An Australian Government Initiative

THE NATIONAL SYSTEM FOR THE PREVENTION AND MANAGEMENT OF MARINE PEST INCURSIONS

NATIONAL PRIORITIES FOR INTRODUCED MARINE PEST RESEARCH AND DEVELOPMENT 2013–2023

Developed by the Marine Pest Sectoral Committee, 2013

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Executive summary

The National Priorities for Introduced Marine Pest Research and Development 2013–2023 were developed by the Marine Pest Sectoral Committee (MPSC) in consultation with the Australian marine science community, industry partners and other stakeholders (Appendix 1).

This document is intended to identify priorities for invasive species research, particularly for the information of external stakeholders. It does not commit the MPSC to providing funds for these research priorities.

Marine pests have had major environmental, economic and social impacts, including human health impacts, worldwide. The National System for the Prevention and Management of Marine Pest Incursions (National System) takes a comprehensive approach to addressing all potential marine pests and their vectors. However, our understanding of marine pests and how they invade is far from perfect and further R&D is required to improve the way we manage marine pests.

This document is designed to provide direction for R&D investment and thereby ensure that R&D outcomes provide timely and relevant advice for marine pest management. This document is intended to compliment the National Marine Pest Strategy (under development).

R&D projects covered in this document are divided into four priority areas:

- vector management
- species and ecological information for management
- monitoring, evaluation and review and
- information, communication and education.

The projects outlined in this document are also classified by their priority (high, medium or low) and the length of time required (short, intermediate or long). This document aims to encourage a comprehensive national research and development program which promotes coordinated and collaborative research and enables the prioritisation and implementation of research to support the National System and its ongoing integrity, ultimately leading to better marine pest management.

This document replaces the 2006–2016 Research and Development Strategy produced by the National Introduced Marine Pest Coordination Group.

1. Purpose of the document

This document is designed to provide direction for introduced marine pest research and development activities. Managers, policy makers, marine industries, conservationists, researchers and the general community will be able to use the priorities to guide effort and expenditure. The aim of the document is to ensure that R&D provided by all research partners and stakeholders provides timely and relevant advice to underpin marine pest management.

While the document aims to provide direction for the next ten years, specific requirements for research and development are likely to change as new knowledge and technologies become available, both in Australia and overseas. Accordingly, the priorities will be updated regularly as projects are completed and priorities change.

This document replaces the 2006–2016 Research and Development Strategy produced by the National Introduced Marine Pest Coordination Group.

2. Context for marine pest R&D

2.1 The marine pest problem

According to Hewitt and Campbell (2010), there are 429 introduced and cryptogenic species detected in the bioregions of Australia and New Zealand. These have been recognised from literature, museum collections and port surveys. It is difficult to predict which species will become pests in Australian waters and therefore the National System approach is to minimise the introduction to Australia of all exotic marine species. When an introduced marine species establishes and becomes a pest the impacts can be devastating and unlike point source pollution and habitat disturbance where the impacts can sometimes be remediated, the impacts of marine pests are generally on-going.

Marine pests may be suspended in ballast water or attached as biofouling to vessels including commercial ships, non-trading vessels, recreational boats and petroleum infrastructure. Marine pests may also be introduced accidentally or deliberately through the aquaculture, aquarium or fishing industries.

For the past 20 years Australia has been working internationally and domestically to improve the effectiveness of voluntary and regulatory measures to reduce the risk of unwanted marine pest introductions. Over this period, the Australian Government, Northern Territory and state governments have made strong commitments to the development of efficient and effective arrangements to strengthen Australia's marine biosecurity.

The *National Priorities for Introduced Marine Pest Research and Development 2013–2023* was developed by MPSC in consultation with the Australian marine science community, industry partners and other stakeholders (Appendix 1).

2.2 The National System

The National System is a suite of measures aimed at:

- preventing marine pests from arriving in Australian waters or spreading to new areas
- providing a coordinated emergency response should a new pest arrive in Australian waters
- controlling and managing marine pests already here, where eradication is not feasible.

The National System has three major aspects:

1. Prevention—systems to reduce the risk of introduction and spread of marine pests, including management arrangements for ballast water and biofouling
2. Emergency management—a national response mechanism to control or eradicate pests that do get in
3. Ongoing management and control—management of marine pests already here, where eradication is not feasible.

There are also four supporting components:

1. monitoring—ongoing national program to provide early detection of new pests
2. communication—industry and community awareness and education
3. research and development—targeted research to assist with development of policy and management measures
4. evaluation and review—evaluating the effectiveness of the National System.

In 2011, MPSC replaced the National Introduced Marine Pests Coordination Group as the body responsible for the National System. MPSC is comprised of representatives from the Australian government, each state government and the Northern Territory. Industry and environmental input is achieved through an associated industry consultation group.

In 2012 the Intergovernmental Agreement on Biosecurity (IGAB) was finalised by the former Primary Industries Ministerial Council. The Prime Minister of Australia signed the agreement in January 2012, along with all jurisdictions with the exception of Tasmania.

