

From the Editor

Welcome to the first issue of Ballast Water News in 2003, celebrating the launch of our new strategic alliance with one of the world's premier international environmental organizations; IUCN - The World Conservation Union.

The spread of invasive aquatic species across the world's oceans is effected not only by shipping, but also by many vectors. Global efforts to address one vector, such as those being undertaken by the GloBallast Programme for ships' ballast water, can only be fully effective if complemented by efforts to address the other vectors as well. An integrated, cross-sectoral approach to environmental management can only be achieved through cooperation and partnerships at all levels. The pursuit of such partnerships has always been a priority for GloBallast, and will receive increased attention this year as we move further into regional cooperation and prepare for future activities, in support of the forthcoming ballast water Convention.

To launch our new agreement with IUCN, we are honoured to have as our Guest Speaker, Mr Carl Gustaf Lundin, Head of the IUCN Global Marine Programme, along with two articles by Imène Meliane, Marine Programme Officer at IUCN's Centre for Mediterranean Cooperation in Malaga, Spain. Under the GloBallast-IUCN partnership, IUCN has become a co-producer of Ballast Water News, and we look forward to presenting many more interesting articles from the Union in future issues. We are also cooperating on other communication and awareness activities, regional replication and the preparation of future plans and proposals.

A feature in this issue is an article on the invasion of South America by the Golden Mussel *Limoperna fortunei*. This freshwater species has been transported from estuarine ports in its native range in East Asia, across the oceans to the Rio de la Plata in Argentina/Uruguay, most likely as a stowaway in ships' ballast water. Invading South American river systems at the rate of 240 km a year, it is now impacting directly on the Pantanal and Iguacu World Heritage Areas, and threatens the world's ecological 'crown jewels' - the Amazon basin. The article provides a somewhat sobering reminder of the global reach of shipping-related environmental impacts, and of the urgent need for truly effective management measures.

The commencement of regional cooperation in Southern and East Africa provides a good-news story, as do the launch of GloBallast awareness activities by the Prime Minister and Deputy Prime Minister of India, and the Deputy Minister for Environment in Brazil, along with the commencement of an electronic monitoring project in Ukraine.

An encouraging trend in recent times has been an increase in ballast water management activities by various countries, of their own initiative and without financial or other support from GloBallast. Two examples are presented in this issue, in Slovenia and Canada. To ensure maximum effectiveness, it is vital that such national projects remain consistent with the uniform international regime.

This is the last year of activities for the current phase of GloBallast, which we sincerely hope will culminate in adoption of the new Convention in early 2004



Steve Raaymakers
Contributing Editor

From the Programme

It is with great satisfaction that GloBallast acknowledges its new partnership with IUCN - The World Conservation Union. For the next four issues our newsletter will host a series of articles from IUCN and will benefit from the direct support of the Union for the production and distribution of Ballast Water News in 2003. The transfer of invasive species in ships' ballast water is a global problem with significant impact on biodiversity, economic security and human health. This type of strategic partnership opens the door for an integrated approach to address the ballast water issue in a meaningful and efficient manner. GloBallast sees this cooperative endeavour as the first concrete step towards a stronger collaboration with IUCN that could materialize in a medium-term partnership for the future implementation of ballast water management activities at the regional level.

In preparation for the next session of the Marine Environment Protection Committee (MEPC), scheduled from 14 to 18 July 2003, in March an Intersessional Ballast Water Working Group reviewed the draft *International Convention for the Control and Management of Ships' Ballast Water and Sediments* and ironed out a number of aspects which were pending from the last session of MEPC in September 2002. In his opening address the Director of the IMO Marine Environment Division, Mr Koji Sekimizu, emphasized the need to accelerate the development of measures to address invasive aquatic species and urged the participants to make every effort to resolve any outstanding issues, so as to enable the Committee to approve the documents, for consideration for adoption by the Diplomatic Conference early next year.

After successful initiation of regional activities in the Black Sea, Baltic Sea, ROPME Sea Area and East Asia, another moment of reference was the 1st Regional Task Force Meeting on Ballast Water Management for Africa held in Saldanha, South Africa from 17 to 18 March 2003.

The African continent includes a number of sensitive large marine ecosystems, which are now at threat from marine species transported beyond their natural range and dispersed across the continent by shipping. After listening to various presentations from the 12 participating countries it became clear that Africa had already suffered from the effects of marine bio-invasions including harmful algal blooms and increased fish mortality. The continent possesses significant marine resources including biodiversity, fisheries and coastal and marine industries. These values are likely to increase in economic importance in the future and therefore they need to be protected now.

The participants developed a regional Strategic Action Plan (SAP), which provides a framework for future activities related to Ballast Water Management and Control in Africa, and paves the way for the adoption of the anticipated IMO Convention. It is envisaged that the SAP will be submitted in its final format for adoption by the Contracting Parties to the Nairobi Convention for the countries on the east African coast. A similar approach is intended in the western part of the continent for the Parties to the Abidjan Convention.

Finally, I am extremely pleased to announce the *2nd International Ballast Water Treatment R&D Symposium*, to be held immediately after MEPC 49 - demand is high, so register now!



Dandu Pughiuc
Chief Technical Adviser

Ballast Water News is the quarterly newsletter of the Global Ballast Water Management Programme (GloBallast), and is produced with the support of the World Conservation Union (IUCN). GloBallast is a cooperative initiative of GEF, UNDP, IMO and other partners to assist developing countries to reduce the transfer of harmful organisms in ships' ballast water, through the implementation of IMO guidelines.

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The views expressed in Ballast Water News are not necessarily those of IUCN, GEF, UNDP or IMO.



