Ballast Water News

Global **Ballast Water** Management Programme

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From the Editor

Perhaps understandably, with the World Summit on Sustainable Development held in one of the GloBallast Pilot Countries during the reporting period, this issue of Ballast Water News has a somewhat ecological and environmental perspective. Dandu Pughiuc attended the Summit, and in addition to his regular column on this page, provides a more detailed report on page 3.

As Guest Speaker we are extremely pleased to welcome Mr Roger Lankester of Friends of the Earth International, the 'environmental conscience' of IMO's Ballast Water Working Group who tirelessly promotes ecological sustainability, the precautionary principle and biological diversity while, as an engineer, embracing sensible, pragmatic solutions for effective environmental management.

A most pleasing report this issue is the granting of US$34,000 by the US State Department to initiate invasive aquatic species monitoring and research in the north-east Baltic. A key objective of the GloBallast Programme is to stimulate additional investment in the issue in various regions. In October 2001 GloBallast held a regional workshop in Tallinn, Estonia, with this objective in mind. It is hoped that the support from the US will catalyse further ballast water management activities in the Baltic, on a cooperative, regional basis.

We are also pleased to include a report on the ballast water R&D seminar convened by India on 13 and 14 June 2002, at the National Institute of Oceanography (NIO) in Goa. As a GloBallast Pilot Country India, under the guidance of the Country Focal Point Mr Sanjoy Chakrabarty, has become increasingly active in ballast water issues. NIO is playing a leading scientific role, including in the Port Biological Baseline Surveys and Risk Assessment. The national R&D symposium further cements India's position in this field.

We complete this issue with short articles on NOBOB or 'no ballast on board' vessels, an alternative ballast water exchange design being investigated by Navion of Norway, and a reminder of the need for scientific rigour, quality control and clear standards, criteria and procedures for the evaluation, verification and approval of new, alternative ballast water treatment systems.

As IMO's Marine Environment Protection Committee convenes from 7 to 11 October, the issue of standards will hopefully move closer to resolution, the draft text of the new ballast water Convention will be reviewed and a decision taken on the timing of a Diplomatic Conference to adopt the Convention. Through the Plan of Implementation adopted at the World Summit on Sustainable Development, the nations of the world called upon themselves to adopt the ballast water Convention as a matter of priority. Will they heed their own call?

Steve Raaymakers
Contributing Editor

From the Programme

Despite annual holidays, GloBallast had a busy agenda during the last three months. The combined GEF/UNDP annual project implementation review was carried out and positively received by UNDP-GEF. The overall findings were that GloBallast has achieved a great deal in a relatively short period and most of the success criteria established by the project document have been achieved to a highly satisfactory level.

In addition, the scheduled, external, mid-term evaluation of the Programme by two independent international evaluators was commenced during the quarter, the outcomes of which will be considered during the 4th Global Task Force meeting in Beijing at the end of October.

A point of reference in the relatively short history of GloBallast was its participation in the World Summit on Sustainable Development held in Johannesburg, South Africa from 26 August to 4 September. During a ten-day marathon covering the major issues affecting the future of our planet, GloBallast seized this unique opportunity to impress on the international community the threat posed by invasive aquatic species transferred in ships' ballast water.

The achievements of the Programme, with particular reference to implementation in South Africa, were the theme of a dedicated stand at the Summit's Water Dome. The official opening of the exhibition benefited from the participation of high-profile personalities including the former President of South Africa, Mr. Nelson Mandela, and attracted thousands of visitors. A significant number of side events were hosted in the Water Dome throughout the Summit. The GloBallast stand, among the few focused on the ecological, economic and social importance of the oceans, attracted visitors from a wide range of sectors.

The GloBallast concept and a warning message on the threat posed by invasive aquatic species were promoted via a number of conferences organized during the Summit under the auspices of GEF and the World Conservation Union (IUCN). The Programme joined its voice to those of other specialized agencies and organizations to remind delegates of the global importance of the world's coasts and oceans and the need for a concerted, holistic and integrated effort to protect them.

The climax of participation in the World Summit was the official launching of the partnership initiative on regional replication of the GloBallast Programme. It was particularly rewarding to notice an immediate response to our call for partnership coming both from countries and inter-governmental organizations, and to see the GloBallast initiative included in the so-called Type II outcomes of the Summit.

Dandu Pughiuc
Chief Technical Adviser

Ballast Water News is the quarterly newsletter of the Global Ballast Water Management Programme (GloBallast). GloBallast is a cooperative initiative of GEF, UNDP and IMO to assist developing countries to reduce the transfer of harmful organisms in ships' ballast water, through the implementation of IMO ballast water management guidelines.

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Guest Speaker

Mr Roger Lankester

Friends of the Earth International Oceans Division

Roger Lankester is a chartered engineer and his interest in the marine environment stems from the concern some two decades ago over TBT anti-fouling paints on recreational craft. This led to his joining Friends of the Earth International at IMO-MEPC in 1989.

