



**Australian Government**

**Department of Agriculture  
and Water Resources**

# Review of national marine pest biosecurity

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OCTOBER 2015





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### Contact

Department of Agriculture and Water Resources

Postal address	GPO Box 858 Canberra ACT 2601
Switchboard	+61 2 6272 2000
Facsimile	+61 2 6272 2001
Web	<a href="http://agriculture.gov.au">agriculture.gov.au</a>

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# Executive summary

This report presents the findings of the Australian Government Department of Agriculture and Water Resources's review into national marine pest biosecurity arrangements.

The Australian Government committed \$5 million for the review and subsequent strengthening of marine pest biosecurity arrangements as part of the government's election commitment for a more competitive and sustainable fisheries sector. This report provides recommendations to the Australian Government to improve national marine pest biosecurity.

Marine pests are organisms that can be transported to Australia, become established here and then affect marine and maritime industries, marine environments and the community. Marine pest biosecurity is the sum of activities undertaken to prevent exotic marine species of biosecurity concern arriving in Australia, respond to these species when they are detected and manage them if they become established.

A key aspect of biosecurity is the assessment, management and communication of risk. Assessment of marine pest risks presents some unique challenges because of a poor understanding of the likelihood and consequences of exotic marine species becoming established in Australia. There are real difficulties in determining which species may arrive and become established and in predicting the consequences of their presence. Measures that manage risk pathways, rather than risks posed by individual species, are most effective for managing marine pest risks.

## Shared responsibility

This report recommends a more equitable sharing of responsibility for national marine pest biosecurity and involving a wider range of non-government stakeholders in decision-making. Changes are recommended to reflect that marine biosecurity is a responsibility shared among the Australian, state and territory governments, the private sector, interested organisations and the Australian people.

The community, particularly those who work in the marine environment and use it for recreation, has a high level of interest in the marine environment. The review identified these people as an underutilised resource. This report recommends changes, including establishing a marine pest network, to enable scientists, industry, governments and interested members of the public to work together. The changes will focus on improving communication, coordinating research and development, better detection of exotic marine species and raising awareness of the biosecurity risks of marine pests and how they can be better managed. The changes will also harness the collective interest of stakeholders to improve national marine pest biosecurity.

## A renewed framework

This report recommends the national marine pest biosecurity strategy being developed by the Marine Pest Sectoral Committee set new nationally agreed objectives and achievable outcomes, and clearly articulates the roles and responsibilities of all stakeholders.

The current model for Australia's national marine pest biosecurity is the National System for the Prevention and Management of Marine Pest Incursions (the National System). The National System is a suite of biosecurity measures being developed and implemented by Australian governments, industry and scientists, but over time the aims, roles and responsibilities have lost clarity and the National System has never been fully implemented. The Intergovernmental Agreement on Biosecurity (IGAB) sets the framework and principles for Australian governments to work towards a consistent and collaborative approach to biosecurity for all sectors. A national marine pest biosecurity strategy will be an effective framework for stakeholders to work collaboratively to better implement the IGAB and share national marine pest biosecurity responsibilities.

## A focus on prevention

This report identifies preventive measures as the most cost-effective and efficient measures for national biosecurity to reduce impacts of marine pests.

The review considered the cost-effectiveness of prevention and eradication of marine pest incursions and management of established pests. The identification of preventive measures as more cost-effective and efficient is in line with the general approach for terrestrial biosecurity. Eradication and control remain options for managing marine pest risks to marine and maritime industries and the environment in the event of a marine pest becoming established. However, the high cost and low probability of successful eradications in marine systems highlights that preventive approaches are the best option to minimise impacts of marine pests.

Monitoring the effectiveness of prevention measures used to minimise marine pest incursions will be an essential component of continuously improving national marine pest biosecurity. Monitoring of vessels for the effectiveness of biofouling management measures will be an important aspect of implementing mandatory biofouling requirements. Monitoring of ballast water treatment systems and discharge will align with international agreements.



## Align Australia's marine pest biosecurity arrangements with international agreements

This report recommends that the Australian Government introduce mandatory biofouling management requirements that are closely aligned with international guidelines. This aligns with the approach already adopted for ballast water.

The two pathways that present the highest aggregate risk for marine pest entry are ballast water in vessels and biofouling that is caused by marine organisms present on vessels. The Australian Government currently manages the risks of ballast water in vessels entering Australian waters under the *Quarantine Act 1908* and *Quarantine Regulations 2000*, and will continue to do so under the *Biosecurity Act 2015* from 16 June 2016. There are currently no legislative requirements expressly dealing with biofouling on vessels entering Australian waters. Adopting an international approach to biofouling management will help regulatory consistency for the shipping industry.

The use of import permits, import risk analyses and the Live Import List provide effective tools for the Australian Government manage other marine pest entry pathways, and manage the marine pest importation risks in line with international obligations.

## Align surveillance activities with clear objectives

The review recommends that the National Monitoring Strategy be replaced with specific monitoring and surveillance strategies and clearer objectives to inform ongoing marine pest biosecurity activities.

Surveillance for marine pests in the marine environment is a vital supporting component of the National System. The National Monitoring Strategy identifies locations around Australia and techniques for surveillance for marine pests. The results of this surveillance were intended to inform marine pest management activities. However, the National Monitoring Strategy has not been effectively implemented. In addition to the significant costs associated with the National Monitoring Strategy, unclear and unsuitable objectives have hampered its acceptance and implementation. A new strategy for obtaining surveillance information from a wider range of sources should be developed, including a marine pest network and monitoring of preventive measures.

## Setting a new direction

This review and its recommendations set a new direction for the development of Australia's marine pest biosecurity arrangements that will be more inclusive by sharing responsibilities and with a greater alignment with Australia's international obligations. The main aim of the new arrangements should be effective prevention measures to minimise the entry of exotic marine species. This should be cost-effective and reduce the need for eradication and containment activities since it is almost impossible to cost-effectively eradicate marine pests once they become established.

# Recommendations

1. The Australian Government should improve its engagement with industry and other stakeholders through the Marine Pest Sectoral Committee and other fora, and clarify the role and involvement of non-government stakeholders in national marine pest biosecurity decision-making.
2. A national marine pest biosecurity strategy should be finalised and implemented to set a new direction for the national management of marine pests and replace the National System for the Prevention and Management of Marine Pest Incursions. This should include the development of national monitoring and surveillance strategies to replace the National Monitoring Strategy.
3. The Australian Government should prioritise its resources towards minimising the likelihood of marine pests entering, becoming established and spreading in Australia.
4. The Australian Government should develop regulations to reduce to an acceptable level the biosecurity risks associated with biofouling on all vessels arriving in Australia.
  - a. The regulatory framework for vessels' biofouling should be consistent with the direction set by the International Maritime Organization and include a requirement for vessels to implement an effective biofouling management plan.
  - b. Monitoring for compliance with biofouling regulations should be based on risk.
5. The Australian Government should support national education and awareness activities to minimise the domestic spread of marine pests.
6. The Australian Government should ensure implementation of domestic ballast water legislation is done in a cooperative partnership between the Australian, state and territory governments, commercial and non-commercial operators including ports and the shipping industry.

7. The Australian Government should continue to manage marine pest entry pathways through import controls.
8. The Australian Government should develop guidance material to assist management of marine pest risks through pathways other than ballast water and biofouling.
9. National marine pest emergency response activities should continue to be implemented under the Intergovernmental Agreement on Biosecurity and the National Environmental Biosecurity Response Agreement.
10. The Australian Government should support a national marine pest emergency response exercise.
11. The Australian Government should support national monitoring of risk pathways to evaluate the effectiveness of biosecurity measures.
12. The Australian Government should establish a national marine pest network to develop strong partnerships that enable Australia to better identify, assess, communicate and manage the risks of marine pests. Membership should include industry, research and community members as well as representatives from all levels of government. The network should provide the national framework to:
  - coordinate national communications activities, including education and raising awareness of marine pests
  - facilitate passive surveillance activities from a wider range of sources such as community groups and industry, and facilitate coordinated reporting and data sharing of marine pest detections
  - facilitate analysis of monitoring and active surveillance programmes
  - facilitate national research and development activities, including functional support for the Marine Pest Research Network as a component of the network.
13. As a result of agreement to recommendation 12, the Australian Government, through the National Biosecurity Committee, should clarify the roles and responsibilities of committees and groups associated with national marine pest biosecurity as the marine pest network is established. This should include determining the appropriate functions of the Marine Pest Sectoral Committee and the Consultative Committee on Introduced Marine Pest Emergencies.

# Chapter 1

## Setting the scene

### 1.1 Marine pests

Marine pests are exotic marine plants or animals that pose a threat to Australia's economy, environment or community if introduced by human activities.

Not all exotic marine plants and animals are marine pests; many exotic marine species have established in Australia with little known impact to the local environment.

While some native marine species can exhibit pest-like behaviour, native species are not considered marine pests for the purpose of national marine pest biosecurity. However, the biosecurity policies of individual states and territories may address risks from species that are native to other regions of Australia being transported into their jurisdiction.