Guest Speaker

Mr Carl Gustaf Lundin
Head of Global Marine Programme
IUCN – The World Conservation Union



Fil. Lic. Carl Gustaf Lundin joined IUCN as head of the Global Marine Programme in November 2001. His primary responsibility is to develop the programme in four areas: marine protected areas; building partnerships for conservation of ecosystems and endangered marine species; sustainable fisheries management; and climate

change effects on marine resources. He is responsible for all aspects of managing the programme as well as fundraising and development of public information materials.

Before joining IUCN Carl worked with the World Bank for more than 12 years. His primary focus was coastal and marine management issues in several regions of the world including Argentina Coastal Contamination and Marine Pollution project; China Coastal Development Project; Eritrea Port Project; Indonesia Coral Reef Rehabilitation and Management Project; Mexico's Natural Protected Areas Projects; Mesoamerican Biological Corridor Project; Aquaculture Development Project; Seychelles Biodiversity and Marine Pollution Project and the Uruguay Maritime Management Project. He has worked on a wide range of reports and publications in this field as well.

Throughout the world, biological diversity faces many threats. One of the major threats is now acknowledged by scientists and governments to be biological invasions by alien species. This is particularly true for the marine and aquatic environments where the impacts of alien invasive species have proved to be immense, and usually irreversible.

Shipping, both through ballast waters and hull fouling is one of the main vectors for the introduction of alien species in aquatic environments. The globalisation and growth in the volume of trade and tourism, coupled with the emphasis on free trade, provide more opportunities than ever before for species to be spread accidentally or deliberately. The International Maritime Organization (IMO) is dedicating remarkable efforts in addressing the problem of invasive species that are carried through shipping, but shipping is only one vector, and there are still many other vectors where efforts should be made to control introductions. It is increasingly recognised that it may be more effective and efficient to take a more holistic, integrated approach to the management of invasive species.

Biological boundaries and ecosystems do not recognize political borders. Therefore, governing species introduction, especially in the marine environment, should be addressed at the international and regional level as well as a national and local concern, and cooperation between nations and organizations is critical to efficiently address this problem.

Many international conventions and organizations have references and programmes for alien invasive species. Very few however, effectively join efforts. The World Conservation Union believes that cooperation and

collaboration are essential to help prevent the deleterious effects of alien invasive species. In its guidelines for the prevention of biodiversity loss caused by alien invasive species, IUCN is committed to maintain and develop links and cooperative programmes with other organisations involved in this issue. IUCN is contributing to the Global Invasive Species Programme (GISP), together with CAB International, the United Nations Environment Programme (UNEP) and the Scientific Committee on Problems of the Environment (SCOPE).

Faithful to its commitments, the Union, led by the Global Marine Programme is now engaging with IMO and the GloBallast Programme to bring its expertise, through its different components (including its Commissions, Programmes and Regional Offices), to raise awareness on the problem of aquatic invasive species.

The IUCN Global Marine Programme considers aquatic invasive species as one of the most important marine issues on a global level where the programme should engage fully.

The threats posed by aliens to the precious few remaining undisturbed ecosystems are considerable. Today we are witnesses to a global mixing of faunas and floras across the oceans, and to a beginning of substantial changes in some hot spots of marine biodiversity like some coral reef areas in the Pacific region. The current systems of monitoring and protection of these high value areas should be modified to consider and deal with the problem of alien species introductions. We are at the early stage of tackling marine bio-invasions. It is only the beginning of a long process that will require a lot of additional attention and efforts.

The initiation of a new partnership between IUCN and IMO/GloBallast, including co-production of this newsletter, heralds a new era of international cooperation upon which the necessary additional efforts can be built.

Carl Gustaf Lundin

IMAREST



Register Now!

GloBallast and The Institute of Marine Engineering, Science and Technology (IMarEST) are pleased to announce registrations for the

2nd International Ballast Water Treatment R&D Symposium

**21-23 July 2003,
 IMO, London**

The R&D symposium is intentionally scheduled immediately after the 49th meeting of IMO's Marine Environment Protection Committee (MEPC), which will be making key decisions on the new international ballast water Convention. It therefore presents an unrivalled opportunity to update latest global R&D outcomes and future directions.

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Aquatic Bio-invasions: A Challenge for the World

For millennia, the natural barriers of oceans, mountains, rivers and deserts provided the isolation essential for species and ecosystems to evolve. In just a few hundred years, these barriers have been overcome by major global forces that have combined to help species travel vast distances to new habitats, becoming invasive alien species in their new environments.

Few countries have developed the legal and institutional systems that are capable of responding effectively to these invasive species. Many invasive aliens are 'colonising' species that benefit from the reduced competition that follows habitat degradation. It is in this integrated context that IUCN has identified the problem of invasive alien species as one of its major initiatives at the global level.

The aquatic and marine environments present conditions that are exceptional and challenging for the control of bio-invasions. Species spread in a three-dimensional fluid system, where monitoring is a difficult and costly task. Moreover, many eradication and control options (e.g. clearance, shooting, pesticide, herbicide) used in the terrestrial biota are harder to apply in the aquatic systems.

IUCN drew international attention to the devastating threats of invasive alien species in the *International Day for Biological Diversity* in May 2001, giving the issue a more prominent place in the thinking of conservationists, planners and ordinary citizens. It played a lead role in making the problem of invasives a global priority under the Convention on Biological

Diversity (CBD) and published two books on the subject, *"The Great Reshuffling – Human Dimensions of Invasive Alien Species"*, and *"100 of the World's Worst Invasive Species"*.

IUCN is a pivotal partner in the Global Invasive Species Programme (GISP) that has done so much to raise awareness of the seriousness of biological invasions and has published a global strategy to address invasives and a toolkit for their management. All components of IUCN – including its Commissions, Programmes and Regional Offices – act together to support the Union's Global Initiative on Invasive Species.

The Invasive Species Specialist Group (ISSG), part of IUCN's Species Survival Commission, is a global group of 146 scientific and policy experts on invasive species from 41 countries. The group provides expertise and advice on a broad range of issues and coordinates the *Cooperative Initiative on Invasive Alien Species on Islands*, manages the *Global Invasive Species Database*, publishes the newsletter *Aliens* and runs the listserver *Aliens-L* (www.issg.org).