Friends of the Earth is one of the world's leading environmental non-government organizations, campaigning for ecological sustainability, environmental protection and nature conservation. Roger has represented them on various IMO working groups and for the last six years has been a member of the MEPC Ballast Water Working Group. He also prepared two of the initiation reports for the GloBallast Programme and is an NGO representative on the Programme's Global Task Force.

Had the environmental problem of the translocation of alien, harmful or unwanted aquatic species through the vector of ships ballast water been realised a century ago, it is likely that ship design would have evolved differently. Even with Darwin's theory of evolution well established in natural scientific thinking, such esoteric matters were still remote from engineering, commerce and trade. We know differently now that ultimately all things are inter-connected and decisions made for development, engineering, social and political aspiration all may have an environmental implication. Hence the concept of the precautionary approach is central to sustainable development.

Few maritime environmental problems start with the benefit of a clean sheet. This perhaps illustrates the magnitude of the ballast water problem. It is likely to be the most difficult environmental issue ever considered and resolved by IMO. Although the marine environment is an integrated whole it is comprised of many thousands of discrete biological communities and ecosystems both large and small. These have evolved as a result of variable current and tidal patterns, water temperatures, nutrient levels, substrates and so on. The intrinsic value of such diversity has only recently been fully realised and established by international agreements such as the Convention on Biological Diversity resulting from the Rio Earth Summit in 1992.

It is clear that the marine environment and its physical, chemical and biological processes are the life support system for us all. This new vision of how we perceive and use the Earth demands determined and unified global action if these processes are not to be impaired. Indeed, apart from habitat destruction the introduction of alien species is seen as the most serious threat to biological diversity.

The GloBallast Programme is an example of how seriously the international community views this matter. Having had the privilege of attending the Programme's Global Task Force meetings, the growth of awareness and capacity is astonishing. In some cases the knowledge of the subject by participating States is at the very cutting edge. Also the co-operation that has been achieved between the diversity of interests involved is an indication that given the right approach and management, environmental problems can have a high potential for resolution. It is hoped that once the new IMO ballast water Convention is adopted, the GloBallast Programme will be extended with other developing countries joining and benefiting from the capacity and work that has been achieved so far.

Despite these positive indications, Friends of the Earth International remains concerned. With a number of notable exceptions, the impression obtained from the debate at IMO is one of some reluctance to take the final bold step of concluding and approving the Convention. No one underestimates the risk to the shipping industry of taking pre-emptive action that may not conform to any minimum IMO standards, or companies undertaking research into novel engineering solutions without clear mandatory global standards. But doing nothing has even greater risks.

It is estimated that by the year 2013 goods transported by sea will have doubled. In theory the amount of ballast water transferred by ships could also double. Oil and chemical tankers, gas carriers, container ships, bulk carriers and cruise ships will all contribute to this future increase in trade. Cruise ships especially will be a particular focus of concern as they visit pristine habitats, often in the form of small islands with limited capacity in their maritime administrations. The responsibility for self-management of this aspect of the shipping industry is very high indeed.

Transport by sea could have the least environmental impact if the right action is taken at IMO. It will not be whilst ships remain a major vector for transferring alien species. In the last decade the economic and ecological consequences of invasive species have been shown to be dire. Imagine if the predicted increases in maritime trade are realised.

In order for the shipping industry to fulfil its potential in the quest for sustainable development, a global mandatory instrument is vital to control ballast water and the introduction of harmful species. It is important for economic reasons as well as the priority of protecting public health and aquatic biodiversity. The discussion and conclusion for IMO member states at MEPC 48 will be crucial and Friends of the Earth International urges that the outcome must be an agreed draft Convention ready for a diplomatic conference. Failure is not an option!

Roger Lankester

GloBallast at World Summit

From 26 August to 4 September 2002 GloBallast participanted actively in the World Summit on Sustainable Development in South Africa.

Coming ten years after the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992, the World Summit on Sustainable Development (WSSD) provided a major opportunity for the world community to re-affirm its commitment to sustainable development, to review progress since Rio and to adopt further plans, commitments and targets for the implementation of the actions necessary to fight poverty, protect the environment and manage the world's natural resources in a sustainable manner.

Despite media coverage during the lead-up to the Summit predicting that little would be achieved at Johannesburg, the final outcomes are widely considered to have been a major success, including the adoption of the Johannesburg Declaration on Sustainable Development and the Plan of Implementation.

GloBallast participated actively at Johannesburg, with myself from the PCU and Adnan Awad and Colleen Jacka from the programme's office in South Africa attending. A major exhibit about the Programme was mounted at the Water Dome. Thousands of brochures and posters were distributed and I was able to make several presentations about the ballast water and invasive aquatic species issue at various specialist events throughout the Summit.

The GloBallast stand at the WSSD Water Dome

The issue of invasive species is extensively reflected in the Plan of Implementation adopted at the Summit. Biodiversity, which plays a critical role in overall sustainable development, is essential to the ecological functioning of the planet, human well being and the livelihood and cultural integrity of people. However, the Summit heard that biodiversity is currently being lost at unprecedented rates due to human activities, and identified invasive alien species as one of the main causes of biodiversity loss.