Marine species can expand their range by both natural and human-mediated (anthropogenic) processes (Carlton 2002). Range expansions through natural processes occur over a long time. Human activity can accelerate biological incursions and leads to the introduction of species into regions where they did not historically occur. Marine species have been transported by anthropogenic means, both accidentally and intentionally, for thousands of years (di Castri 1989).

Many terms are used interchangeably to describe plants and animals that have been moved beyond their native range by humans. These include alien, exotic, introduced, invasive, non-indigenous, non-native and nuisance. This report uses this terminology:

- 'exotic marine species'—a species that is not known to be native to Australia
- 'introduced marine species'—a species that is found in Australia as a result of human activity, whether by accidental or intentional release, escape, dissemination or placement
- 'marine pest'—an exotic marine species that is the subject of national marine pest biosecurity; it causes, or is likely to cause, unacceptable impacts to the environment, economy, human health or social values.

## 1.2 National marine pest biosecurity

Marine pest biosecurity involves the management of risks to the economy, the environment and the community from the entry, establishment or spread of exotic marine species. When measuring the risk of a marine pest, the likelihood of entry, establishment and spread should be combined with the consequences to the marine environment. Managing the biosecurity risks of exotic marine species involves coordinated activities across jurisdictions, industries and communities (chapter 2) to:

- minimise the entry, establishment and spread of marine pests into and within Australia
- prepare for and respond to marine pest incursions
- manage and contain marine pests that have established where eradication is not feasible
- monitor these activities to determine their effectiveness.

## 1.3 Importance of marine pest biosecurity

Marine pest biosecurity is important to ensure that risks from marine pests are appropriately managed and that potentially significant consequences on Australia's marine industries and environment are minimised. Australians expect protection of the marine environment and marine industries, which have a vital role in our economy. The value of some of these industries and environmental assets are:

- the gross value of Australia's fisheries is predicted to reach \$2.7 billion in 2015–16 (Stephan & Hobsbawn 2014)
- in 2012–13 the gross value of aquaculture production (including southern bluefin tuna wild-catch input to the South Australian tuna farming sector) was approximately \$1 billion and accounted for 43 per cent of the gross value of Australian fisheries production (Stephan & Hobsbawn 2014)
- over \$221 billion of Australia's exports, and \$184.4 billion of Australia's imports were by sea in 2012–13 (BITRE 2014)
- the total contribution of the Great Barrier Reef Catchment Area to the Australian economy was estimated to be \$5.71 billion in 2005–06 (GBRMPA 2007). The Great Barrier Reef contributed \$2.7 billion (June 2010 prices) to the total value-added component of tourism to the Australian economy.

Marine pests can impact the economy, the environment and the community in a number of ways:

- The productivity of fishing grounds and aquaculture operations can be impacted. Some pests, like the northern Pacific seastar (*Asterias amurensis*), prey on species utilised in aquaculture and fishery operations.
- Once established, marine pests can compete with native species for food and habitat, and some prey directly on native species.
- Marine and industrial infrastructure such as jetties and marinas, long lines used in aquaculture or industrial water intake pipes can be damaged by infestations.
- Marine pests can significantly increase the level of biofouling on vessel hulls and can also damage engines by clogging cooling water intakes, reducing vessel performance and speed, and increasing fuel consumption.

- Some marine pests (such as toxic dinoflagellates) are microscopic organisms that can accumulate in shellfish and in high levels are toxic to humans. Others can be a host for parasites, such as the Chinese mitten crab (*Eriocheir sinensis*), which is an intermediate host for human lung fluke parasite (*Paragonimus westermani*) (Gollasch 2011).
- Introduced species are considered the greatest cause of the loss of biological diversity after habitat destruction (Vitousek et al. 1997). The introduction of new predators, competitors, disturbers, parasites and diseases alter the structure and biodiversity of ecosystems (Carlton 2002).

Many exotic marine species have established throughout the world, with reported impacts for a small proportion of these. Some marine pests have been reported to have large economic consequences:

- Managing the consequences of the fresh water zebra mussel (*Dreissena polymorpha*) and quagga mussel (*Dreissena rostriformis bugensis*) in the Great Lakes of North America was reported at over US\$500 million per year (Connelly et al., cited in Arthur, Summerson & Mazur 2015). The mussels foul power plants, water systems, industrial complexes, boats and docks. The cost to electricity generation and drinking water plants alone was over US\$267 million from 1989 to 2004 (Connelly et al., cited in Arthur, Summerson & Mazur 2015).
- The introduction of the warty comb jelly (*Mnemiopsis leidyi*) to the Black Sea in the 1980s was correlated with a decline in anchovy stocks and loss of US\$250 million from the fishery (Zaitsev, cited in Arthur, Summerson & Mazur 2015).
- The consequence of the introduction of the shipworm (*Teredo navalis*), which tunnels into timber docks and ships, to the United States in the early part of the 19th century was just over US\$200 million per year in 1992 dollar terms (Cohen and Carlton, cited in Arthur, Summerson & Mazur 2015).

Environmental consequences of marine pests have also been reported throughout the world. These consequences are more complex, difficult to assess and difficult to express in dollar values (section 1.4.2). Australian examples demonstrate potential adverse environmental consequences of marine pests, which in many cases are not quantified (section 1.4.1) (Arthur, Summerson & Mazur 2015):

- European fanworm (*Sabella spallanzanii*), established in southern Australia, is believed to affect nitrogen cycling when in high densities and competes for space and food with benthic marine life.
- Japanese kelp (*Undaria pinnatifida*), established in Victoria and Tasmania, can competitively exclude native algal species, dominate space and disrupt food resources for native herbivores.
- The European green crab (*Carcinus maenas*) can reduce the abundance of susceptible native prey species (Grozholz et al., cited in Arthur, Summerson & Mazur 2015).



### 1.3.1 Global treaty framework

Australia has a number of international commitments that must be considered in developing and applying marine pest biosecurity. Some of these treaties place obligations on the Australian Government to manage the risks of marine pests and to ensure biosecurity measures are appropriate:

- The United Nations Convention on Biological Diversity (CBD) objectives include the conservation of biological diversity and the sustainable use of biological resources. Article 8(h) of the CBD is particularly relevant to marine pest biosecurity:

*Each Contracting Party shall, as far as possible and as appropriate: ... (h) Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species.*

- The International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention) (IMO 2004) aims to prevent the spread of harmful aquatic organisms from one region to another through ships' ballast water and sediments. Although the BWM Convention has not entered into force, Australia is a signatory and is working towards ratification. As a signatory, Australia should not act in a manner that is not consistent with the BWM Convention's intended purpose.
- The International Maritime Organization's (IMO) biofouling guidelines intend to provide a globally consistent approach to managing biofouling. The guidelines include the Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species (IMO 2011) and related guidance for operators of recreational craft less than 24 metres in length—Guidance for minimizing the transfer of invasive aquatic species as biofouling (hull fouling) for recreational craft (IMO 2012).
- The International Convention on the Control of Harmful Anti-fouling Systems on Ships (IMO 2001) addresses anti-fouling systems on ships. The convention focuses on the prevention of adverse impacts from the use of anti-fouling systems and the biocides they may contain, rather than preventing the transfer of invasive marine species.
- The Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) (WTO 2013) provides rules that guide WTO member countries in the development, adoption and enforcement of sanitary (human and animal health) and phytosanitary (plant health) measures. The Australian Government uses these standards to prevent introduction of pests and diseases through importation of live aquatic animals and their products (section 4.4).
- The United Nations Convention on the Law of the Sea (UNCLOS) provides the global framework by requiring general obligations on States to protect and preserve the marine environment. Article 196(1) is particularly relevant to marine pest biosecurity:

*States shall take all measures necessary to prevent, reduce and control pollution of the marine environment resulting from the use of technologies under their jurisdiction or control, or the intentional or accidental introduction of species, alien or new, to a particular part of the marine environment, which may cause significant and harmful changes thereto.*

Other treaties influence development of biosecurity measures, including the Technical Barriers to Trade Agreement, the International Convention for the Prevention of Pollution from Ships and the International Convention for the Safety of Life at Sea.

## 1.4 Applying biosecurity

The primary aim of applying marine pest biosecurity measures is to appropriately manage the biological risks to an acceptable level. Risk is an estimate of the likelihood of something occurring and the consequences if it does (section 1.4.1).

Science underpins understanding of risks and our decision-making in managing biological risks. This enables:

- investment and resource allocation strategies to target areas of greatest biosecurity risk, with measures that give the greatest return on investment
- biosecurity measures to be improved as knowledge and understanding of risks and risk management develops.

Biosecurity measures to address marine pest risks can have negative impacts on industry, the economy, the environment and the community. Striving for balance between managing the risks of marine pests and the impacts of potential biosecurity activities is integral to the effective and appropriate application of biosecurity measures (section 1.4.2). This balance is best achieved by using the knowledge and experience of all stakeholders in marine pest biosecurity.