IUCN's Commission on Environment Law and the Environmental Law Programme are playing a key role in supporting the development of legal and institutional framework for addressing alien invasive species. The Environmental Law Programme published *A guide to designing Legal and Institutional Framework on Alien Invasive Species*. This guide seeks to provide national legislators and policy makers with practical guidance for developing or strengthening legal and institutional frameworks on alien invasive species, consistent with Article 8(h) of the CBD, as well as explaining and clarifying pertinent obligations under other international instruments.

The battle against invasives is also waged in the field by IUCN. The Union's Regional Programmes in Asia, Meso-America and Eastern Africa held regional workshops to discuss the problem and develop recommendations and plans for actions. The Eastern Africa Regional Programme has included the issue of invasive species into its ecosystem management activities and has recently published a booklet describing some threats and solutions for alien invasive species in Africa's wetlands. Eastern Africa suffers serious problems with alien aquatic weeds.

IUCN's Global Marine Programme is particularly concerned about the problem of marine invasive species and is developing various activities and projects to address the issue. Apart from being the main partner in IUCN's work with IMO/GloBallast, the Marine Programme also addresses union-wide policy and programmatic work in this field.

As a Union, IUCN seeks to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. Marine invasives pose a particularly serious threat and will need more urgent action throughout the world. IUCN will work with its members and other partners, including IMO/GloBallast, to slow the speed of introductions, and find cost-effective mechanisms that are equitable and environmentally responsible to address this issue.

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Created in 1948, IUCN – The World Conservation Union brings together 72 States, 107 government agencies, 750-plus NGOs, 34 affiliates, and some 10,000 scientists and experts from 181 countries in a unique worldwide partnership. IUCN is the world's largest environmental knowledge net-work and has helped over 75 countries to prepare and implement national conservation and biodiversity strategies. It focuses on species and biodiversity conservation and the management of habitats and natural resources. The Union builds on the strengths of its members, networks and partners to enhance their capacity and to support global alliances to safeguard natural resources at local, regional and global levels.

Invading Mussels Threaten Amazon: GloBallast - Brazil Take Action



In the late 1980's the Golden Mussel *Limnoperna fortunei*, a native of East Asia, was found in the Rio de la Plata between Uruguay and Argentina. A freshwater bivalve that normally lives attached to natural and artificial hard substrates in its native range, *L. fortunei* is most likely to have been carried to South America by ships trading between riverine/estuarine ports in Asia and the ports of Buenos Aires and/or Montevideo.



Limnoperna fortunei



A ship entering the Rio de la Plata

Having been carried across the oceans in ships' ballast water (it would have been killed by oceanic salinity if carried attached to the hulls of ocean-going vessels), the Golden Mussel is now being translocated throughout South American freshwater systems as fouling on river vessels.

Spreading rapidly into adjacent watersheds, within 10 years the mussel had established 1,100 km upstream throughout the Plata, Parana and adjacent river systems. It is spreading northwards in South America at the rate of 240 km per year (Darrigran 2001), potentially threatening the entire Amazon basin and linked river systems within the next decade.



Main Brazilian waterways and connections. Red = current extent of *L. fortunei* (Source: Darrigran 2000)

The rapid spread of this aggressive invader is cause for major ecological and economic concerns. The aggressive rate of invasion by the Golden Mussel is exemplified by the following: In 1991, the density of

Golden Mussels in Bagliardi, Argentina was five individuals per m². By 1992, this had increased to 36,000 per m². In 1993, 80,000 per m² and in 1998, the density was 150,000 mussels per m². In Brazil, it was first found in 1998, at the mouth of the Jacui River, near the port of Porto Alegre. One month later, it was found 70 km southward, in Guaiba River, Itapua, near Patos Lagoon. In 2000, it was also found in Arambare. After 18 months of invasion in Brazil, it was observed in a density of 27,275 individuals per m², mainly on the roots of aquatic plants.



Mass fouling by the Golden Mussel on aquatic plant

The potential economic impacts of *L. fortunei* in South America are very similar to those described for *Dreissena polymorpha*, the European Zebra Mussel, in the North American Great Lakes and adjacent waterways (biofouling and blockage of pipes and water systems of cities, industries, power plants and other infrastructure). Zebra Mussel control measures in North America are estimated to have cost between US\$750 million to US\$1 billion from 1989 and 2000 alone (O'Neil 2000). The cost of similar control measures in remote parts of South America is likely to be even higher.

Since 1998, the mussel has already reached the city of Corumba, in Mato Grosso do Sul State, brought by boats through the Paraguay River. In April of 2001, it was first found at the massive Itaipu Hydroelectric Plant, attached to the pipes, filters and pumping systems. The biologists of this hydroelectric company are frantically searching for alternatives to control the infestation to avoid the consequences experienced at the Yacyreta hydroelectric plant (Argentina/Paraguay), which has to be stopped for periodic cleaning, with significant economic losses.



The world's largest hydroelectric plant at Itaipu, already impacted by the Golden Mussel

Ecologically, harmful effects of the golden mussel on native molluscs and benthic communities of Brazil, Argentina and Uruguay have also been significant. Before the Golden Mussel invasion, the macrofouling communities in the neotropical region were restricted to salt or estuarine waters. Today, due to its high fecundity and the absence of natural enemies, it is possible to find *L. fortunei* and associated bio-encrustations throughout the entire Parana watershed.

The potential repeat of a Great Lakes-type Zebra Mussel invasion in the sensitive Amazon system is unthinkable, and demands immediate action.

Brazil was first alerted to the problems this species was causing in Argentina and Uruguay by Calixto (2000), and in 2002 the GEF/UNDP/IMO GloBallast Programme launched the Golden Mussel Project in Brazil.