As a result of UNCED, the Convention on Biological Diversity (CBD) was adopted to provide a global framework for the protection of biological diversity. In order to achieve a more efficient and coherent implementation of the objectives of the CBD and a significant reduction in the current rate of biodiversity loss, the Johannesburg Plan of Implementation requests countries to strengthen national, regional and international efforts to control invasive alien species and encourage the development of effective work programmes at all levels.

Related to this IMO is particularly requested in Article 33 of the Plan to accelerate the development of measures to address invasive alien species in ballast water and is urged to finalize the International Convention on the Control and Management of Ships' Ballast Water and Sediments.

The Johannesburg Summit therefore provided yet another call from the international community for IMO member States to rapidly finalise the new ballast water Convention. The 48th meeting of IMO's Marine Environment Protection Committee will be held from 7 to 11 October 2002, will review the draft text of the convention and will decide on the date of the Diplomatic Conference for the adoption of the Convention.

Mr Koji Sekimizu presenting at WSSD

The Summit provided a number of opportunities for governments, international organizations and other major groups to organize side events and presentations to announce and introduce their partnership proposals and initiatives. Mr Koji Sekimizu, Director of the IMO Marine Environment Division, presented a number of initiatives currently supported by IMO. The partnership proposed for the sustainable continuation of the GloBallast Programme, dubbed "GloBallast Advanced", stimulated significant interest.

The current phase of GloBallast has precipitated an unprecedented momentum of concerted international action, and created an overwhelming demand from developing countries for continuing programmatic support for regional replication and technical assistance activities. A number of countries and regions have expressed a strong interest in joining the Programme and the interest is growing almost daily.

GloBallast Advanced will focus on building partnerships for the effective implementation of international ballast water control and management arrangements in developing countries, following completion of the current phase of the Programme and adoption of the new IMO ballast water Convention.

Dandu Pughiuc

www.johannesburgsummit.org

Baltic Workshop Bears Fruit

*In October 2001 the GloBallast Programme convened the **Baltic Regional Workshop on Ballast Water Management** in Tallinn, Estonia with support from the Estonian Ministry of Environment, Maritime Administration and Marine Institute (see Ballast Water News No. 7: October – December 2001).*

The workshop involved maritime and environmental experts from Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden, the Helsinki Commission, the European Commission, the Global Environment Facility and the US State Department, with the following objectives:

- To integrate the Baltic Sea Region into the GloBallast programme.
- To undertake initial awareness raising about invasive marine species, the ballast water problem and IMO ballast water activities amongst key stakeholders in the Region.
- To establish the current status of invasive marine species and ballast water management arrangements in the Baltic Sea countries.
- To identify and plan some practical projects for potential funding, that will catalyse concerted action to improve the management of ballast water and invasive marine species in these countries, and enhance sub-regional and regional cooperation.

Securing additional resources and finances to address the problem of invasive aquatic species and ballast water transfers is key objective of the GloBallast Programme. Significant emphasis was therefore given to the last objective, with each country presenting project proposals for possible funding and various potential donors being invited.

As an outcome of the workshop, Estonia, Finland, Latvia and Russia developed a cooperative project entitled *Alien Invasive Species in the North-East Baltic Sea: Monitoring and Assessment of Environmental Impact.* This was submitted with the support of GloBallast to the US Government for consideration for funding. An initial grant of US$34,000 to initiate the Estonian component of the study, has been secured with the signing of a contract between the Estonian Marine Institute and the US Embassy in Tallinn on 17 September 2002.

The North-east Baltic (including two large gulfs in this area – Gulf of Finland, Gulf of Riga) forms a distinct sub-region within the Baltic and cooperation between these neighbouring countries is essential if invasive aquatic species are to be addressed effectively.

Several invasive alien species, whose impact on Baltic Sea ecosystems seems to be very important, are established in the sub-region. These include the Ponto-Caspian zebra mussel *Dreissena polymorpha*, the predatory cladoceran *Cercopagis pengoi* and the North American polychaete

The north-east Baltic

Marenzelleria viridis. Although *D. polymorpha* has been in the Baltic Sea since the mid 1800s, it is still expanding its distribution and was very recently first found in Russian waters of the Gulf of Finland.

In addition, a number of other alien species are to be found in the area: the Ponto-Caspian hydroid *Cordylophora caspia*, the New Zealand mud snail *Potamopyrgus antipodarum*, the Baikalian amphipod *Gmelinoides fasciatus*, the Ponto-Caspian amphipod *Pontogammarus robustoides*, the American barnacle *Balanus improvisus*, the Chinese mitten crab *Eriocheir sinensis*, the Amur sleeper *Perccottus glenii* and the Ponto-Caspian hydrozoa *Maeotias marginata*, whose status and impacts are largely unknown (Leppäkoski et al. 2002).