The IGAB aims to strengthen working partnerships and the national biosecurity system by identifying the roles and responsibilities of the Commonwealth, state and territory governments and outlining priority areas for collaboration.

The National Environmental Biosecurity Response Agreement (NEBRA) is the first deliverable of the IGAB, and sets out emergency response arrangements, including cost-sharing arrangements, for responding to biosecurity incidents that primarily impact the environment and/or social amenity and where the response is for the public good.

The research and development priorities outlined in this document aim to progress the requirements of the IGAB and NEBRA relating to introduced marine pests.

2.3 Objective of this document

The overall objective for the *National Priorities for Introduced Marine Pest Research and Development 2013–2023* is to ensure a comprehensive national research and development program. It will promote coordination and collaboration and support the prioritisation of research for the National System.

2.4 Guiding principles for marine pest R&D

Research and development for the National System should be guided by the following principles:

A long-term commitment and partnership approach from governments, industry, recreational groups, conservation groups and researchers. This is essential for achieving an effective holistic approach.

Regular communication and collaboration among governments, industry, recreational groups, conservation groups and research providers nationally and internationally. This will minimise unnecessary duplication and ensure that the overall research effort is complementary.

An ecologically sustainable development approach should be taken in addressing marine pest issues. This considers the environmental, social and economic impacts of both pests and management. This approach will ensure prevention and management measures are economically justified, socially acceptable, safe, practicable, technically achievable and environmentally sound.

The best available scientific and technical advice should inform management. This will ensure decisions are underpinned by sound evidence.

A risk management approach should be used to reduce the likelihood of introducing and translocating marine pests. This will ensure management is applied when it is most likely to be effective and efficient.

3. Research priority areas for the National System

Fundamental to these programs are key areas of research and development. Based on the knowledge gaps and areas of research that need further effort, four key areas have been identified:

- vector management
- species and ecological information for management
- information, communication and education; and
- evaluation and review

These four key areas cut across the elements of the National System (prevention, emergency management and ongoing management and control).

Research and development needs under these areas are identified in the following sections, noting that individual projects may contribute to multiple areas. The research topics for each key area are grouped by their priority—high, medium or low—and their duration—short (1–2 years), intermediate (2–5 years) or long-term (5–10 years).

These areas are underpinned by R&D capability, capacity and infrastructure. Specific needs for this are outlined below in Table 1.

Table 1. Capability, capacity and infrastructure programs

ID	R&D needs	Priority	Duration
I1	Conduct a marine pest biosecurity R&D capability audit and address issues identified	High	Short
I2	Enhance taxonomic expertise nationally for identification of invasive species	High	Long
I3	Cost recovery	High	Short
I4	Securing long term funding arrangements	High	Long
I5	Increase public awareness of invasive species research outcomes through a centralised database	High	Intermediate
I6	National diagnostics clearing house	High	Long
I7	Genetic identification capacity	High	Long

Note: short (1-2 years), intermediate (2-5 years) or long-term (5-10 years).

3.1 R&D priority: vector management

Strategic Objectives

Ensure potential and actual vectors of marine pests are managed to effectively minimise the risk of introduced marine pest incursions and translocations.

To achieve the strategic objective, R&D on vector management will focus on understanding vectors, the way they may transfer marine pests and development of effective management technologies and approaches.

Table 2: Vector Management R&D requirements

ID	R&D needs	Priority	Duration
V1	Enhance understanding of the risks and risk taxa associated with the aquarium trade	High	Short
V2	Improve understanding of fouling composition associated with different vectors, their niche areas and gear assessment. Develop quantitative risk factors	Medium	Intermediate
V3	Pathway analysis • relating vector characteristics and patterns to current and potential pest numbers and risk • traffic patterns and introduction spread • vector distance (speed/duration) • assessing comparative risk of vectors and pathways	Medium	Intermediate
V4	Assess effectiveness of current treatment options for non-ballast vectors (e.g. antifouling paints and marine growth protection systems)	Medium	Short
V5	Develop new treatment options for biofouling in niche areas of vessels and methods to assess their effectiveness	High	Intermediate
V6	Test the validity of the risk assessment underpinning the national ballast water framework in terms of survival in ballast tanks, and potential for viable introduction and establishment.	High	Intermediate
V7	Determine the feasibility and practicality of using quarantine arrangements for new marine pest incursions	Medium	Short
V8	Develop new in-water cleaning technologies for all vessel types that effectively capture biofouling debris	High	Intermediate

Note: short (1-2 years), intermediate (2-5 years) or long-term (5-10 years).

3.2 R&D priority: species and ecological information for management

Strategic Objective

To prevent marine pests from entering Australian waters and effectively eradicate or manage established marine pest populations.

To achieve the strategic objective, R&D on species and ecological information will focus on ensuring that information on invasive species, their ecology and impacts is available to inform decision making and the risk management approach of the National System.