Supervised by the Brazilian Ministry of Environment (MMA), co-ordinated by the Admiral Paulo Moreira Marine Research Institute (IEAPM) of the Brazilian Navy, and supported by the GloBallast Programme Coordination Unit at IMO in London, the most important aim of this project is to offer the Brazilian Government and industry procedures for controlling the spread of the mussel.

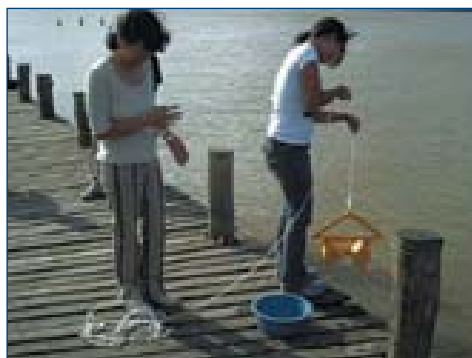
Of particular concern are potential irreversible impacts on the aquatic ecology of the Pantanal Conservation Complex, declared a World Heritage Area by UNESCO. The GloBallast Golden Mussel Project therefore links with the 'sister' GEF project *Integrated Watershed Management Program for the Pantanal and Upper Paraguay River Basin*, thereby effecting synergies and cooperative deployment of GEF resources for the protection of the Pantanal.

The study started in October 2002 and aims to be completed in January 2004, and is being developed in 9 phases:

1. Literature review on *L. fortunei* (completed).
2. Project planning workshop in Porto Alegre, Brazil (December 2002).
3. Technical site visits to impacted areas to obtain information on the impacts caused by the mussel, including institutions, universities, water treatment companies, ports, hydroelectric powerplants and other industries that depend on river water.
4. Field sampling at 30 sites in rivers and lakes of south, southeast and Midwest Brazil. The field sampling will assess current distribution and densities of *L. fortunei* in the plankton (larval stages) and in the benthos (settled spat and adults). The following environmental data will be recorded: air and water temperature, conductivity, salinity, pH, dissolved oxygen and water transparency.
5. Genetic analysis of molecular markers (alloenzymes) to confirm the mussel's origin.
6. Data analysis and mapping of the current distribution and density of the Golden Mussel and the speed of its dispersion, including modelling to forecast its potential arrival at ecologically and economically strategic sites. Procedures of control will be proposed by this work.
7. Assessment of present and future environmental and economic impacts of the mussel, using information from phases 1 to 6 plus additional research.
8. Preparation of reports in Portuguese, Spanish and English.

9. Seminar to present results and recommended control measures to Brazilian, Argentinean, Paraguayan and Uruguayan authorities, industries and academics.

To undertake such a project in so large an area, and given the mussel's wide distribution across political boundaries, a multi-national team involving researchers from different Brazilian States and also Argentina, Uruguay and Paraguay, has been assembled. The project marks the practical beginning of regional co-operation in South America on ballast water and aquatic bio-invasion issues, a key objective of the GloBallast Programme.



Sampling in Guaiba Lagoon, Rio Grande do Sul



The Iguacu Falls World Heritage Area – aquatic ecosystem threatened by the Golden Mussel

The incursion of the Golden Mussel so deep into the internal waterways of the world's fourth largest continent, impacting the Pantanal and Iguacu World Heritage Areas, and threatening even the globally significant Amazon basin, clearly demonstrates the far reaching environmental impacts of international shipping.

While it is hoped that the GloBallast Golden Mussel Project will help develop management actions to control the further spread of this highly invasive species, such measures can only be effective if the original source of introductions is also effectively addressed, through the proper management and treatment of ships' ballast water.

The fact that the Golden Mussel invasion has occurred, despite obvious lessons from the Zebra Mussel in North America, highlights the urgent need for industry and governments to take immediate action to reduce the spread of harmful aquatic species by shipping activities.

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References for this article are listed on page 11.

Africa Acts Regionally

The regional replication component of the GloBallast Programme has continued to gain momentum, with the first meeting of the Regional Task Force (RTF) for Southern and East Africa being held on 17 and 18 March 2003, at the Saldanha Bay demonstration site in South Africa. This is the fifth region to initiate cooperative activities under GloBallast, following similar events in the Black Sea, Baltic Sea, ROPME Sea Area and East Asian Seas.



The first Regional Task Force meeting for Southern and East Africa

The RTF comprises both maritime and environment representatives from 10 countries – Angola, Comoros, Kenya, Madagascar, Mauritius, Mozambique, Namibia, Seychelles, South Africa and Tanzania. Also represented are the United Nations Environment Program (UNEP), the United Nations Development Program (UNDP), the Port Management Association of Eastern and Southern Africa (PMAESA), the Western Indian Ocean Marine Science Association (WIOMSA), the World Conservation Union (IUCN), the GloBallast Programme Coordination Unit (PCU) and the IMO Nairobi office. Observers included representatives from Zambia and the Regional Maritime Academy in Ghana. The objectives of the meeting were:

- To establish the status of invasive aquatic species concerns and ballast water management practices in countries of the region.
- To develop the components of a draft Regional Strategic Action Plan (SAP).
- To consider the appropriate regional mechanisms for ongoing implementation of ballast water management activities in the region.

Representatives from each country delivered presentations on the current status of invasive aquatic species and ballast water management at their homeports. While awareness of the issue and concerns about potential impacts are generally quite high, outside of South Africa very little ballast water management capacity exists, and little is known about alien species already present in coastal waters.

All countries of the region strongly encouraged and supported the role of GloBallast as facilitators of the RTF, and advocated the use of South Africa's experiences in recent years, for adaptation and replication throughout the region. The PCU also presented aspects of the developing IMO Convention, in order to help ensure a regional approach that is consistent with this imminent international regime.