The Department of Agriculture and Water Resources has core priorities for managing biosecurity. The priorities that relate marine pest biosecurity are to:

- manage Australia's biosecurity by effectively identifying and targeting risk management to focus on the things that matter most
- partner with other governments, industry, clients and stakeholders to manage Australia's biosecurity
- deliver biosecurity services to support access to overseas markets and protect the economy and the environment from the impacts of unwanted pests and diseases.

### 1.4.1 Understanding the risk

The Department of Agriculture and Water Resources adopts a formal risk-based approach to the analysis of biosecurity risks arising from exotic pests and diseases entering, establishing and spreading.

The risk-based approach involves a three step analysis of the biosecurity risk:

- assessment of the likelihood of a pest or disease entry, establishment and spread in Australia
- assessment of biological and economic consequences should this occur
- estimation of the unmanaged risk, drawn from the conclusions of likelihood and consequence assessments.

The department uses an estimation of an unmanaged risk to consider whether biosecurity measures are required to reduce the risk to an acceptable level.

In undertaking risk assessments and implementing risk management measures the department considers guidance and standards developed at international organisations, including the World Trade Organization, World Organisation for Animal Health (OIE), International Plant Protection Convention (IPPC) and Codex Alimentarius (Codex). The OIE, IPPC and Codex cover animal (including aquatic animal) health, plant health and food safety, respectively. Australia may choose to implement more stringent measures than those set by these organisations to protect life or health within Australia.

The department considers guidelines and instruments developed by the International Maritime Organization (IMO) in assessing the risk management options for marine pest pathways. The international community considers vessel ballast water and biofouling to be high risk pathways for the transfer of exotic marine species.

The Australian Government applies biosecurity measures to maintain Australia's appropriate level of protection (ALOP). Australia's ALOP is expressed in the *Biosecurity Act 2015* as a high level of sanitary and phytosanitary protection aimed at reducing risk to a very low level, but not to zero. This reflects community expectations and provides for a high standard of biosecurity that manages risks to a very low level. It also recognises that a zero risk stance is impractical, and effectively impossible, because it would mean no tourists, no international travel, no imports and no vessel traffic into Australia.

Where a biosecurity hazard is identified, and there is insufficient information to estimate the unmanaged risk, the department may adopt interim measures (often voluntary) while the department seeks to better inform the assessment of the biosecurity risk and determine the most effective risk management measure.

## 1.4.2 Challenges

Pathways and vectors for marine pests are not always known or clearly understood. Many factors affect the survival, spread and proliferation of introduced species, including basic climatic factors and food resources, the nature of the reproductive biology of a species and the presence or absence of competitors, predators and parasites (Carlton 1996). However, this doesn't mean that introductions do not occur. Every assessment indicates that the rate of marine introductions in US waters has increased exponentially over the past 200 years and there are no signs that these introductions are levelling off (Carlton 2002).

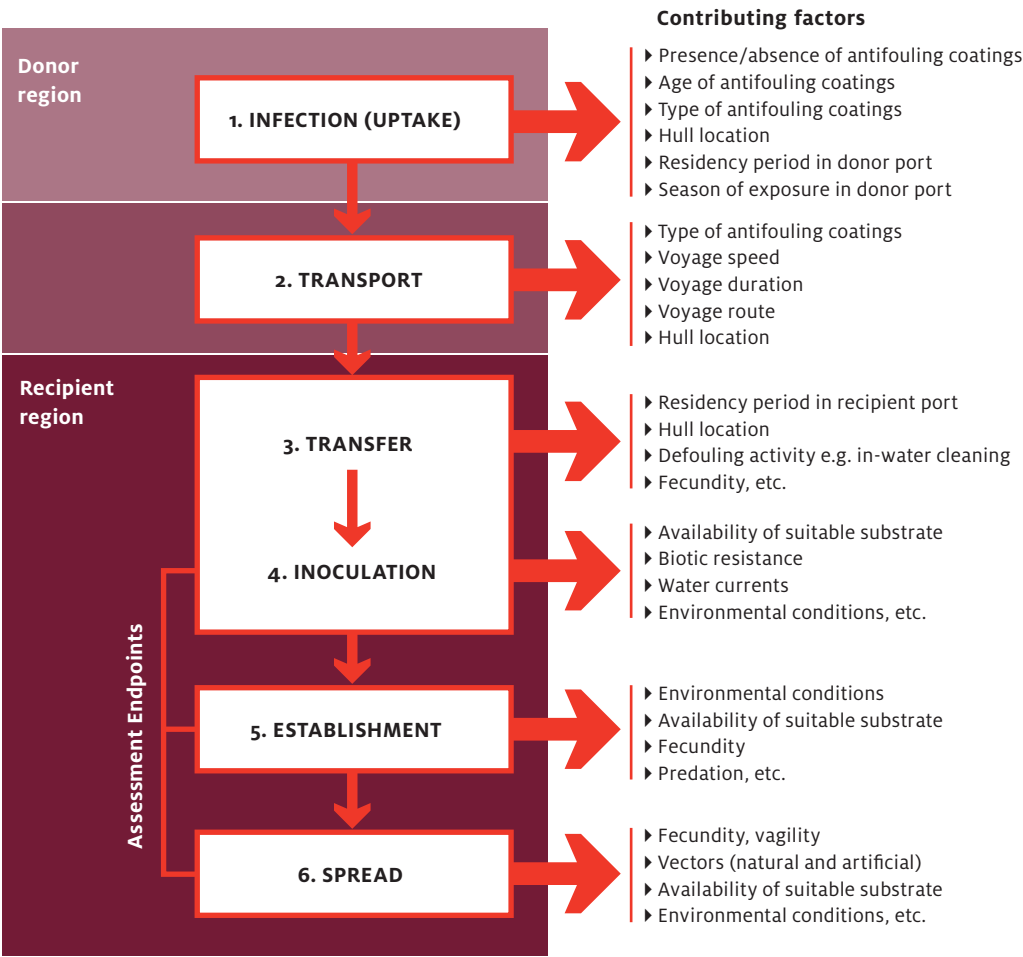
Biosecurity services need to be adaptable and flexible to meet the emerging and dynamic challenges associated with global change. Large-scale, constant changes in the movement of people, shipping patterns, marine resource use and the climate directly influence the threat posed by exotic marine species. An effective national biosecurity system should acknowledge these changing factors and be responsive to them.

### Difficulty determining the risk

The estimation of risk (likelihood x consequence) of an exotic marine species in the marine environment is difficult. Estimating the likelihood of an accidental introduction through biofouling and ballast water pathways of an exotic marine species is complex and requires a number of assumptions. Further, not only is estimating likelihood problematic, but it is compounded by the need to estimate consequence in a connected, ever-changing marine environment.

Estimating likelihood

FIGURE 1 Conceptual model of the species invasion process and contributing factors



Source: Adapted from DAFF 2011b

To successfully translocate and establish in a new location, exotic marine species must overcome a series of events and selective filters. These processes do not work in isolation and the selective filters affect how many organisms survive to the next stage. The species must:

- be entrained by a vessel
- survive the voyage from the donor to the recipient region
- reproduce or be dislodged in the recipient region
- colonise an available substrate or environment in the recipient region
- be able to complete its lifecycle in the recipient region (that is, undergo continued reproduction to become established).

Estimating the likelihood of a species surviving to an assessment end point is near impossible (Bax & Dunstan 2004). If a species is entrained, it might not survive the voyage. If it survives the voyage, its release in the new environment may fail. If it is released, it may die. If it stays alive, it may not reproduce. If it does reproduce, it may be limited by the recipient environment and may not establish and spread. Predicting which species will arrive, survive, persist and proliferate is very challenging (Bax & Dunstan 2004).

It is not well understood why some events lead to successful species' establishment while other pathways have been in place for some time and have failed to lead to successful establishment and spread. While it seems logical to assume that all likely invasions that could have occurred would have taken place if a particular pathway has been active for a long time, this is not accurate (Carlton 2002). Zebra mussels were first detected in the Great Lakes many decades after ballast water began arriving from Europe (Carlton 2002). Australia has been a regular port of call for vessels since the early 19th century, but the first record of an exotic marine species was in 1862 from Port Phillip Bay (Sliwa et al. 2009).

The invasion process is so complex that it is not as simple as considering the volume of vessel arrivals. Species must overcome a series of steps and selective filters unique to the individual vessel. Coupled with an ever-changing environment, knowing what will come next and why, continues to challenge invasive species scientists.

## Estimating consequences

Estimating the economic consequences of marine pests in Australia is relatively new and information about potential and actual risks of marine pests is still being developed. Arthur, Summerson & Mazur (2015) reviewed the current understanding of the potential consequences of marine pests and the cost effectiveness of potential response actions. Published records of the consequences (or impacts) of marine incursions are limited, with a heavy focus on the introduction of the zebra mussel into the Great Lakes of North America (section 1.3). There are challenges around gathering data on impacts. For example, the difficulty in estimating consequence is exacerbated by a lack of knowledge around the 'pre-impact' state, and invasive species may have positive as well as negative impacts in environments that have already been disturbed by human activities (Thieltges, Strasser & Reise 2006). An economic impact assessment should ideally value all costs and benefits to society, including social and environmental costs and benefits. However, assigning monetary value to social and environmental impacts is a key challenge and may not be appropriate.