Table 3: Species and Ecological Information for Management R&D requirements

ID	R&D need	Priority	Duration
S1	Develop molecular probes for marine pests	High	Short–Intermediate
S2	Identify high risk habitat types and the impacts of degradation on invasibility	Medium	Intermediate
S3	Conduct studies of the life history/ecology of priority invasive species including studies to: • understand reproductive strategies and dispersal mechanisms • determine the diet of invasive species • understand growth rates and competitive ability • identify ecological interactions with native species • investigate life cycle parameters for key species under Australian conditions including physical tolerances, spawning timing, duration of larval stages.	High	Intermediate
S4	Develop improved methods for rapid risk assessment of non-indigenous species	High	Short–Intermediate
S5	Assess, and quantify socio-economic impacts of invasive species	High	Intermediate
S6	Investigate and test effectiveness of options for control or eradication of marine pests	High	Intermediate
S7	Investigate potential for range extensions of invasive species due to climate change	Medium	Long
S8	Investigate the genetic adaptability of invasive species	Low	Long

Note: short (1-2 years), intermediate (2-5 years) or long-term (5-10 years).

3.3 R&D priority: monitoring, evaluation and review

Strategic Objectives

Effective monitoring of Australian waters to detect and respond to marine pests.

Evaluate marine pest management for continuous and adaptive improvement of the National System.

To achieve the strategic objectives, R&D on monitoring, evaluation and review will focus on improving monitoring design and techniques, understanding the associations between habitat and marine pests, and developing new methods for evaluating management strategies.

Table 4: Monitoring, Evaluation and Review R&D Requirements

ID	R&D need	Priority	Duration
M1	Develop effective monitoring/inspection tools for remotely assessing the extent of biofouling on a range of vessels, in particular for niche areas	High	Medium
M2	Develop parataxonomic tools for marine pests to support monitoring programs and ensure reasonable confidence in samples requiring expert taxonomic verification (in particular target species for monitoring)	High	Short
M3	Develop methods to assess the level of risk reduction possible using different strategies and considering environmental, social and economic impacts.	High	Short–Intermediate
M4	Determine the optimal sample size, replication, depth, etc for maximising the likelihood of detecting pest species (different times of year, different locations, different functional groups)	High	Intermediate
M5	Develop improved analyses for assessing the cost effectiveness of methods for monitoring different target species	Medium	Intermediate
M6	Research and collate habitat types within locations that make up the National Monitoring Network where not currently available	High	Short–Intermediate
M7	Develop criteria to define eradication endpoint	Medium	Long
M8	Assess number of individuals and spatial distribution of pest populations to inform detection densities for monitoring	Medium	Intermediate
M9	Improve methods for delineation surveys	Medium	Intermediate–Long

Note: short (1-2 years), intermediate (2-5 years) or long-term (5-10 years).

3.4 R&D priority: information, communication and education

Strategic Objectives

Inform governments, industry and the community of the importance of the elements of the National System and encourage or facilitate the uptake of voluntary and/or mandatory measures.

To achieve the strategic objective, R&D on information, communication and education will focus on ensuring that information on invasive species and their management is accessible, useable and current, for all stakeholders. R&D will also ensure tools and networks are available to support the implementation of the National System Communications Strategy (available on request from the Department of Agriculture, Canberra).

Table 5: Information, Communication and Education R&D requirements

ID	R&D need	Priority	Duration
C1	Develop training and capacity building initiatives such as marine pest training modules	High	Intermediate
C2	Establish a list of student research projects and building student/researcher networks	High	Intermediate
C3	Evaluate uptake of National System guidelines codes of practice in all relevant sectors	High	Intermediate
C4	Contribute to international forums including through provision of training, capacity building and conference participation	Medium	Long
C5	Address intellectual property issues with respect to invasive species data internationally	Low	Intermediate
C6	Investigate opportunities for citizen science to contribute to the National System	Medium	Intermediate
C7	Provide publicly accessible research priorities and funding opportunities	Medium	Intermediate
C8	Understand the sociological factors associated with the adoption of risk mitigation measures by stakeholders	High	Intermediate

Note: short (1-2 years), intermediate (2-5 years) or long-term (5-10 years).

Reference

Hewitt, C and Campbell, M 2010, 'The relative contribution of vectors to the introduction and translocation of invasive marine species', Department of Agriculture, Canberra, available at marinepests.gov.au/marine_pests/publications.

Appendix 1: Research partners and stakeholders

In developing and continuing the national research and development program, the MPSC will coordinate collaborative research and development activities among research partners and stakeholders.

Research partners

Government departments and agencies including:

- Australian, state/NT and local governments
- Departments and agencies for conservation and sustainability; fisheries, marine, environmental and catchment management; transport, infrastructure and planning.

Marine industries including:

- shipping
- trading ports
- recreational boating
- offshore petroleum
- aquaculture
- paint manufacturers

Science and research institutions and associations including:

- universities
- cooperative research centres
- Commonwealth government research agencies
- state government research agencies
- the Australian Marine Sciences Association

Conservation groups and the general community:

- The Marine and Coastal Community Network
- Coastcare Groups
- Conservation Councils of Australia

Stakeholders

Commonwealth and state government agencies

Marine sectors including:

- commercial and recreational fishing, boating and diving
- aquaculture
- ports and shipping
- petroleum
- science and research institutions
- conservation groups and the wider public