Countries participating in the first RTF meeting

The meeting developed components of a draft SAP through targeted working groups, focused on several key areas:

- Highlighting existing regional structures, including legal frameworks, organisations and operational programmes.
- Principal actions, including communication and awareness, legal and institutional, port surveys and risk assessments, regional database, national action plans, training and capacity building and cooperation with other regional schemes.
- Implementation, funding and sustainability of the SAP, including phased approach and ongoing RTF secretariat.

It was agreed that the activities proposed within the SAP generally fell within three time frames or phases:

1. During the current GloBallast workplan, the South African Country Focal Point (CFP) will chair the RTF and some initial demonstration projects will be conducted.
2. Defined by any follow-up project to GloBallast, a proposed regional coordinator would chair the RTF, support ongoing replication of demonstration projects and develop mechanisms for regional cooperation and self-sufficiency.
3. Long-term, ongoing activities and needs. The RTF secretariat to be assimilated into regional bodies (such as the Nairobi and Abidjan Conventions) in order to maintain an ongoing coordination function and assist implementation of National action plans.

The draft SAP is currently in the process of being revised and adopted by the countries involved. All that participated deemed the meeting a success, and follow-up activities are already in progress. Overall the momentum and enthusiasm within the region is high to initiate the SAP and thereby commence an ongoing cooperative approach to reducing the threat of invasive aquatic species. The region is highly appreciative of the role being played by GloBallast, and looks forward to developing this relationship further towards a common goal.

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India Engages at Highest Level

A key objective of the GloBallast Programme is to raise awareness about the seriousness of the problem of invasive aquatic species carried in ships' ballast water, at all levels of society – so as to galvanize an effective response from governments, industry and the community.

To date the GloBallast awareness campaign, both globally and within the Pilot Countries, has targeted the maritime and related sectors. As the prospect of the adoption of an international ballast water Convention draws nearer, efforts are now shifting to focus on senior government decision makers and the higher political levels.

Of particular note in this regard, is the recent launch of an awareness-raising calendar, by none other than both the Prime Minister and Deputy Prime Minister of India, the Honourable Mssrs. Atal Bihari Vajpayee and L.K. Advani respectively, on 6 January 2003.

The calendars were produced and the launch organized by the community-based environmental group Rambhau Mhalgi Prabodhini (RMP), under the initiative of Dr Sanjay Deshmukh, Director of Research at RMP. This grass-roots NGO has been a highly effective partner for the implementation of various GloBallast activities in coastal areas of India, and is an extremely active member of the cross-sectoral National Task Force established and coordinated by the Country Focal Point, Mr Sanjoy Chakrabarty.

This demonstration of commitment and engagement from the very highest level of National Government in a country as large and globally significant, and with as many competing priorities as India, is an extremely positive boost to national, regional and international efforts to address this global environmental threat.



Launch of the GloBallast awareness calendar in India by the Prime Minister – Honourable Mr. Atal Bihari Vajpayee (Centre) and the Deputy Prime Minister – Honourable Mr. L.K. Advani (far right – sitting). Holding the calendar (standing) is Dr Sanjay V. Deshmukh.

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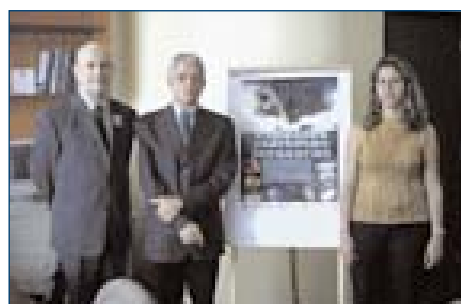
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Deputy Minister Makes Award

In late 2002, the Federal Ministry of Environment, the lead agency for GloBallast activities in Brazil, held a national competition to develop new posters with Brazilian-specific perspectives, to raise awareness on ballast water issues. Advertisements were placed in national media, generating significant interest and many high quality responses.

On 21 March 2003, the Deputy Minister for the Environment, Mr Claudio Roberto Bertoldo Langone, presented an award of US\$1,700 provided by the GloBallast Programme, divided across the winning entry's as follows: 1st place – Paulo Salvador Martorelli, 2nd place – Alam Gustavo Trovó and Alessandra Bernadete Trovó (joint production) and 3rd place – José Augusto Massena Reis. The posters are now being reproduced and distributed widely throughout the country.



The winning poster with from left to right: José Augusto Massena Reis, Paulo Salvador Martorelli and Alessandra Bernadete Trovó.



Ukraine Commences E-Monitoring Project

In Ballast Water News No.8 (Jan – March 2002) we reported on plans by GloBallast – Ukraine to develop and test a shipboard ballast water exchange electronic monitoring system (BWEEMS). Such a system would take data on ballast water parameters such as water levels, temperature, salinity and pressure, plus operational data such as starting/stopping of pumps, ships' positions (GPS) and dates and times, from automatic sensors located throughout the ships' ballast and other operational systems.

The data would be recorded in a central processor (including potentially the ship's voyage data recorder), and transmitted to shore-based offices. This would eliminate the need for paper-based ballast water reporting forms and the scope for recording and reporting errors and irregularities. It would also greatly enhance safety of re-ballasting at sea, triggering alarms when safety limits are approached.

In January 2003, Ukrainian researchers and marine technologists commenced this project, with funding from GloBallast and significant support from the Ukrainian shipping industry and government. The initial phase, due for completion in late 2003, seeks to develop a fully functional table-top model, and demonstrate its application using low-cost, off-the-shelf sensors and software and existing shipboard systems.

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Slovenia Seeks Solution

With a total coastline of only 46 km, a sea area of only 180 km² and a single commercial port (Koper), one might wonder why the Republic of Slovenia in the northern Adriatic is taking action to address aquatic bio-invasions through ships' ballast water.