## Impacts on non-market values

A number of Australian and international cases have been documented where marine pests have had impacts on human, animal and plant life, economic and cultural activities and the aquatic environment. However, in Australia, little is understood about the environmental consequences of established marine pests. Arthur, Summerson & Mazur (2015) suggested that the valuations of environmental and social costs may reveal a large impact of marine pests may be environmental and social costs. These are non-market costs, which are not explicitly priced, and include environmental and ecosystem damage caused by both incursion and eradication and the social costs that such damage impose on communities. The environmental and social impacts of pest incursions are not easily expressed in dollar terms, but non-market valuation techniques exist that could be used to evaluate these damage costs in dollar terms (Arthur, Summerson & Mazur 2015).

## The risk is constantly changing

The marine environment is dynamic and the difficulties of estimating risk are compounded by a number of factors that are constantly changing (Carlton (1996). These factors in combination alter the potential for exotic marine species to be transported from one region (donor) to a new region (recipient), including:

- emergence of new vectors and pathways bringing exotic marine species
- change in nature and prevalence of older vectors and pathways
- altering trade patterns and the effect on connectivity to 'donor' regions
- biological, chemical, ecological or physical changes in the recipient region that alter its receptability to incursions by exotic marine species
- occurrence of random inoculation events that can increase reproductive success.

## Trade

As Australia's trade relationships change, new pathways for the introduction of exotic species emerge. With these come new marine species available for transport, leading to the increased possibility of novel marine pest incursions.

Growth in economic activity and worldwide trade is resulting in increased shipping traffic. In Australia this is bringing an increase in vessel arrivals from overseas ports, larger vessels and cargoes on new shipping routes including South America and Africa (BITRE 2014).

Trade relationships are changing, which will alter vessel movements and introduce new 'donor' regions for exotic marine species. Australia's trade is increasing with India; between 2005 and 2010 bilateral trade in goods and services increased by 24 per cent a year, to US\$16 billion in 2008–09 (DFAT 2010). Energy and minerals account for 89 per cent of Japan's total imports from Australia and duties and taxes on these products will be eliminated when the new Japan–Australia Free Trade Agreement is implemented. After nearly 10 years of negotiations, tariffs are also planned to be removed on Australian resources, dairy, beef and live animal exports under a new trading agreement with China, opening up further trade opportunities.

The understanding of marine pests in overseas ports is increasing and informing our understanding of the connectivity of shipping routes to marine pest incursions. The 'hub and spoke' model describes the effect of increased or changed shipping connectivity on exotic marine species pathways. When an exotic marine species enters a high intensity transport hub it may be carried along shipping routes to other high intensity transport hubs. Dispersal from hubs to each point at the end of the spokes can spread marine species over great distances to many locations. In essence, a species entering a major port system is likely to quickly interface with multiple global shipping routes and destinations. This is exacerbated by increased interstate trading and movements, which also increases the potential for translocation and secondary outbreaks of marine pests in Australia.



## Habitat change

Human activities can change the environment and structure of donor and recipient regions, and facilitate successful entry, establishment and spread of exotic marine species (Tyrrell & Byers 2007). Processes such as chemical pollution, eutrophication, habitat alteration, fisheries impacts, introduced species, global climate change and port/marina construction influence the likelihood of further marine pest incursions.

An environmental change in a region may lead to population increases of some marine species leading to more individuals interacting with a transport mechanism. The creation of additional man-made structures in port environments to accommodate the change and increase in trade can enhance available substrate for marine pests. Growth in trade has seen further infrastructure development within ports in Australia and increased capacity and utilisation of existing port infrastructure. Growth in recreational vessel use increases demand for marina facilities, which can create habitat for introduced species (Connell 2000) and provide sheltered and novel 'habitat islands' for colonisation by exotic marine species (Bax et al. 2002).

## Climate change

Projections of climate change and climate variability suggest a strong potential impact on the establishment and spread of new and existing pest species through range extensions or range shifts as marine temperatures and acidity levels change. This is an area of additional uncertainty, with range shifts and extensions of marine species being increasingly reported. In North America, evidence indicates species shifting north, potentially linked to global climate change (Carlton 2000). Peck et al. (2015) examined the link between ocean acidification and changes in the composition of biofouling assemblages and found an increase in soft-bodied ascidians and sponges under acidified conditions.

## Summary

Incursions will continue in coastal systems as long as vessels ply the world's oceans. The sheer complexity around estimating likelihood and consequence of exotic marine species makes it difficult to predict future incursions and impacts. However, minimising risk is achievable by focusing on improved management of risk pathways, rather than focusing on particular species, ports or shipping routes (which is highly problematic and subjective). This leads marine biosecurity efforts squarely in the direction of prevention.

### 1.4.3 Marine biosecurity continuum (the invasion curve)

Greater emphasis on managing marine pests across the whole biosecurity continuum in the changing global environment is needed. Effective biosecurity management requires activities offshore to reduce risks reaching the border (Australian waters), actions within Australia to deal with incursions, and resource allocation to target the areas that pose the highest biosecurity risks.

The Australian Government has recently used the generalised invasion curve concept (developed by the Victorian Government Department of Environment, Land, Water and Planning) depicted in Figure 2 to explain the key categories of actions appropriate to the stage of a pest incursion.

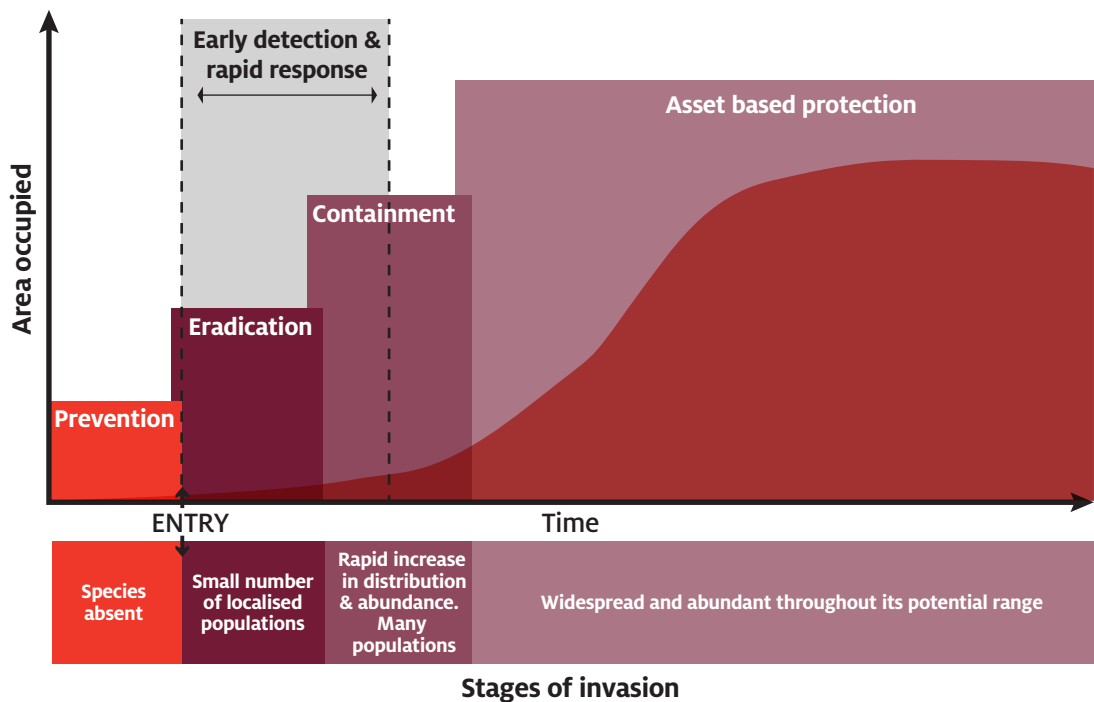
Prevention activities aim to minimise the number of marine pests entering, establishing and spreading. Eradication involves the complete removal of the target species. Containment involves measures adopted to minimise the spread of an established pest. Protection of assets (private and public) involves activities to reduce the affects of marine pests that have widely established in Australia.

The responsibility for marine biosecurity activities are not shared equally among all stakeholders for all marine pest risk management measures. Governments have a greater responsibility in the prevention and eradication stages, whereas those best placed to protect assets at risk from established marine pests are generally the owners of those assets (public or private).

The return on investment of public funds generally reduces when progressing along the invasion curve.

The review examined the value and cost-effectiveness of management approaches and activities in each stage of a marine pest invasion, and commissioned an ABARES project to support this (Arthur, Summerson & Mazur 2015) (section 4).

