

# Gaps and Priorities in Addressing Marine Invasive Species

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Adult Japanese kelp plants colonizing sea urchin barrens in Australia. Photo Credit: Hugh Gregory Pederson

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# Gaps and Priorities in addressing marine invasive species

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# Gaps and Priorities in addressing marine invasive species

## INTRODUCTION

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 and become invasive alien species in their new environment.

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 exceptionally challenging conditions for the control of bio-invasions. The absence of clear borders in the marine environment limits the options available to managers. Detection, particularly at low densities, is difficult. 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, etc) used in the terrestrial biota are harder to apply in the aquatic systems.

## I. IUCN WORK ON MARINE ALIEN INVASIVE SPECIES

IUCN has long considered alien invasive species as one of the major threats to biological diversity. In February 2000, IUCN adopted the "Guidelines for the Prevention of Biodiversity Loss caused by Alien Invasive Species" (available on-line at <http://www.iucn.org/themes/ssc/pubs/policy/invasivesEng.htm>). These guidelines were designed to help countries, conservation agencies and concerned individuals reduce the threats posed by invasive alien species to global biodiversity and give effect to Article 8 (h) of the Convention on Biological Diversity.

In May 2001, IUCN drew international attention to the devastating threats of invasive alien species on the *International Day for Biological Diversity*, giving the issue a more prominent place in the thinking of conservationists, planners and ordinary citizens. IUCN played a lead role in making the problem of invasives a global priority under the Convention on Biological Diversity 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 also published *Turning the Tide* the Proceedings of the International Conference on Eradication of Island Invasives, held at the University of Auckland in February 2001.

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 in invasives issues. In addition it 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*. (See [www.issg.org](http://www.issg.org)).

Recently, over 20 ISSG members with expertise in marine invasive species have formed a new marine working group that will be exclusively focusing on alien invasive species in marine and brackish environments. Members are being increasingly called on to contribute to technical consultations and workshops, and to provide advice to States and regional and international bodies seeking to develop marine invasive management plans or actions. The group will be tackling different issues related to marine invasive species particularly focusing on understanding and discussing invasion theories, setting risk assessment objectives and guidelines, considerations for the design of surveys and monitoring systems, and providing a forum for developing congruent policy.

ISSG coordinates the Cooperative Initiative on Island Invasive Alien Species which objective is to facilitate cooperation in key areas of invasive alien species management where it will generate a significant improvement in the conservation of island biological diversity. The initiative will have immediate results, building on work already occurring (particularly in relation to island eradications); as well as long term results from increased knowledge, capacity and cooperation. The initiative is deliberately focused on threats posed by invasive alien species to island biological diversity (as opposed to threats to agriculture, health etc), in order to provide a manageable proposal. Currently discussions are underway with ISSG and the World Commission on Protected Areas (WCPA) Task Force on Island Conservation and Protected Areas (TAFICOPA) on island to address marine invasive species management issues in islands protected areas.

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

IUCN constantly endeavours to bring the issue of invasive species to the attention of the international and regional conventions and fora that we are involved in, particularly, the International Maritime Organization, the Barcelona Convention for the protection of the Mediterranean Sea, various components of the Antarctic Treaty System, The World Trade Organization and of course the Convention on Biological Diversity. The role of marine debris as a vector for transport of marine invasive species was highlighted at the 6<sup>th</sup> session of the United Nations Informal Consultative Process on Oceans and Law of the Sea in June, 2005.

The battle against invasives is also waged in the field by IUCN. IUCN's Regional Programmes in Asia, South America, Eastern Africa and the Mediterranean are actively working on invasive species in aquatic environments.

Most particularly, IUCN's Global Marine Programme (GMP) has been developing various activities and projects to address the problem posed by marine invasive species. Over the last 3 years, it has developed a cooperative relationship with the GloBallast programme. GMP currently has two projects dealing with addressing marine invasive species, one in the Seychelles, focusing on monitoring aliens in coral reef environments, and the other in Chile tackling the management of exotic species for aquaculture purposes. GMP is currently developing other initiatives related to marine invasive species within a sustainable development context.

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 is working with its members to slow the speed of introductions, and find cost-effective mechanisms that are equitable and environmentally responsible to address this issue.

IUCN is also a pivotal partner in the Global Invasive Species Programme (GISP), and in this context, it has contributed to significantly raise awareness of the seriousness of biological invasions and to the development of a global strategy to address invasives and a toolkit for their management.

## **II. SIGNIFICANT AND PRIORITY GAPS RELATED TO ON-GOING WORK ON MARINE AIS**

### **1. Research:**

**Taxonomy** has been highlighted as one of the major impediments to address AIS in the marine environment.

Accurate species identification is a key challenge in detection and monitoring marine invasives. The number of taxonomists, particularly for algae and invertebrates, has diminished significantly over the last several decades. In addition, physical and morphological characters used to identify species can be subtle and difficult to distinguish for non-specialists, and taxonomic information is incomplete for many groups of invertebrates, in particular sponges and ascidians.