However, it is the extremely restricted nature of Slovenian coastal and marine resources that give this issue such high priority – Slovenia's emerging economy has significant links to coastal amenities and tourist resorts as well as commercial fisheries, and the potential impacts of a harmful aquatic bio-invasion could be devastating in such a small area. Slovenia's ocean realm is one of the country's most precious and sensitive resources.

In addition, the Port of Koper is one of the biggest ports in the Adriatic Sea, and the only Slovenian port open to international trade. This only serves to heighten its strategic importance and the need to ensure that environmental issues, including ballast water operations, are well managed.



Given increasing reports of harmful ballast-mediated bio-invasions around the world, a group of scientists and experts at the Faculty of Maritime Studies and Transportation from the University of Ljubljana in Portoroz, began to wonder 'Could we be next?' Undertaking preliminary

research, they concluded that Slovenian coastal and marine resources are definitely at risk from aquatic bio-invasions, and successfully secured funding from the Slovenian Ministry of Education, Science and Sports and the Port of Koper, for the national research project *Harmful Introductions and Ballast Water Management in the Slovenian Sea*.

Involving the Faculty of Maritime Studies & Transportation, the Port of Koper, Maritime Authority, Port State Control and marine biologists, the project started on 1 July 2001 and is scheduled for completion on 31 December 2003. The main aims are to research the extent of the ballast water 'phenomenon' in the Slovenian Sea with an emphasis on the Port of Koper; and to propose guidelines for the prevention of harmful introductions, according to international and Slovenian legislation and institutional arrangements. The work programme has two main phases.

- Phase I: Analyses of shipping patterns and ballast water practices in the Port of Koper; sampling of ballast water on designated ships; preparation of an electronic database and analyses of the gathered data.

- Phase II: Risk assessment for species invasions, detailed review of Slovenian and international legislation and proposal of ballast water guidelines for Slovenia.

Since 1 October 2001 all ships calling at the Port of Koper are required to submit a Ballast Water Reporting Form in order to collect data to support the risk assessment and development of management guidelines. The Slovenian reporting form is based on the standard IMO form with additional questions on cargo operations. This is useful for the control of false reporting, and for supporting studies on relations between ballast water/cargo operations/type

of cargo/ship type. This in turn allows easier assessment of ballast water releases based on cargo data, which is regularly collected by port authorities.

The origin and quantity of ballast water released in the Port of Koper since 1990 have been assessed, using the data from the ballast water reporting forms and empirical models.

In June 2001 a ballast water sampling workshop was organized in Portoroz and the first



Shipboard sampling with the air-driven well pump

shipboard sampling in Slovenia was conducted. As an output of the workshop, a sampling framework was prepared, and new equipment was developed for sampling through sounding pipes. Sampling of ships is now underway.

The project is now in the second phase and different risk assessment approaches are being studied from different countries and fields (e.g. environment protection, bio-invasions, nuclear plants, chemical industry, human health protection). The final risk assessment will encompass the collected data of ballast water releases, analyses of samples from shipboard sampling and the foreseen trends in maritime transport in the Port of Koper.

An extremely useful benefit from the study has been increased cooperation between scientists, government, the port authority and shipping industry in Slovenia, and a marked increase in the country's participation in international ballast water activities, including the IMO Ballast Water Working Group, GloBallast activities and others. Closer cooperation with immediate neighbours Italy and Croatia and at the wider Mediterranean level has also been initiated.

And last, but not least, a comprehensive awareness campaign has been mounted, including introduction of the ballast water issue in the curriculum of the Faculty of Maritime Studies, press and TV coverage, and the circulation of information among research groups, ministries, port authorities, shipping agencies and other parties.

It is hoped that Slovenia's efforts will contribute to the broader application of the 'precautionary approach' with 'regional cooperation' and 'pragmatic compromise' as a recipe for the regulation of the ballast water issue, on the way to sustainable development in the maritime sphere.

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Ballast Exchange Mapped on GIS

Geographic Information Systems (GIS) provide a valuable tool for tracking and managing ballast water information, and ultimately to minimize the impacts of ballast exchange practices on the marine environment. The Marine Safety Branch, Transport Canada, Dartmouth, Nova Scotia and Geocentric Mapping Consulting recently completed a pilot project examining ways GIS technology can be applied to ballast water exchange data and to produce decision support mapping to assist in resolving marine environmental issues.

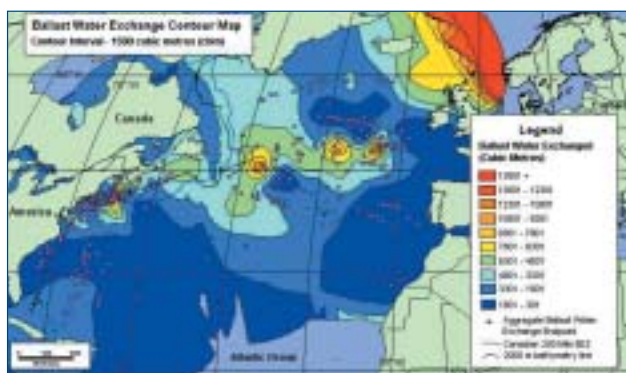
The recent project, conducted in late 2002, developed a GIS approach to analyse and map information extracted from IMO compliant Ballast Water Reporting Forms. The facsimile forms were sent from vessels transiting to Atlantic Canadian ports from Europe and points south (United States, Panama, Caribbean, and South America) to the Marine Safety Branch, Transport Canada. A project database (MS Access™) of 914 geo-referenced coordinates (latitude/longitude) representing open ocean and port locations of ballast water exchange end points (with ballast volume exchanged) was developed from 132 Report Forms. The data collection period was the month of December 2001.

The GIS (MapInfo) provided a spatial and SQL environment for extracting the open ocean ballast exchange records. Two GIS spatial mapping techniques were applied to the 640 open ocean ballast exchange end points: 1.) Ballast Water Exchange Vessel Thematic Tracks and 2.) Inverse Density Weighing point interpolation contouring.