**FIGURE 2** Stages of invasion and generalised invasion curve



## 1.5 Brief history of national marine pest biosecurity

### 1.5.1 Marine pest surveillance and detections in the 1980s and 1990s

In 1988 Japanese seaweed or wakame (*Undaria pinnatifida*) was found on Tasmania's east coast, believed to have been introduced through ballast water or biofouling on international vessels and spread along the coast by fishing and recreational vessels.

In 1992 northern Pacific seastar (*Asterias amurensis*) was probably introduced to Australia in ballast water and first confirmed in the Derwent River Estuary. It is now found along the east coast of Tasmania. In 1995 it was identified in Port Phillip Bay, Victoria and by 1999 the seastar is said to have covered a 100 square kilometre area in the bay.

In 1994 the Australian Government funded the CSIRO to create a national research centre to undertake research on the impacts and management of exotic marine species.

Between 1996 and 2002 the Centre for Research on Introduced Marine Pests (CRIMP), with funding support from the then Association of Australian Ports and Marine Authorities, surveyed over 30 locations to obtain baseline information about the distribution and abundance of exotic species in Australian ports.

In 1999 black-striped mussel (*Mytilopsis sallei*) was discovered in Darwin marinas. The infestation grew quickly and the Northern Territory Government immediately implemented an eradication campaign. This was one of the few successful eradications of an established marine pest population in the world.

### 1.5.2 Development of a national approach to marine pest biosecurity

The black-striped mussel outbreak in Darwin highlighted the need for an integrated approach to managing marine pest incursions in Australia. In 1999 a national taskforce was convened that recommended immediate action and long-term reform of marine pest biosecurity arrangements through establishment of the National System for the Prevention and Management of Marine Pest Incursions (the National System).

In 2000 the National Introduced Marine Pests Coordination Group (NIMPCG) was established to develop reform measures under the National System. NIMPCG comprised representatives from the Australian, state and Northern Territory governments, marine industries, scientists and environmental organisations and was chaired by the Department of Agriculture and Water Resources.

In 2002 a working group confirmed the National System would focus on the core elements of prevention of incursions, emergency response, management and control of established pests, and provided for four supporting elements: monitoring, communications, research and development, and evaluation and review. These elements formed the basis of the Intergovernmental Agreement on a National System for the Prevention and Management of Marine Pests (Marine Pest IGA) (Commonwealth of Australia 2005). The Marine Pest IGA was not signed by all parties and did not come into effect; however, all signatories agreed to develop and implement the National System as described in it.

The 2008 Beale review *One Biosecurity: a working partnership* re-emphasised the importance of developing a shared responsibility approach to biosecurity. This report recommended that the Australian Government regulate international and domestic ballast water management and regulate biofouling on international vessels arriving in Australia, with the states and territories retaining responsibility for domestic biofouling arrangements.

The National System is now being developed and implemented under the Intergovernmental Agreement on Biosecurity (COAG 2012a) and the emergency response elements of the National System are governed by the National Environmental Biosecurity Response Agreement (NEBRA) (COAG 2012b).

### 1.5.3 Development of ballast water arrangements

In 1990 Australia became one of the first countries to manage marine pest risk by introducing voluntary guidelines for ballast water and sediment discharge from international vessels entering Australian waters (AQIS 1993). In 1991 the IMO issued international guidelines for preventing the introduction of unwanted organisms and pathogens from ships ballast water and sediment discharges.

In 2001 Australia introduced mandatory management requirements for all ballast water on ships arriving from overseas. The risks of ballast water in vessels entering Australian waters are managed under the *Quarantine Act 1908* and *Quarantine Regulations 2000*. This includes powers to give directions in relation to the storage, treatment and disposal of ballast water and requirements for the keeping of ballast water information. Victoria introduced additional ballast water management arrangements in 2004 for vessels arriving in Victoria from other Australian ports.

In 2005 Australia signed the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention). The convention was developed through the International Maritime Organization and aims to prevent the spread of harmful aquatic organisms and pathogens from one region to another through ballast water and sediments. Australia is looking to ratify the convention as part of developing domestic ballast water management arrangements.

When the *Biosecurity Act 2015* comes into force on 16 June 2016, Australia will implement nationally consistent domestic ballast water management arrangements and be in a position to ratify the BWM Convention.

### 1.5.4 Development of biofouling arrangements

Since the inception of the National System, biofouling has been increasingly recognised as a risk pathway for the introduction of marine pests. There are currently no legislative requirements under the *Quarantine Act 1908* expressly dealing with biofouling, and the Commonwealth does not have regulatory requirements for vessels to have managed biofouling prior to entering Australian waters. The Australian Government currently encourages operators to maintain their vessels in line with the National Biofouling Management Guidelines, which closely align to International Maritime Organization's *2011 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species* (section 4.2).

The Australian Government has been investigating practical ways of introducing biofouling management requirements for vessels arriving in Australian waters for several years. A regulation impact statement was released for consultation in 2011–12 and has been undergoing further analysis since then.

## 1.6 Review of National Marine Pest Biosecurity

In October 2014 the Australian Government allocated \$5 million over four years for a review of invasive marine species and subsequent strengthening of marine pest biosecurity arrangements.

The review focused on the Australian Government's responsibilities and activities in national marine pest biosecurity and makes recommendations to cost-effectively improve national marine pest biosecurity arrangements. The scope of the review is at Appendix B.

The review process included significant stakeholder consultation:

- Jurisdictions and National System partners were consulted in the development of the scope of the review.
- An issues paper was publicly released on 23 October 2014 inviting comment on any aspect of national marine pest biosecurity.
- A discussion paper was released on 1 April 2015 seeking further input and discussion on some of the key issues raised.
- Workshops discussing the topics raised in the discussion paper were held in all states and territories.
- Many stakeholders also took the opportunity to discuss their views and concerns through meetings and teleconferences.

Throughout the consultation process, the department received 38 written submissions and held meetings, teleconferences and workshops with over 90 stakeholder organisations involved in or affected by marine pest biosecurity activities.

As part of the review, the department commissioned two studies by ABARES:

- *Comparison of the cost and effectiveness of prevention, eradication, containment and asset protection of marine pest incursions* (Arthur, Summerson & Mazur 2015)
- *A review of the design and use of Australia's national monitoring strategy and identification of possible improvements* (Arthur et al. 2015).

In developing this report, consideration has been given to the many issues raised by stakeholders through submissions and meetings as well as information from the commissioned reports.

## Chapter 2

# A shared responsibility

The Australian Government considers management of marine pest biosecurity risks to the economy, the environment and the community to be a shared responsibility of governments, industry, natural resource managers, custodians or users and the community (COAG 2012a).

Through agreements such as the Intergovernmental Agreement on Biosecurity, governments have sought to instil this principle in biosecurity arrangements and operations.

A clear understanding among all parties of the roles and responsibilities in marine pest biosecurity is required for effective coordination and collaboration, and to give effect to the shared responsibility principle.

## 2.1 Current arrangements

### 2.1.1 Australian government roles and responsibilities

The Department of Agriculture and Water Resources administers the *Quarantine Act 1908* and the *Biosecurity Act 2015*. The *Quarantine Act 1908* is currently the primary Commonwealth legislation covering marine pest biosecurity and the protection of Australia from incursion of marine pests. The Department of Agriculture and Water Resources has primary carriage of Commonwealth legislative responsibilities for pre-border and international border biosecurity prevention activities. The Department of Agriculture and Water Resources also contributes to biosecurity activities within Australia where there is a discernible national interest. These activities are conducted in partnership with state and territory governments, industry and other stakeholders (section 3). The *Biosecurity Act 2015* will commence on 16 June 2016.

The Department of the Environment administers the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act), which is the central piece of Commonwealth environment legislation. No marine pest species have been listed as a key threatening process, or is the subject of a national threat abatement plan, under the EPBC Act.



The Department of Agriculture and Water Resources and the Department of the Environment work together in national marine pest biosecurity planning. In administering national marine pest biosecurity, the Department of Agriculture and Water Resources also seeks policy input from other Australian Government agencies that have responsibilities or interests in marine pest biosecurity. These include:

- Australian Fisheries Management Authority
- Australian Institute of Marine Science
- Australian Maritime Safety Authority
- CSIRO
- Department of Defence, and Defence Science and Technology Organisation
- Department of Foreign Affairs and Trade
- Department of Industry and Science
- Department of Infrastructure and Regional Development
- Great Barrier Reef Marine Park Authority
- National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

The Department of Agriculture and Water Resources and the Department of the Environment work with other agencies, state and territory governments, marine industries and scientists to implement the National System for the Prevention and Management of Marine Pest Incursions (the National System), through the Marine Pest Sectoral Committee and the National Biosecurity Committee.

## Jurisdictions

National marine pest management is the responsibility of the Australian Government and the state and Northern Territory governments and involves a variety of government agencies and portfolios.