Strengthening capacity in traditional taxonomy and marine species identification is a much needed action. Discussions during the 3<sup>rd</sup> World Conservation Congress stressed on the need to shift the emphasis to have taxonomy as a means (as opposed to an end) and concentrate on developing tools for rapid and unambiguous identification of invasive species.

Advances in molecular biology and biotechnology could provide innovative and easy to apply methods for detecting and identifying invasive species. Research towards developing such identification techniques would be a worthwhile investment.

**Understanding invasion patterns** is also another area where more research is needed. This information is the basis for risk assessment and invasive species management. More research is needed to develop improved techniques for predicting invasiveness that consider ecological traits, similarities between source and recipient environments and, or host distributions. This includes an understanding of the relationship between propagule pressure and invasion success. Improved research on poorly studied vectors such as marine debris is also essential.

**Prevention and treatment technologies:** particularly for ballast water and hull fouling treatments. Effective treatments for ballast water have yet to be developed and applied at full scale on operating vessels. Research to determine their efficacy is in its infancy and there are many research needs and issues that must be resolved in order to eliminate the risks posed by ballast water throughout the marine environment, including on the high seas.

**Rapid scientific risk assessment methodologies** are still to be developed to support informed and effective management decisions either for voluntary introductions or when a new exotic species is reported.

***Address interactions with climate and other global change processes:***

Several global processes, including climate change, economic globalization, overfishing and alteration of nutrient cycles, are contributing to escalating the rates of species invasions. Climate change alters the physical environment in ways that can favour non native species and may also alter ecosystem resilience to invasions. Economic globalization is not only changing the pathways and rates of species transfers between oceans, but also the economic forces affecting local and regional decisions, and thereby indirectly influencing invasion opportunities.

**2. Legislation and Regulations**

At the international level, several legal instruments and conventions address or mention invasive species; however binding regulations that specifically address the transfer and introduction of alien species in the marine environment are very rare.

Certainly, the main instrument of this kind is the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM 2004) that was adopted by the IMO members in February 2004 after 13 years of negotiations but is not yet into force.

The Convention will require all ships to implement a Ballast Water and Sediments Management Plan. All ships will have to carry a Ballast Water Record Book and will be required to carry out ballast water management procedures to a given standard. Existing ships will be required to do the same, but after a phase-in period.

The new Ballast Water Convention will provide a uniform, standardized, global ballast water management regulatory regime. The standards that have been developed, however, present a minimum level of improvement. The Convention recognizes the trade-offs between setting very stringent standards that challenge technological improvement and setting standards that are immediately achievable. Consequently a review process has been established to determine if the current discharge standards are achievable, and if so, how much more progress can be made. This process provides a mechanism to improve environmental protection through development of a dynamic standard.

In addition, the guidelines to support this convention are only planned for development prior to 2007.

No regulations exist for managing hull fouling. IMO through its Marine Environmental Protection Committee has yet to consider the issue. However a number of Members have indicated that this issue will be raised as a priority within the next two sessions (before 2007). There's a great concern about an increase in hull-fouling linked introductions after the adoption of the International Convention on the Control of Harmful Anti-fouling Systems on Ships. While this convention will contribute to a better environmental protection against the harmful effects of the tri-butyl tin - TBT paint compounds, to date there's no equivalently efficient alternative as anti-fouling treatments.

One significant gap that will remain however is the management of hull fouling associated with the large global fleet of recreational vessels that fall outside the IMO's mandate. Given the un-flagged, and in many instances un-registered, nature of this class of vessel, national and regional regulatory mechanisms would appear to be the primary solution.

Some other significant international instruments address the issue of species introductions, such as the Convention on Biological Diversity and the FAO Code of Conduct for Responsible Fisheries. These codes and conventions discourage the use of AIS in aquaculture (including mariculture) under general obligations and call for accurate assessments of the risks of using exotic species. The FAO Code of Conduct for Responsible Fisheries does contain a whole section named “Precautionary Approach to Species Introduction” which considers both intentional and unintentional introductions.

Alien Species is also a thematic area of the Jakarta Mandate relative to Marine and Coastal Biodiversity. A gap analysis of legal instruments, guidelines, procedure and actions addressing Alien invasive species in the marine environment has been presented in the 5th COP. This analysis highlighted the rarity of such action and the lack of programmes aiming the implementation and support of legislative measures. Several Plans of Work under the CBD mention invasive species and some need to include or increase mention to marine AIS, in particular, the POW on marine and coastal biodiversity, the POW on Protected areas and the new POW on islands. The Global Strategy for Plant Conservation presents a serious gap when it comes to its marine component. This needs to be addressed, particularly with regards to invasive species that are recognised as one of the major threats.

