports on Risk Assessments for each Demonstration Site and progress same for Port Biological Baseline Surveys and other activities.
- Validate modular ballast water management training course in Africa (South Africa lead).
- Attend/support MEPC 51, IMO London, 30 March – 2 April.
- Produce 16th issue of Ballast Water News.



More Information?

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