State and territory governments (jurisdictions) have responsibility for marine pest biosecurity within their respective borders, which is underpinned by legislation to support delivery of services. State and territory governments are also responsible for management of their respective borders and biosecurity requirements for interstate movement.

In 2012 the Australian, state and territory governments (except Tasmania) signed an Intergovernmental Agreement on Biosecurity, with shared responsibility for biosecurity as a guiding principle (COAG 2012a). The agreement clarifies the respective roles and responsibilities of governments in the broader national biosecurity system. It also identifies opportunities for stakeholders to work together to strengthen the national biosecurity system.

Jurisdictions and the Australian Government also work cooperatively through national committees with high level responsibility for marine pest biosecurity.

## Marine Pest Sectoral Committee

The role of the Marine Pest Sectoral Committee (MPSC) is to develop and coordinate the implementation of harmonised, national arrangements to identify, minimise and address the marine pest risk to Australia's marine environment and associated industries. The MPSC also has an advocacy role within government to highlight the impacts of marine pests on Australia's marine environment and associated industry. The MPSC replaced the National Introduced Marine Pest Coordination Group (NIMPCG) and reports to the National Biosecurity Committee.

## National Biosecurity Committee

The NBC provides strategic leadership in managing national approaches to emerging and ongoing biosecurity policy issues across jurisdictions and sectors. The committee takes an overarching, cross-sectoral approach to national biosecurity policy, and works collaboratively to set strategic direction and achieve national policy objectives for biosecurity in Australia. The NBC is supported by four sectoral committees for animal health, plant health, invasive species and marine pests. Through these committees the NBC considers biosecurity issues affecting primary production, the environment, community well-being and social amenity. The committee provides advice on national biosecurity matters to the Agricultural Senior Officials Committee (AGSOC) and the Agricultural Ministers Forum (AGMIN) as appropriate. The NBC is formally established under the 2012 Intergovernmental Agreement on Biosecurity and is responsible for the implementation of national priority reforms identified in the agreement.

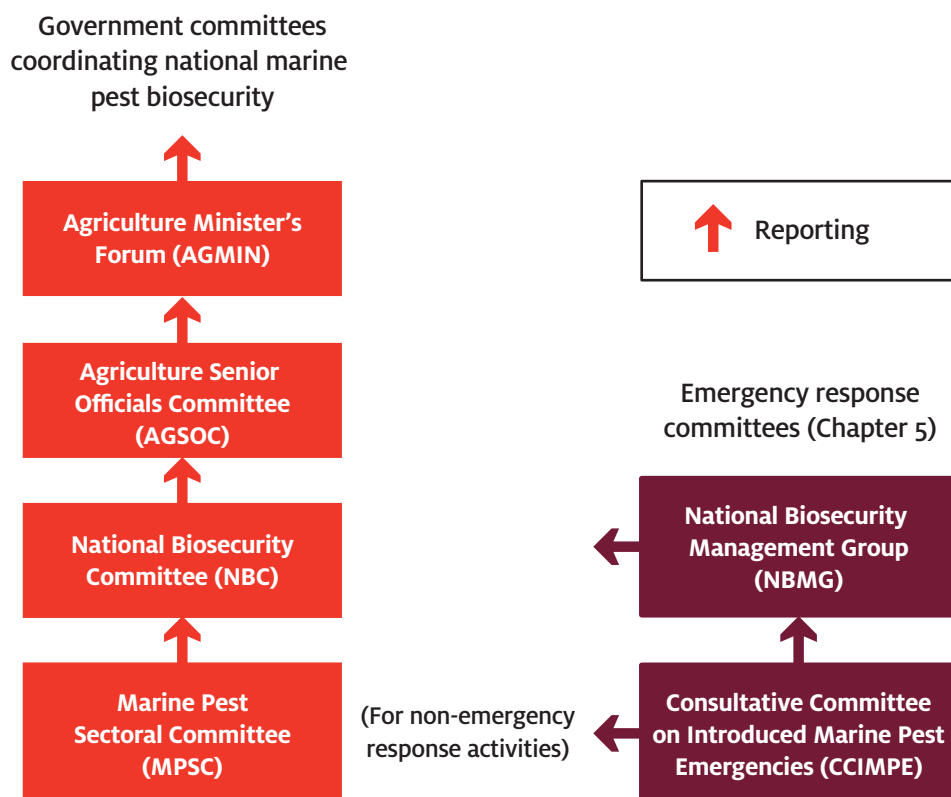
The Secretary of the Australian Government Department of Agriculture and Water Resources chairs the NBC. The Australian Government is also represented by the Department of Agriculture and Water Resources's Deputy Secretary for Biosecurity and a Deputy Secretary from the Australian Government Department of the Environment. The NBC's other members are senior representatives from primary industry or environment departments for each state or territory.

## Agriculture Senior Officials Committee

The AGSOC comprises all department heads and chief executive officers of Australian, state, territory and New Zealand government agencies responsible for primary industries policy issues. The Secretary of the Australian Government Department of Agriculture and Water Resources chairs the committee. The committee provides for cross-jurisdictional cooperation and coordinated approaches to matters of national interest.

## Agriculture Ministers' Forum

The AGMIN comprises Commonwealth, state, territory and New Zealand ministers with responsibility for primary industries matters and is chaired by the Australian Government Minister for Agriculture. AGMIN pursues and monitors priority issues of national significance affecting Australia's primary production sectors and is supported by AGSOC to achieve its objectives.

**FIGURE 3** National marine pest biosecurity committees

## Industry, asset holders and managers

Under the principle of shared responsibility for marine pest biosecurity, industry and asset holders' roles and responsibilities may arise as both risk creators and beneficiaries of biosecurity activities. The generalised invasion curve (section 1.4), helps to show how the Australian Government considers industry and marine asset holders' responsibilities for biosecurity change with each stage of a pest incursion.

Marine industries are currently working with the Australian and state and territory governments to implement a set of marine pest biosecurity measures, which combine to form the National System for the Prevention and Management of Marine Pest Incursions (the National System) (chapter 3).

One aspect of the Australian Government's collaboration with state and territory governments and industry is in preparing for, and responding to, exotic marine pests detected in Australia.

Management of established marine pests on private assets is primarily the responsibility of the asset holders, who are generally the primary beneficiary of those management activities. For some established marine pests a coordinated national approach is a more effective way to achieve positive biosecurity outcomes.

In addition to contributing to biosecurity management activities, industry, asset holders and environmental managers have a role in contributing to biosecurity decision-making that affects them. A principle underpinning the Intergovernmental Agreement on Biosecurity is that governments, industry, and other relevant parties are involved in decision-making, according to their roles, responsibilities and contributions.

The Marine Pest Sectoral Committee engages industry stakeholders and other environmental partners in developing and implementing new marine pest biosecurity measures. In developing policies and approaches, MPSC members are expected to engage their jurisdictional stakeholders before bringing these approaches to the MPSC. The committee holds biannual stakeholder workshops (the day before each MPSC meeting) to give participants the opportunity to engage with members on national marine pest policy and programmes. In May 2015 the MPSC agreed to strengthen links with stakeholders and more directly engage its industry partners in priority setting and decision making. The Marine Pest Sectoral Committee also has a number of task groups with members that are non-government stakeholders, and include peak industry body representatives.

## 2.2 Stakeholder concerns and views

### 2.2.1 Unclear roles and responsibility

A lack of clarity regarding the roles and responsibilities (including legal) of stakeholders across marine pest biosecurity was a primary issue identified in submissions, workshops and during conversations with stakeholders. Some of the most important issues to resolve were identified as:

- the roles and responsibilities of various state and federal government departments in marine pest biosecurity
- determining who is responsible for activities in responding to marine pest incursions, including funding responses to incursions
- the roles of non-government and non-industry stakeholders such as museums, independent experts, environmental groups and national resource management groups in developing national marine pest biosecurity arrangements
- the roles and responsibilities of marine asset holders in monitoring for marine pests, approving marine pest inspections and vessel cleaning operations
- industry confusion with the responsibilities for, and issues addressed by, various government committees and working groups.

Some stakeholders suggested that aspects of national marine pest biosecurity operations do not reflect those who create the risks and those who own or care for the marine environment. Examples provided include:

- The role of industry as a partner in marine pest biosecurity is not reflected in the operation of the Marine Pest Sectoral Committee.
- The current regulatory framework, particularly for biofouling management, has pushed responsibility for implementation of national marine pest biosecurity arrangements from the Australian Government to the states and territories.
- Formal environmental approval processes have resulted in some industries having a disproportionate burden for marine pest biosecurity risk, while other risks remain unregulated and unmanaged.

Stakeholders also identified clarity of roles and responsibilities as integral to the effectiveness of any ongoing collaboration and coordination for activities across the marine pest biosecurity system.

## 2.2.2 Lack of national leadership and coordination

Comments on the Australian Government's leadership identified it as largely administrative, rather than a facilitator of partnerships to improve and address national marine pest biosecurity issues. Some stakeholders also suggested national leadership for marine pest biosecurity was not as effective as other biosecurity sectors.