The ICES Code of Practice on the Introduction and Transfer of Marine Organisms is one of the most comprehensive instruments to assist in the responsible use of introduced, it is however only voluntary. It has been recently revised in 2004. The 2004 code includes the concerns expressed in the previous version, adopts the FAO 1995 principles especially the precautionary approach. It includes updated definitions, an implementation strategy based on increasing awareness, and a risk evaluation approach.

Several regional agreements also address marine invasive species in a more or less specific way. Most of UNEP regional seas conventions have a specific mention to alien species introductions in the marine environment. In addition, some regional economic integration organizations have powers to develop regulations or recommendations regarding certain aspects of trade in potentially harmful alien species (e.g. NAFTA, MERCOSUR and the EC).

The Antarctic Treaty System presents rigorous provisions to control introduction of alien species. Parties to the Convention on the Conservation of Antarctic Marine Living Resources (Canberra, 1980) are required to prevent changes or to minimise the risk of changes in the marine ecosystem not potentially reversible over two or three decades, taking into account the state of available knowledge, including the effect of the introduction of alien species (Article II (3)(c)). The Madrid Protocol on Environmental Protection (1991) provides that no species of animal or plant not native to the Antarctic Treaty Region may be introduced onto land or ice shelves or into the water except in accordance with a permit.

The Committee on Environmental Protection, which advises the Antarctic Treaty Consultative Meeting has recently recognized the importance of the issue and added it to its agenda. However, very little has been done with regard to marine invasive species. To date, alien species issues have not been considered at any meeting of the Parties of CCAMLR.



Several recent studies document species introductions into Antarctic and Southern Ocean waters. The likelihood of transport of invasive species into the Southern Ocean may increase in future as a consequence of the growth of tourism, fisheries and science activities in the region. It is also possible that global change, particularly global warming, may increase the rate of successful establishment of alien species by reducing differences in environmental conditions between donor and recipient environments. Marine debris and shipping (mainly through hull fouling) are the two major vectors for marine species introductions into the Southern Ocean and deserve an increasing attention. In the ATCM, the IUCN strongly recommended further actions within the framework of the Treaty to prevent species introductions, particularly in the marine environment in order to conserve the integrity of the unique Antarctic system.

As for national legislations, only a few governments have a specific law or regulation dealing with the introduction of alien species. New Zealand has the Biosecurity Act (and subsequent amendments) and the Hazardous Substances and New Organisms Act to comprehensively cover the prevention of intentional and accidental introductions of organisms across all ecosystems. In Australia, the Commonwealth Environment Protection and Biodiversity Conservation Act of 1999 establishes several measures to reduce, eliminate or prevent the impacts of listed alien species on biodiversity in the Australian jurisdiction. In addition, Australia is developing its National System for the protection from invasive marine pests that comprises three main elements: a prevention regime, providing a single, nationally consistent approach to minimising the risk of new incursions of marine pests into Australia; emergency responses to new incursions; and continuing management and control of established populations of marine pests already in Australia. The proposed new US National Aquatic Invasive Species Act is an example that is meant to fill authority gaps, set needed standards, require pre-screening, enhance research and coordination. It is important to note that this text has been endorsed by most environmental organizations and groups who work on aquatic invasive species in the US.

In general, the National Legal and Institutional Frameworks are fragmented. Mentions or provisions related to invasive species are distributed across a wide range of instruments with poor coordination between the various responsible agencies and very often, mention to introduced species or invasive species in the marine environment is inexistent.

There's an urgent need to adopt a more holistic and strategic approach to the problem and increase levels of coordination between the different responsible agencies, or opt for one implementing agency.

### **3. Management**

#### ***Integrated marine invasive species management using the ecosystem approach:***

We believe that one of most urgent priorities to be addressed while dealing with management of marine invasive species is to adopt the ecosystem approach in order to ensure an integrated management.

Besides the technical aspects of marine AIS management, there's an urgent need to consider the social and cultural dimensions of the problem and strongly involve the communities.

We can not repeat it enough; prevention remains the number one priority. Efforts should be increased to reduced and prevent the introduction of new species into the marine environment. National invasive species management programmes, should address all introduction vectors, including intentional introductions. These programmes should comprise early-warning invasions and rapid-response systems, expanded bioinvasions research as well as an education and public awareness components. They should also seek developing incentive measures or economic instruments to deter unwanted introductions or promote eradication and control.

Regional and sub regional programmes to address marine alien invasive species should be set up to facilitate the exchange of information and expertise.