Ports and shipping in the sub-region are currently undergoing significant growth, and shipping trade is expected to increase fourfold by 2010. The Baltic economies are becoming more globally orientated and a major increase in Russian oil exports is underway through expansion of existing ports and construction of new ports in the Gulf of Finland (see graph). The sub-region can be considered as "a hot spot" area in the Baltic Sea in terms of vulnerability to alien species and high potential of established invaders to negatively affect the ecosystems (Panov, Leppäkoski & Ojaveer 1999). If effective preventive actions are not implemented, biological pollution could become the most serious environmental issue for the sub-region in the near future.

The North-east Baltic also serves as a source of secondary introductions of alien species to other aquatic ecosystems worldwide. The appearance of the water flea *Cercopagis* in 1998 in the North-American Great Lakes (MacIsaac et al. 1999) can be attributed to the existing invasion corridor between the eastern Baltic and the Great Lakes (Panov et al. 1999). Recent genetic studies show the

source population of the spiny water flea *Bythotrephes* in North American Lakes as Lake Ladoga, Port of St. Petersburg area (Berg et al. 2002), and the source population of *Cercopagis* in North American Lakes is the Neva Estuary in the eastern Gulf of Finland (Cristescu et al. 2001).

The goals of the US-funded study are to improve understanding of the distribution and population parameters of biological invasions in the North-east Baltic, develop a monitoring system for aquatic invasive species and to assess their environmental impacts, in order to provide essential information for invasive species management, including a joint on-line information system and early warning facility.

Methods will include field surveys and experiments and laboratory work. Field sampling will be done according to the standard HELCOM recommendations that guarantee comparability of the data by countries and also with existing historical datasets.

Biological sampling in the Gulf of Riga

The proposed project is of 5-years duration. The $34,000 provided by the US State Department for the Estonian component is for the first year of work only (Sep. 2002 - Sep. 2003). Additional funding will continue to be sought for subsequent years. The Estonian Marine Institute, which is implementing the project, is also contributing resources through two state-financed science projects.

The funding of this project represents an extremely favourable outcome of the GloBallast Baltic workshop and is a credit to the concerted follow-up efforts of the dedicated staff at the Estonian Marine Institute, in particular Dr Henn Ojaveer, and at the US Embassy in Tallinn. This enlightened support from the US provides another building block to the ever-expanding global network of invasive aquatic species survey and monitoring programmes, contributing to the ultimate goal of an effective detection and early warning system.

As the North-east Baltic project develops, it is hoped that survey and monitoring methods will include application of standard protocols developed specifically for invasive aquatic species, as promulgated by the GloBallast Programme.

Finally, given that regional cooperation is absolutely essential if invasive aquatic species are to be addressed successfully, it is hoped that additional funding will be secured to expand the project from Estonia to include the other countries in the original project proposal. It is also hoped that other projects developed at the Tallinn workshop, including those from Lithuania and Poland, will be funded, thereby ensuring a more regionally coordinated and effective response to the problem of ballast water transfers and invasive aquatic species.

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India Holds R&D Seminar

India hosted its 1st R&D Seminar on Ballast Water Control and Management on 13 and 14 June 2002. Delegates included scientists and technologists from India, Myanmar and Singapore.

Seminar Delegates

India is a maritime nation with 12 major ports (refer map) and several minor ports, which serve as gateways for marine bioinvasions. In addition to introduction of alien species in these ports, the threat of secondary spread to neighbouring environments and the highly sensitive coral reefs of the Andaman, Nicobar and Lakshadweep Islands is a distinct possibility. Hence appropriate protocols to control ballast water mediated invasion is of great importance to the ecology of the seas around India.[1]

The 1st R&D Seminar was organized through the National Institute of Oceanography (NIO), Goa. Delegates included scientists and technologists from different R&D organizations of India, Myanmar and Singapore.

The presentations made during the seminar illustrated the status of invasive species along the east and west coasts of India.[2-6] Research related to ballast water management and the technological options currently being investigated in Singapore were presented.[7] In exploring the options for ballast water treatment, the utility of ionizing radiation was discussed. Given its ability to control a broad spectrum of organisms and life history stages, the fact that is presently being used for medical sterilization, food irradiation and treatment of municipal wastes, the seminar considered that this technology could be explored for ballast water treatment.[8]

One of the presentations dealt with modeling dispersion of ballast water discharged in the coastal environment. This was demonstrated with a simulation of a case study in the Gulf of Kachchh region on the west coast of India where there is one major port and several minor ports, using a two-dimensional hydrodynamic model - MIKE21.[9]

The seminar heard that potential change in ballast water characteristics during transportation is an important aspect in management and quarantine. Ballast water stored under dark conditions eliminates photosynthesis and stops production of organic matter. In this regard changes in the chemical composition of ballast water during transportation shall be at different scales based on the nature of the substances. For instance, the changes that may occur in the magnitudes of inorganic chemicals such as nutrients and trace elements could be minimal and will be masked by analytical errors.