Stakeholders identified a number of concerns with the structure and effective operation of the agreements and committees relating to marine pest biosecurity through submissions and consultations. Stakeholders proposed a number of areas where the Australian Government could provide additional coordination and leadership, including:

- establishing a clear justification for aspects of the national marine pest biosecurity system, based on environmental and economic impacts of marine pests
- ensuring the collective effort of stakeholders is focused on those activities that address areas of highest risk, and activities are underpinned by rigorous and credible evidence
- establishing infrastructure for cost recovery from risk creators and beneficiaries
- coordinating communication of domestic movement of high risk vessels to reduce the risk of marine pests spreading across Australia.

Other proposed areas for greater coordination and leadership are discussed in chapter 6.

## 2.2.3 Marine Pest Sectoral Committee does not have industry representation

Submissions and consultations identified the lack of industry and environmental group representation on the Marine Pest Sectoral Committee as an ongoing concern for stakeholders regarding marine pest governance arrangements. The MPSC's predecessor, the National Introduced Marine Pests Coordination Group, operated with non-government voting members from 2001 until its conclusion in 2011 and was identified by a number of stakeholders as a better forum for engagement. There was also a view that progress with implementing the National System has slowed significantly, partly as a consequence of industry being removed from the MPSC.

The following statements represent a number of stakeholder comments on the issue:

*... the sidelining of industry into a separate group shows that there is no real intention to accept our role as partners in the fight against IMP.*

**Ports Australia, Issues Paper submission 11**

*The sharp segregation of MPSC Industry Forums from MPSC meetings... together with secrecy of MPSC meeting documents ... does not engender a sense of engagement and consultation with industry.*

**National Aquaculture Council, Issues Paper submission 17**

In consultations, stakeholders made reference to the shared responsibility principles of marine pest biosecurity and their role (albeit unclear) in developing the National System. A number of industry representatives and jurisdictions proposed that improvements to governance arrangements could be achieved by including industry representation on the MPSC. Other options identified were:

- amend MPSC arrangements to reflect those of the National Introduced Marine Pests Coordination Group, whereby marine industry and environmental organisations had full representation and voting rights

*Improved governance and transparency could be returned to the MPSC processes by reverting to the NIMPCG governance system.*

**OceanWatch Australia, Issues Paper submission 06**

- enable an industry representative to attend MPSC meetings as an observer or full member.

*The Department recommends reviewing the current governance arrangements to include industry representation on the Marine Pest Sectoral Committee.*

**Tasmania Department of Primary Industries, Parks, Water and Environment,  
Issues Paper submission 12**

*Industry should be more involved in initiatives to strengthen the National Marine Pest Biosecurity approach... Opportunities for members of industry (either APPEA or members directly) to be incorporated into the Marine Pest Sectoral Committee or reviews of outputs from the National Environmental Biosecurity Response Arrangements (NEBRA) should be considered.*

**Australian Petroleum Production & Exploration Association,  
Discussion Paper submission 14**

## 2.3 Consideration

### 2.3.1 Clarify roles and responsibilities to implement the shared responsibility principle

Current understanding of roles and responsibilities in national marine pest biosecurity is not sufficient to enable the coordination and collaboration of activities, which is essential to avoid duplication of effort and ensure collective resources are targeted towards effective marine pest biosecurity activities. A clearer understanding of the roles and responsibilities of stakeholders is required to effectively share responsibility among stakeholders and enable collaborative work to develop effective national marine pest biosecurity arrangements.

The current framework for marine pest biosecurity arrangements contributes to uncertainty among stakeholders. Biosecurity principles and the IGAB require interpretation to a sector specific level. There is currently no guiding document or single source for detailed information on stakeholders' roles and responsibilities for national marine pest biosecurity (chapter 3).

The Australian Government has a coordination and leadership role in developing



effective national marine pest biosecurity arrangements. Collaborative and cooperative relationships between Australian, state and territory governments are essential for the Australian Government to ensure that development. Investment towards ensuring all stakeholders understand everyone's roles and responsibilities is vital, but must be accompanied by stakeholder ownership of roles, responsibilities and overall strategies in national marine pest biosecurity. The current level of engagement with non-government stakeholders in decision-making does not foster significant ownership of new policies and strategies developed by marine pest biosecurity governance committees.

The MPSC holds a consultation workshop with non-government representatives before each committee meeting and encourages industry membership of the MPSC's task groups. During consultation industry advised the department that this involvement is insufficient to cover the shared responsibility principles outlined in the IGAB. In particular, industry and other relevant parties are not involved in decision-making, according to their roles, responsibilities and contributions.

The Australian Government, through the NBC and MPSC, should review the role of non-government national representative bodies in marine pest biosecurity decision-making. The NBC works to ensure that engagement of non-government stakeholders is effective and appropriate across all biosecurity sectors. This should include consideration of the operating guidelines for the MPSC, which currently preclude non-government representatives from being members or observers. Deliberations should also take into account the potential interactions between the MPSC and the marine pest network proposed in this report (chapter 6).

The Marine Pest Sectoral Committee is currently developing a national marine pest biosecurity strategy. This provides opportunity for stakeholders' roles and responsibilities to be clarified. The Australian Weeds Strategy and Australian Pest Animal Strategy evaluations (Lambert, Woodburn & Clarke 2013) and the Beale Review (Beale et al. 2008) support the notion that this will be crucial to the success of a national marine pest biosecurity strategy. It also provides an opportunity for stakeholders to take ownership of their roles and responsibilities through input into the strategy's development, and enable progress towards normalising the shared responsibility principle through the strategy's implementation.

The Australian Government works actively to minimise and mitigate the negative impacts of personnel and structural changes on Australian Government activities. The national strategy may also improve governance of national marine pest biosecurity and provide further surety that momentum and direction is not lost through representative changes.

### **Recommendation 1**

The Australian Government should improve its engagement with industry and other stakeholders through the Marine Pest Sectoral Committee and other fora, and clarify the role and involvement of non-government stakeholders in national marine pest biosecurity decision-making.

## Chapter 3

# The National System

Sharing responsibility and working collaboratively on collective goals requires a clear understanding of the roles and responsibilities of all parties involved. In this context, the review examined the National System for the Prevention and Management of Marine Pest Incursions (the National System) framework, and whether it provides an effective platform for future Australian Government investment towards collaborative and coordinated efforts of stakeholders.

The National System is a suite of measures being developed and implemented by the Australian, state and Northern Territory governments, marine industry, researchers and conservation groups. These measures seek to address risks from marine pests by preventing pest incursions, coordinating emergency response actions and managing established marine pests.

This chapter focuses on issues relating to the underlying framework that supports the development and implementation of the National System.

### 3.1 Current arrangements

#### 3.1.1 Current underlying framework of the National System

Australian, state and Northern Territory governments' commitment to establishing the National System was formalised in 2005 through the Marine Pest IGA. The Marine Pest IGA outlined the roles and responsibilities of signatories for implementing the National System and the arrangements for its oversight, coordination and evaluation.

The Marine Pest IGA was not signed by all parties so did not come into effect. However, all signatories agreed to develop and implement the National System and act as though the Marine Pest IGA was in force.

The Intergovernmental Agreement on Biosecurity (IGAB) came into effect in 2012 and provided principles to underpin the operation of a national biosecurity system (COAG 2012a). The IGAB superseded the operating arrangement for the Marine Pest IGA.

The IGAB provides guiding principles for the development of the broader national biosecurity system. It does not provide detail on roles and responsibilities for the marine pest sector and does not make reference to the National System. Some of this detail is in the National Environmental Biosecurity Response Agreement (NEBRA), which includes details of national marine pest emergency response arrangements and is the first deliverable of the IGAB (chapter 5).

Information about the National System is provided on a dedicated website—[marinepests.gov.au](http://marinepests.gov.au)—but there is no intergovernmental agreement or national strategy document that outlines the roles and responsibilities for developing and implementing the National System components. However, a national marine pest biosecurity strategy is currently being developed by MPSC.

The Marine Pest Sectoral Committee's terms of reference include to develop, implement and review the National System and to deliver priority areas as determined by the National Biosecurity Committee for implementation of the Intergovernmental Agreement on Biosecurity.

### 3.1.2 Components of the National System

The National System contains three main components—prevention, emergency preparedness and response, and ongoing management and control—and four supporting arrangements to address marine pest biosecurity risk.

#### Prevention

The prevention component of the National System includes measures to prevent marine pests from arriving in Australian waters and spreading around the coastline. The National System measures seek to manage the marine pest risks from ballast water, biofouling and the aquarium trade (chapter 4).

#### Emergency preparedness and response

The emergency preparedness and response component of the National System aims to provide a coordinated emergency response to contain or eradicate new marine pest incursions into Australia or significant new translocations of introduced marine pests of concern.

Australia has governance arrangements in place for emergency management for marine pest incursions through NEBRA, and the effectiveness of the operation of NEBRA in the marine pest environment is considered in chapter 5.