***Management in Marine Protected Areas, particularly in islands:***

Very few MPAs consider invasive species in their management plan. Paradoxically, setting up a marine protected area increases its risk of invasion. Indeed, setting an MPA generates a significant attraction to the area for marine tourism, including recreational boating, yachting, the diving and snorkeling industry, and where allowed, fishing. These activities are likely to lead to increased risks of introducing non-indigenous marine species associated with hull fouling, ballast water (of some cruising yachts), the accidental transfer of species via anchor wells and chains, or on wetsuits as spores or microscopic phases, and bait material from recreational fishing. More importantly, the designation of protected areas often lacks the requirements to establish baseline biodiversity information and to monitor the performance of protection over time. Similarly, the regulations in these areas are established to protect biodiversity and hence the ability to remove species, as in the case of an incursion response, is limited or not available.

There's an urgent need to increase awareness of MPA managers about the threats posed by AIS, provide guidance, methodology and recommendations to MPA managers on prioritising and undertaking surveillance and management regimes related to alien invasive species.

Given that a large percentage of marine protected areas are set around islands, IUCN is currently developing plans, in collaboration with ISSG (particularly the islands initiative) and the WCPA Task Force on Island Conservation and Protected Areas (TAFICOPA) to address Marine AIS issues in island protected areas as first step. A new Programme of Work on Island Biodiversity under the CBD is to be adopted in 2006. It is critical that the Programme of Work includes specific mention of marine invasive species

**4. Funding**

Unfortunately marine invasive species are still not on the radar screen of many decision makers and donors. National programmes addressing marine invasive species when they exist lack appropriate funding for their efficient implementation in most cases.

**III. SPECIFIC ACTIVITIES FOR THE JOINT GLOBAL WORK PLAN:**

IUCN sees a potential Joint Global Work Plan as an instrument that would highlight priorities to be tackled at the international, regional and national levels. The battle against invasive species can only be won if actions are undertaken at all levels, hence, although Global, the joint work plan should also seek ways to be implemented at regional and local levels. Such programme will need to consider synergies with and incorporate lessons learned from existing initiatives.

IUCN suggests that the following activities be part of this work plan:

## **1. Preventing introductions through control of invasion pathways:**

### *1.1. Ballast Water:*

- encourage ratification of the Ballast Water Management Convention by all Parties
- develop an understanding of the current state of IAS through undertaking baseline surveys in major ports
- assess risks of IAS transported through ballast water and develop criteria for prioritising surveys
- develop national and regional standards
- develop provisions and discharge standards for waters beyond national jurisdiction
- develop data sharing arrangements between nations at regional and global scales

### *1.2. Hull Fouling*

- conduct risk assessments of IAS transported through hull fouling and develop criteria for prioritising surveys
- develop an understanding of the current state of IAS through undertaking baseline surveys in major ports
- develop a regime/guidelines for reducing the introduction of non-indigenous spp through hull fouling
- implement public awareness programme for recreational craft

### *1.3. Aquaculture-Mariculture (including hitchhikers)*

- develop useful and applicable methodologies for assessing risk in a timely fashion
- publish guidelines to promote responsible use of exotic spp for aquaculture purposes
- regulate at International level to surmount transboundary issues

### *1.4. Aquarium trade (including hitchhikers)*

- develop useful and applicable methodologies for assessing risk in a timely fashion
- share risk profiling for species
- develop and implement public awareness programme for aquarists

### *1.5. Live Seafood, Bait, packing materials*

- develop useful and applicable methodologies for assessing risk in a timely fashion
- develop and implement public awareness programme for consumers

## **2. Developing baseline knowledge:**

- Develop an understanding of what species are currently in a country/region through stocktakes of literature, museum collections, traditional ecological knowledge (TEK), and establishing prioritised baseline surveys
- Identify species associations with transport mechanisms
- Develop freely available regional and global data warehouses of species based information on the physiological and ecological attributes
- Share the mechanisms and outcomes of risk profiling activities for species and vectors

### **3. Incursion and management response: including surveys, eradication/control and new research**

- Develop early warning systems and monitoring
- Use available tools and develop new tools for eradication
- Heighten understanding of priorities for action
- Increase understanding of societal expectations
- Develop guidelines and tools for incorporating into protected area management plans and budgeting processes, priority setting and the long-term management of priority and high risk invasive alien species (including control of pathways that lead to the introduction, spread and re-invasion of these species)

### **4. Cross-cutting issues:**

- Training, awareness raising (at all levels) and information sharing, building distributed information systems that deliver information on risks, identification, and response strategies.

IUCN welcomes the opportunity to develop a global joint work programme on marine invasive species and very much looks forward to engaging with other partners to further develop practical and/or institutional solutions to one of the major threats to the marine environment.