It is therefore difficult to use inorganic substances as markers of source waters to identify the port/country of origin of ballast water. On the other hand, even though changes in dominant species could occur during transportation, it is likely that some of the characteristic organic molecules produced by organisms unique to the port/country of ballast water origin, could potentially be utilized to trace the port/country of origin. With the same logic, whether a ship changed its ballast waters in high seas or not can be identified by comparing the characteristic biomarkers in tank waters and that of port/country from where it sailed or with that of waters en route.[10]

Detection of bioinvading invertebrate larvae in ballast waters was discussed. It was suggested that for successful detection of invertebrate bioinvasions, molecular probes of threat species needs to be prepared, together with a voucher collection of the concerned adult organisms and larvae. Development of molecular probes for potential threat organisms will go a long way in rapid and reliable detection of threat species.[11] Molecular tools that can identify the organisms in ballast water and markers that can substantiate the effectiveness of mid ocean exchange have a potential implication in quarantine procedures and need to be pursued. Simultaneously, it would be interesting to weigh the option of self-certification by using molecular techniques to grade the risk of ballast.[11]

The R&D seminar concluded with the following recommendations:

- The basis for bioinvasion evaluation depends upon the understanding of historical and present scenario. To facilitate establishment of current status a nationally coordinated monitoring exercise needs to be undertaken. A template for such monitoring at all the major Indian ports needs to be evolved, to ensure uniformity in monitoring and reporting. This exercise should also aim at incorporating regional scenario.
- Bioinvasion models depend upon the available data sets so that a comparison can be made with data collected from port baseline surveys, ballast water sampling and risk assessment models. It was felt that such a compilation from secondary data sets from published literature, technical reports, thesis etc., is possible with the involvement of all the relevant research and academic institutions of the country.
- The Indian coastline is dotted with twelve major ports and in the existing scenario each of these ports needs to identify a suitable ballast water discharge area in case of emergencies. In this context a presentation was made by NIO, which reflected such a possibility through modeling studies. This needs to be initiated in similar lines as that of port baseline survey, ballast

water sampling and risk assessment in all major ports to begin with.

- The NIO, which is serving as the nodal agency for R&D activities under the GloBallast Programme in India, is also involved in the Risk Assessment issues for Mumbai and Jawaharlal Nehru ports. This needs to be replicated for rest of the major ports of India as well.
- The existing IMO ballast water guidelines (A.868(20)) suggest mid ocean exchange as the possible means at the moment to minimize risk of bioinvasion. Quarantining of such practices has become a requirement by some of the countries. The presentations made also recognized that methods need to be established for verifying such exchange. It was opined that characteristic biomarkers of different regions, countries and ports of the world need to be established.
- The debate on risk of ballast mediated invasion and technological options in its mitigation is ongoing. The presentations showed that it might be interesting to explore the option of self certification by using appropriate molecular techniques to grade the risk associated with ballast water. It is also relevant to note that such self certification or declaration of no or limited risk ballast on board can cut the ballast water management cost on many occasions. Such an initiative needs to be encouraged from an R&D perspective. This would require a global effort wherein each country identifies the probable risk species.
- Among the technological options, the use of shore based ionizing radiation facility was considered as an attractive option for ballast water treatment and needs to be explored.
- India should develop a region-specific web site on the issue.

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Major ports of India

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The full proceedings are available from the Country Focal Point.

Navion Tests New Exchange Concept

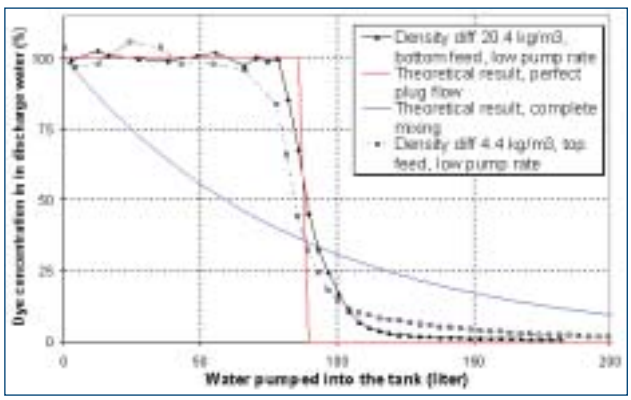
Norway's Navion shipping company has been testing a possible new system for ballast water exchange, which Navion hopes will be efficient, easy to operate and maintain and inexpensive to install. The new concept is now being tested in full scale on the company's 7,500t ethane carrier ***Navion Dania****.*

The Navion Dania

The Navion concept for ballast water exchange aims to exploit variations in density between water in the ballast tanks and in the sea surrounding the vessel, caused by such factors as differing salinity and/or temperature. Small-scale model tests at Norway's Sintef research foundation in December 2001 found that even minor variations in density were enough to achieve a "plug flow" effect or displacement.