Sample outputs (figures below) demonstrate the utility of the approach. The contour plots clearly show the mid-ocean



Ballast Water Exchanged Vessel Tracks Map, with plotted tracks classified by ballast water volume exchanged



Ballast Water Exchange Contour Map. Generated with MapInfo GIS and Vertical Mapper software - IDW (Inverse Density Weighing) algorithm

nature of most exchange, but also highlight exchange events in the corridor in the Gulf of Maine off the coast of New England and southern Nova Scotia; as well as the points of origin and general passage track of vessels contributing to the exchange, and the routes with highest volumes exchanged.

Display of map information in a GIS has other advantages, for example identifying ocean features into which the exchange took place (e.g. The Gulf Stream), (not shown), or allowing an additional consideration of more precise control on management of the exchange (e.g. discharging ballast originating from warm water ports into cold water masses and visa versa). The further advantage of the GIS approach is the ability to automate processing of the data contained in the conventional databases for ballast water exchange, and to allow routine production of maps of this kind for a range of areas and time frames.

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ICES Group Gathers Global Data

On 24 and 25 March 2003 the ICES/IOC/IMO Study Group on Ballast and Other Ship Vectors (SGBOSV) held its annual meeting in Vancouver, Canada. This group of scientists and other experts on invasive aquatic species from ICES member countries, plus observers from other countries and organizations, has been providing valuable scientific advice and support to both ICES and the IMO ballast water Convention negotiations.



The SGBOSV 2003 meeting

Among many useful outcomes of the Vancouver meeting, was a decision to develop a global database of known plankton concentrations in natural seawaters in various regions around the world, and also in ships' ballast tanks, so as to guide the scientific determination of ballast water treatment standards. These data will establish current baseline levels for natural organism concentrations in coastal waters and the threshold of organism delivery. Proposed ballast water treatment should result in a substantial reduction below the current baseline level of organism concentrations delivered in untreated ballast tanks.

This extremely valuable work of the Study Group will be submitted for consideration by the 49th meeting of IMO's Marine Environment Protection Committee (MEPC) in July this year, providing a scientific basis to assist setting ballast water treatment standards under the new Convention.

For full report of SGBOSV 2003: www.ices.dk

Scientists Surprised by Sea Squirts

The spread of invasive aquatic species across the world's seas is effected by many vectors, including in addition to ships' ballast water, fouling on the hulls of vessels and marine structures such as offshore oil and gas platforms. Global efforts to address the ballast water issue, such as those being undertaken by the GEF/UNDP/IMO GloBallast Programme, can only be fully effective if complemented by efforts to address the other vectors in an integrated, holistic manner. Recent scientific work on sea squirts (class Ascidiacea), which are small, sessile, filter-feeding and often colonial marine organisms, has made some interesting revelations with potential implications for fouling as a vector.



An example of bio-fouling on offshore oil infrastructure



General anatomy of a Sea Squirt

Ascidiaceans generally have a rapid growth rate, and a short life span of only a few months. Their free-swimming larvae do not disperse over long distances, having an average life span of 12 to 24 hours, and often only a few minutes to a few hours.

Worldwide, in all ports and harbours with appropriate salinity, ascidians are a main component of the fouling community. As a result of

global spread by shipping, most are non-indigenous species that tolerate high levels of pollution, and even considerable variations in temperature and salinity. It is possible to find some species of cosmopolitan ascidians with pan global distributions. *Diplosoma listenarium*, *Ciona intestinalis* and *Ascidia sydneiensis* present excellent examples of cosmopolitan species that now have a global distribution. All are very frequently and abundantly found in harbours and marinas.

The permanently submerged man-made structures found in ports offer ascidians a good surface for larval settlement and attachment. Ports also provide many shaded substrates, e.g. pilings, vertical walls and ships hulls, as well as abundant nutrients provoking rapid growth and the formation of dense populations of sea squirts (Monniot et al 1991).

In some areas certain ascidian species can proliferate greatly and also dominate the composition of the benthic community. Some species have been referred to as pests, and even called 'sea squirt blooms', as is the case of *Didemnum sp.* in Whangamata Harbour (New Zealand).



An example of a colonial Ascidian

Although non-indigenous ascidians are very abundant in ports and marinas throughout the world, they rarely colonise adjacent natural ecosystems. Healthy ecosystems present a high biodiversity and a complex interaction among the species, which are thought to be important factors preventing the establishment of non-indigenous species. However, as healthy ecosystems

continue to be degraded by other human activities, studies are documenting the rapid spread of some ascidians into such ecosystems (Lambert 2002).

To combat fouling, especially on ships' hulls, the use of anti-fouling paints with toxic substances has been in practice for several decades. Until recently, many anti-fouling paints were based on tri-butyl-tin (TBT). With the adoption of the *International Convention on the Control of Harmful Anti-Fouling Systems on Ships (AFS)* by IMO member States in 2001, the use of TBT is now being phased-out globally.

Recent studies show that the number of introduced ascidians increased after the banning of TBT in antifouling paints (Rees et al 2001). Ironically, while the AFS Convention helps to address one serious marine environmental issue (chemical pollution), the banning of TBT may compound another major problem, causing a significant increase in the rate of harmful marine bio-invasions through hull fouling. Also ironically, while being invasive fouling species themselves, ascidians may offer a solution to this dilemma.

Over millions of years of evolution, ascidians have developed complex chemical signals for everything from the regulation of spawning and larval settlement to defence against bacteria and predators. The screening of marine invertebrates for novel compounds and bioactive substances is a rapidly expanding area of biotechnological and pharmaceutical research (bio-prospecting). Such compounds have a variety of potential applications, ranging from new drugs to 'natural' sunscreens to antifouling paints. Many ascidian species have been found to use chemical mediation to maintain a surface free of competing fouling organisms (Teo & Ryland 1995). *Cystodytes lobatus*, a colonial ascidian is an example. Other solitary ascidians (e.g. *Ascidia*, *Phallusia*) also produce natural antifouling, which keeps their own body surfaces free of encrusting organisms.