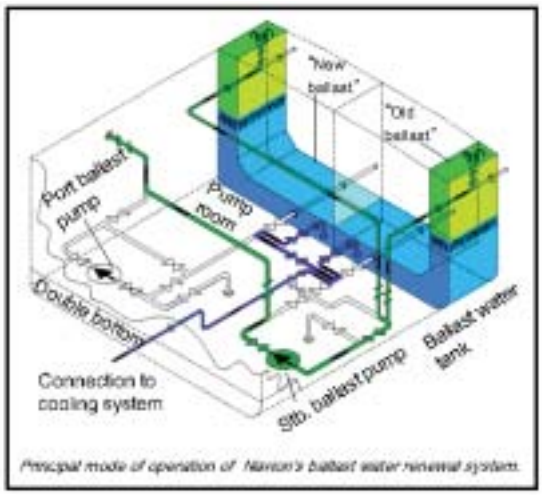
The existing methods of ballast water exchange as recommended by IMO – complete empty and refill or flow-through of three times the tank volume – are time-consuming and require controlled conditions. The vessel's loading condition must be carefully monitored during this operation, which calls for additional manning and possible overtime. It also raises the risk of operational error. In the Navion concept the tanks will always be full and continuous monitoring of the vessel's loading condition is not required.

The Sintef small-scale tests involved adding colorant to simulated ballast water and measuring its concentration in the displaced water. The figure below shows two of the measurement results in relation to theoretical calculations. The test unit was constructed as a scaled-down conventional ballast tank of around 100 litres.



The system calls for a simple piping installation, which allows seawater to be added from both top and bottom of the ballast tanks. This pipework is connected to the existing ballast water pumps, and the efficiency of the system could be enhanced by incorporating the coolant water pumps in the circuit.

Sintef claims that its small-scale trials show that density differentials as low as 0.05 grams per cubic centimetre are sufficient to provide effective replacement. Incoming water is added at the top of the tank if it is lighter than the ballast, and at the bottom if its density is higher. The tests indicate that little mixing occurs between water with differing densities.



Principal mode of operation of Navion's ballast water renewal system

The principal conclusion by Sintef is that the replacement rate for the ballast water could be high. Given that the model unit was designed as an ordinary ballast tank, and such tanks normally have physical reinforcements which theoretically create turbulence and mixing, the water replacement rate could be increased through optimal tank design. It would also be important to control the incoming water flow in order to minimise mixing.

Navion estimates that the cost of installing the system might total roughly NOK 3-5 million for a medium-sized tanker. Retrofitting could be done on certain vessel types in service, while others must be docked. Investment would be lower for ships which incorporate the system from the design phase.

Navion has awarded a letter of intent to Norway's VEKOS ship installation specialist covering world-wide marketing of the system and installation on vessels. Patent applications have been filed by Navion.

The results of the real-life testing will be of extreme interest to IMO and national regulatory bodies. Most importantly, the biological effectiveness of the system in terms of actually preventing or reducing the transfer of species remains to be demonstrated and verified. Before adoption by the shipping industry, any new ballast water management arrangements should be approved through IMO and relevant jurisdictions.

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Warning – Beware the Ballast Bafflers!

Currently, through Assembly Resolution A.868(20), IMO recommends the following main procedures for ships, in order to minimize the transfer of harmful aquatic organisms and pathogens in ballast water:

- Minimize the uptake of organisms.
- Remove ballast sediment on a timely basis.
- Undertake ballast water exchange at sea, as far as possible from shore, using either complete empty and refill or the flow-through method (equivalent to at least three complete tank volumes in the case of the latter).
- Discharge to reception facilities.
- Other options as approved by the port State.

The IMO guidelines also require relevant ships to carry ballast water management plans and maintain and report records according to standard templates. They also provide guidance and details on a range of other issues (http://globallast.imo.org/guidelines/).

While ballast water exchange at sea remains the main risk reduction measure, it is widely recognized that this technique is far from perfect. The hunt is therefore on to find alternative, more effective ballast water treatment techniques, driven also by a potential multi-billion dollar market. As reported in various issues of Ballast Water News, the GloBallast Programme has been working to assist this process. These efforts have included covering the 1st International Ballast Water Treatment R&D Symposium and Standards Workshop in London in March 2001, developing and maintaining the Ballast Water Treatment R&D Directory (http://globallast.imo.org/research/), directly funding R&D activities in some of the GloBallast Pilot Countries and maintaining cooperative links with a number of R&D projects and bodies.

While the 1st R&D Symposium and Standards Workshop were hailed as major successes, playing a crucial role in catalyzing a more coordinated, cooperative, global R&D effort, one of the features of the symposium was a surprisingly poor quality of science evident in many of the papers presented. Unfortunately, this situation does not seem to be improving.

Here at the Programme Coordination Unit (PCU) we are bombarded by salesmen, vendors and researchers offering the ultimate solution to the ballast water problem, almost on a weekly basis. Various groups are claiming that their systems are 'more effective than ballast water exchange' (a virtually impossible comparison given the wild variability of exchange), that they can kill 99% or even 100% of organisms, that there systems are cost effective, low-maintenance, easy to operate, environmentally sound etc etc.

Unfortunately, none of these groups have been able to provide the PCU with hard data that has been published in peer-reviewed, internationally recognized scientific journals. Technical details of their experimental designs and test protocols are often very sketchy, or if available, are sometimes of questionable quality. Test protocols also vary widely between research projects, making it virtually impossible to compare different systems in a meaningful way.

It appears that some of the claims relating to cost effectiveness, low-maintenance and ease of operation of some of the systems may well be justified. Never-the-less, if the system cannot be proven to be biologically effective, according to scientifically rigorous verification procedures, the most important criteria is missing and it should not be accepted as an alternative treatment system.

It is hoped that many of the R&D projects that have commenced more recently, are designed and managed in such a way that these major deficiencies will be addressed, and that the quality of the science will begin to improve, including peer review and publication.

Regulatory agencies and ship designers, builders and owners should be extremely cautious when evaluating new, alternative ballast water treatment systems. There is a danger that shipping will invest in installing systems that may be of limited usefulness in terms of actually killing organisms, and which may become redundant once IMO agrees international standards for such systems.

The vital efforts of the R&D community to find a solution to this problem should be applauded and fully supported, and 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, until these systems are proven effective and approved by a relevant jurisdiction, they are experimental only. International standards and procedures for the evaluation and approval of new ballast water treatment systems therefore need to be agreed and implemented as soon as possible, adopting realistic, practical, achievable and verifiable targets.

The current discussions within the IMO Marine Environment Protection Committee provide a unique and time-critical opportunity to put this matter to rest. In the meantime, beware the ballast water bafflers!

SR

No Ballast ≠ No Bugs

Over the last decade, much attention has been focused on ballast water as a vector for non-indigenous species introductions, and on open-ocean ballast exchange as a defence against new introductions. However the issue of NOBOB (no-ballast-on-board) vessel operations in the North American Great Lakes has risen from a position of relative obscurity to become one of the top concerns in the Great Lakes basin today.

Even ships with no ballast on board (NOBOB) can transfer organisms in residual ballast water and sediments

On average, less than 10% of ocean vessels entering the Great Lakes in recent years contained declarable ballast water on board. NOBOB vessels escape scrutiny under existing U.S. and Canadian federal, state, and provincial laws, yet their ballast tanks may retain residual volumes of un-pumpable ballast water, as well as accumulations of sediment and aquatic organisms and eggs representing numerous previous ballasting operations.

While operating in the Great Lakes, NOBOB vessels take on water as ballast to maintain their trim and stability. This new ballast water can mix with the residual ballast water, mud, and associated non-indigenous organisms in these tanks and then be discharged as the vessel takes on new cargo at a various ports along its route. Thus, the ballasting operations of NOBOB vessels present a previously overlooked risk as a vector for invasions, but the magnitude of risk remains unresolved.

Another concern is the effectiveness of ballast exchange as a preventive measure. Of particular relevance to the Great Lakes is the efficacy of open-ocean ballast exchange when the original ballast is fresh or low salinity water, which differs in density and biota from high salinity water. The freshwater regions of Europe and especially the coastal regions of the Baltic and Black Seas have been implicated as source regions for most of the Great Lakes invaders found since 1985 (e.g. zebra mussel, quagga mussel, round goby, tubenose goby, amphipod *Echinogammarus ischnus*, the fishhook waterflea, *Cercopagis pengoi*, and the diatom *Thalassiosira baltica*). Many of the aquatic organisms found in these regions (a) are euryhaline and can survive exposure to high salinity and (b) form resting stages that accumulate in bottom sediments and are difficult to remove with exchange. Therefore, the effectiveness of exchanging freshwater from these regions for open-ocean saltwater is an important, largely unresolved question to consider.

A multi-institutional team of scientists from the National Oceanic and Atmospheric Administration (NOAA) Great Lakes Environmental Research Lab (GLERL), the University of Michigan, the University of Windsor (Canada), Old Dominion University (USA), Phillip T. Jenkins and Associates (Canada), and the Smithsonian Environmental Research Center (USA) is conducting a multi-disciplinary research program with three interrelated research tasks:

- Task 1: Characterization of biological communities and ballast residuals in NOBOB tanks and relationship to ballast management procedures;
- Task 2: Ballast tank mesocosm experiments to determine whether resident biota in NOBOB ballast tanks are discharged to the Great Lakes under actual ship operating conditions; and
- Task 3: Experiments to test the effectiveness of open-ocean exchange in transoceanic vessels carrying fresh or low-salinity ballast water.

During the 2001 shipping season 22 vessels were boarded and the residual ballast material sampled in 43 ballast tanks. Ballast management surveys were also completed on 61 vessels. Generally, total ballast residuals were <1% of total ballast capacity in those tanks entered and visually assessed, and the sediment component was estimated to be <50% of total residual. Participation of shipping industry and cooperation of captains and crews were outstanding.