Natural antifouling compounds derived from marine organisms themselves, would have enormous practical value given the serious pollution problems caused by some of the chemicals currently in use. In the search for new, effective and environmental friendly anti-fouling, it would be poetic justice to find the solution in a non-indigenous fouling organism!

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References for this article are listed on page 11.

Publications

GloBallast Evaluation Report



In Ballast Water News No. 11 we reported on the outcomes of the mid-term evaluation of the GloBallast Programme, conducted by external independent evaluators on behalf of GEF, UNDP and IMO. The full report of the evaluation has now been published, and is available in both hard copy and PDF.

<http://globallast.imo.org/publications>

Two New Monographs



Two new publications in the GloBallast Monograph Series are also now available; No.6 – the Report on the *1st East Asia Regional Workshop on Ballast Water Control & Management* and No. 7 – the *Phytoplankton Identification Catalogue for Saldanha Bay, South Africa*, in both hard copy and PDF.

<http://globallast.imo.org/publications>

CIESM Workshop Report



The report on the *Workshop on alien marine organisms transported by ships in the Mediterranean and Black Seas*, convened in Istanbul, Turkey in November 2002 by CIESM, is now available under the CIESM Workshop Monograph series.

It contains comprehensive background papers plus science-based recommendations for management actions.

www.ciesm.org

3rd Marine Bio-invasions Conference



From 16 to 19 March 2003 the *3rd International Conference on Marine Bioinvasions* was convened in La Jolla, California, USA.

PDF versions of the Conference Abstracts can now be downloaded from either the California or MIT Sea Grant Program web sites.

[www-csdc.ucsd.edu/](http://www-csdc.ucsd.edu)
web.mit.edu/seagrant/

Invasive Species in Belgium



The proceedings of the symposium *Status and trends of the Belgian fauna with a particular emphasis on alien species* held in Brussels in 2002, are now available through the journal of the Royal Belgian Institute of Natural Sciences (Biologie Vol. 72 – Supplement).

While the symposium covered both terrestrial and aquatic eco-systems, a good number of the papers address aquatic bio-invasions, providing an indication of the current situation along the Belgian coastline and waterways.

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Africa's Wetlands Invaded



Invasive species are becoming of increasing concern in the wetlands of Africa.

IUCN, together with the Ramsar Bureau, has developed an awareness booklet that illustrates seven of the worst alien species already present, identifies some that are 'on the way to becoming invasive' and describes

two native African water plants that are becoming invasive due to human disturbance. The booklet also provides management advice and further sources of information.

www.iucn.org/bookstore

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Progress Report

Activities Undertaken January – March 2003

- ✓ PCU staff annual leave.
- ✓ Finalised ballast water risk assessments – six Pilot Countries and commenced preparation of reports.
- ✓ Facilitated US State Dept / Coast Guard Workshop on Ballast Water Treatment Standards, Arlington USA 12-14 Feb.
- ✓ Prepared for and participated in Inter-sessional Meeting of IMO Ballast Water Working Group 3-7 March.
- ✓ Attended 3rd International Marine Bioinvasions Conference, San Diego, USA 16-19 March (GloBallast delegates from Ukraine & China).
- ✓ Co-chaired ICES/IOC/IMO Study Group on Ballast and other Ship Vectors, Vancouver 24-25 March.
- ✓ Finalised planning and arrangements for 1st International Workshop on Standards and Guidelines for Ballast Water Sampling, planned for Brazil 7-11 April.
- ✓ Finalised planning and arrangements for 1st International Workshop on Standards and Guidelines for Invasive Aquatic Species Surveys and Monitoring, planned for Brazil 13-17 April.
- ✓ Held 1st Regional Task Force meeting for Southern and Eastern Africa, Saldanha, South Africa 17 & 18 March.
- ✓ Commenced Golden Mussel Project – Brazil.
- ✓ Commenced E-Monitoring project, Ukraine.
- ✓ Launched new awareness materials, India and Brazil.
- ✓ Continued development of the GloBallast web site.
- ✓ Published two new volumes in the GloBallast Monograph Series and the report on the Mid Term Evaluation.
- ✓ Entered into new partnership with IUCN, including co-production of Ballast Water News.
- ✓ Produced 12th issue of Ballast Water News.



Activities Planned April – June 2003

- Hold 1st International Workshop on Standards and Guidelines for Ballast Water Sampling, Rio de Janeiro, Brazil 7-11 April.
- Hold 1st International Workshop on Standards and Guidelines for Invasive Aquatic Species Surveys and Monitoring, Arraial do Cabo, Brazil 13-17 April.
- Present at Port of Gothenburg seminar, Sweden 24 April.
- Prepare papers for MEPC 49 by 23 May.
- Prepare draft International Standards and Guidelines for Ballast Water Sampling.
- Prepare draft International Standards and Guidelines on Invasive Aquatic Species Surveys and Monitoring.
- Hold the first delivery and validation of GloBallast training package, Rio de Janeiro, Brazil 12-16 May.
- Progress finalisation of reports on Port Biological Baseline Surveys – 6 Pilot Countries.
- Finalise programme and progress arrangements for 2nd International Ballast Water Treatment R&D Symposium, London 21-13 July.
- Attend and present at 12 International AIS Conference, Windsor, Canada 9-12 June (GloBallast delegates from India and I.R. Iran).
- Attend and present at International Workshop on High Seas Governance, Cairns, Australia 16-20 June.
- Progress arrangements for 1st International Ballast Water Risk Assessment Workshop, Melbourne, Australia, 1-5 September.
- Publish new volumes in the GloBallast Monograph Series
- Produce 13th issue of Ballast Water News.



More Information?

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