All tanks sampled contained live invertebrates and phytoplankton, and/or viable resting stages of zooplankton and phytoplankton. Concentrations of bacteria were similar to those of other environmental samples, whereas concentrations of virus-like-particles in NOBOB residual sediments ranged higher than values reported for other sediment types. Many resting eggs and cysts of both invertebrates and phytoplankton readily hatched in freshwater and/or saltwater treatments under controlled laboratory conditions. Some second-generation populations were produced by the first generation hatched invertebrates. The most common live invertebrates found in residual water analyzed to date were nauplii, rotifera, and cyclopoida, while in the sediment residuals, nematodes, harpacticoids, and cyclopoids were the most common.

Work is continuing in 2002 including sampling of residuals, a voluntary ballast practices survey (Task 1), two additional ballast tank mesocosm experiments (Task 2), and two transoceanic ballast exchange experiments (Task 3).

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Publications

Invasive Aquatic Species of Europe

Although the problem of biological invasions has become a rapidly growing research area, major research gaps remain, both geographically and thematically. *Invasive Aquatic Species in Europe: Distribution, Impacts and Management* is the first attempt to provide an overall picture of the situation in Europe.

The geographical scope of this new book, edited by E. Leppäkoski, S. Gollasch & S. Olenin, stretches from Irish waters in the west to the Volga River and the Caspian Sea in the east, and from the Mediterranean in the south to the Arctic in the north.

All major European aquatic systems on the broadest geographical and ecological scope possible are represented, from fully saline seas, semi-enclosed brackish water bodies and coastal lagoons to freshwater lakes, major river systems and waterways. Not all parts of the continent could be equally covered, as in some areas species invasions are not well studied.

Altogether more than 100 scientists from 24 countries joined to synthesize the available information on aquatic bioinvasions.

More details, material to download and order form at http://www.ku.lt/nemo/EuroAqualnvaders.htm

GloBallast Monograph Series Launched

As part of the GloBallast information clearing-house function, a new monograph series, including reports and proceedings of conferences and workshops as well as technical, scientific and consultancy activities, has been launched by the PCU.

The first to be released are the final reports on the GloBallast Legislative Review and the Baltic Regional Workshop on Ballast Water Management. Further reports in the series are forthcoming.

The monographs can be ordered as hard copies, free-of-charge, from cgregory@imo.org, or downloaded as PDF files from http:/globallast.imo.org/publications/.

New Posters Available

As part of its ongoing communication and awareness campaign, the PCU has released two new posters. The first, entitled 'Ten of the Most Unwanted', describes some of the world's best known invasive aquatic species and the impacts they are causing. The second, entitled 'Ballast Water Stowaways – What Can be Done?' provides a clear pictorial representation of how aquatic organisms are transferred in ballast water and lists some simple but effective measures that can be taken, both on board ships and by port States, to reduce this threat.

Both posters can be ordered as full-size hard copies, free-of-charge, from cgregory@imo.org, or downloaded as PDF files from http:/globallast.imo.org/awareness/.

In addition, the Pilot Countries are continuing to produce local awareness materials for use nationally and regionally, as per these example from South Africa and Iran.

Progress Report

Activities Undertaken July – September 2002

- ✓ PCU staff annual leave.
- ✓ Prepared for and attended World Summit on Sustainable Development, Johannesburg, 26 August – 4 September.
- ✓ Completed UNDP-GEF Project Implementation Review.
- ✓ Undertook mid-term external review of the programme.
- ✓ Commenced second round of country visits for ballast water risk assessments.
- ✓ Attended and presented at NordTest workshop, Copenhagen, 16 September.
- ✓ Prepared for and attended GEF International Waters Conference, Dalian, China, 26-29 September.
- ✓ Distributed new awareness materials.
- ✓ Progressed sponsorship and partnership arrangements for production of TV documentary.
- ✓ Commenced publication of the GloBallast Monograph Series.
- ✓ Produced 10th issue of Ballast Water News.

Activities Planned October – December 2002

- Continue second round of country visits for ballast water risk assessments.
- Present at IMO-UNEP Regional Seas Forum, IMO London 2 September.
- Prepare for and attend Inter-sessional Ballast Water Working Group meeting, IMO London, 30 Sept – 4 October.
- Prepare for and attend MEPC 48, IMO London, 7-11 October.
- Prepare for and hold 4th Global Task Force meeting, Beijing, China 28-30 October.
- Prepare for and hold 1st East Asian Regional Task Force meeting, Beijing, China 28-30 October.
- Participate in CIESM shipping vectors workshop, Istanbul, Turkey 6-8 November.
- Assist and participate in joint RECSO/GloBallast tanker industry workshop, Dubai 16-18 December.
- Complete and implement mid term evaluation review.
- Prepare GloBallast Advanced funding submission to GEF.
- Implement Country Profile database on GloBallast web site.
- Produce 11th issue of Ballast Water News.

More Information?

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