#### Ongoing management and control

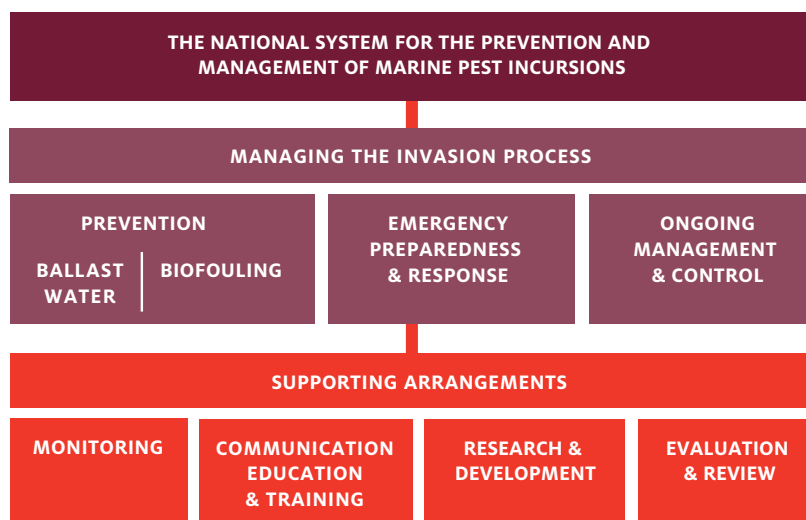
The ongoing management and control component of the National System aims to control and manage marine pests already in Australia, where eradication is not feasible (chapter 4).

## Supporting arrangements

The four supporting arrangements to address marine pest biosecurity risk are:

- the National Monitoring Strategy—a targeted monitoring programme for marine pests to agreed minimum principles and standards. The National Monitoring Strategy consists of the *Australian marine pest monitoring manual* (National System for the Prevention and Management of Marine Pest Incursions 2010b) and *Australian marine pest monitoring guidelines* (National System for the Prevention and Management of Marine Pest Incursions 2010a) that describe the process, standards and rationale for data collection and how these data will be used to inform decision-making (chapter 5)
- communications, education and training programmes to inform stakeholders at all levels of the importance of all three components of the National System
- targeted research and development to support the development, implementation and evaluation of the National System. Current research and development priorities are outlined in the *National priorities for introduced marine pest research and development 2013–2023* (Marine Pest Sectoral Committee 2013).
- evaluation and review of the effectiveness of the National System by the Marine Pest Sectoral Committee.

**FIGURE 4** Components and supporting arrangements of the National System for the Prevention and Management of Marine Pest Incursions



## 3.2 Stakeholder concerns and views

### 3.2.1 Unclear status and relevance of National System

Submissions from stakeholders provided positive comments on aspects of the National System. The National System was considered an appropriate concept for the time when it was designed, with effective underlying biosecurity principles and has current value as a communications tool. There were also comments supporting the suite of national biofouling management guidelines and other publications made under the National System banner.

Concerns were raised about the underlying framework of the National System and the current and future commitment of stakeholders towards its implementation. Stakeholders expressed confusion about the status and relevance of the Marine Pest IGA and questions about the status of the National System.

The relevance of some principles and priority activities developed under the National System were also questioned by stakeholders:

- Issues were identified with the underlying requirement of the National System for the detailed surveillance outlined in the National Monitoring Strategy (chapter 6).
- Stakeholders highlighted issues with species of concern lists (section 4.2) and the species-specific approach that underlies National System measures and supporting arrangements (chapter 6).
- A number of stakeholders noted that the National System was designed at a time when the development of ballast water regulation was the overarching focus.

The department received suggestions that the National System should be revised to better reflect the current understanding of marine pest impacts, vectors and pathways. Stakeholders' issues paper submissions also suggested overarching problems with national marine pest biosecurity arrangements including:

- a lack of national direction and cohesiveness across national, state and local marine pest biosecurity activities
- the Australian Government's effectiveness as a leader, facilitator and national coordinator
- the effort and resources invested towards detailed marine pest surveillance.

*Whilst a significant amount of work has been done to develop the National System for the Prevention and Management of Marine Pest Incursions since 1998, there are still considerable areas requiring immediate development.*

**Australian Shipowners Association and Shipping Australia Limited, Issues Paper submission 08**

*The National System is a good tool for communications, general information and as a portal. However, the process was started in 1998 and there is still no uniform ballast water system and no uniform biofouling system. Jurisdictions are progressing individual arrangements but industry must work across all of these arrangements and this causes difficulties for industry to comply...*

**Australian Shipowners Association and Shipping Australia Limited, Issues Paper submission 08**

*The framework and structure provides adequate management of the National System. Detailed information on how it all should work is easily accessible on a well-structured website.*

**NT Department of Primary Industries and Fisheries, Issues Paper submission 14**

*The current system, being more-or-less a loose arrangement between Commonwealth and states/territories is too uncoordinated for effective and rapid decision making.*

**Australian Museum, Issues paper submission 02**

*Implementation of the initially well-designed National system has lost its way, and this review is timely in reviewing the basis and effectiveness of the system and recommending a more effective and practical way forward.*

**ES Link Services, Issues Paper submission 04**

*Good design but lack of government commitment, little of the original scheme survives. Since 2006, the government approach has turned 180 degrees, with no active engagement of non-government expertise in the further development of the National system.*

**ES Link Services, Issues Paper submission 04**

*The momentum for development and national implementation of the National System has faded since, with only small kernels of the proposed National System now remaining.*

**ES Link Services, Issues Paper submission 04**

*Not all jurisdictions are signed up to the COAG agreement, which creates inherent weakness in the framework, and makes promoting actions to stakeholders far more difficult.*

**OceanWatch Australia, Issues Paper submission 06**

*The focus of the system on monitoring for incursions rather than preventing incursions appears to be flawed.*

**Ports Australia, Issues Paper submission 11**

*The national system as it stands is limited in effectiveness. In particular the lack of consistent implementation of surveillance, research, domestic ballast water management, international biofouling management, long term control and containment, ongoing funding arrangements (including effective cost recovery) and responses to significant range extensions are limiting.*

**Government of South Australia, Issues Paper submission 13**

*The system would be more appropriately termed a guiding framework in that it informs rather than directs jurisdictional processes.*

**Government of South Australia, Issues Paper submission 13**

*The National System appears to be plausible as an overarching framework but needs refinement and field testing.*

**National Aquaculture Council, Issues Paper submission 17**

*Despite decades of consideration, international and domestic management of marine biosecurity is done in a piecemeal, inconsistent and ad hoc way which increases costs and uncertainty to industry. Better understanding about what regulations and requirements exist in different state jurisdictions (including activities and regulations within port waters) and a consistent approach (domestically and internationally) is required.*

**Maritime Industry Australia Ltd Discussion Paper submission 05**

### **3.2.2 Lack of commitment and funding for the National System**

A number of comments were made on the high level of resources and commitment required to implement all of the National System measures in response to the issues paper questions on the effectiveness of the National System as an overarching framework.

Submissions and subsequent consultations suggested that the original design of the National System reflected the high level of funding and commitment from stakeholders at the time, and that implementation has slowed as the level of commitment and funding has faded. An often heard comment was that funding required for full implementation of the National System measures may only come as a result of another high-profile marine pest detection, such as the 1999 black-striped mussel in Darwin.

Stakeholders suggested three key areas to improve the level of resourcing and commitment for national marine pest biosecurity:

- increase public and government awareness of marine pest biosecurity risks
- clarify the economic case-for-action for marine pest biosecurity
- implement a more cost-effective system.

*As designed in 1999, the National System was a platinum scheme for invasive marine pest management. However, the lack of government commitment to this scheme has hampered its implementation or effectiveness.*

**ES Link Services, Issues Paper submission 04**

*The idea has merit – identify the pathways, source the risk and divert effort to address the principal risk to achieve good value for effort/cost on a national level. The delivery seems to lack funding, engagement and enforcement.*

**Ports Australia, Issues Paper submission 11**

*Also, we suggest that owing to insufficient funding base, marine biosecurity protocols have been developed without sufficient empirical data on the foreign species actually arriving in biofouling and ballast water.*

**Australian Museum, Issues Paper submission 02**

*The National System for the Prevention and Management of Marine Pest Incursions needs review as it was developed at a time when jurisdictions had greater resources to direct at this issue.*

**Tasmania Department of Primary Industries, Parks, Water and Environment,  
Issues Paper submission 12**



*The subsequent dwindling priority, commitment to, and resourcing of the National System across Government and most jurisdictions seems to reflect the lack or realisation of predicted impacts of established invasive species, or of further invasions of new harmful species...*

**ES Link Services, Issues Paper submission 04**

*In some cases changes in position and commitment by the Australian Government and the States/NT has significantly slowed implementation of a cohesive system (e.g. domestic ballast water management, national monitoring arrangements).*

**Government of South Australia, Issues Paper submission 13**

Although there were a number of comments on the lack of commitment and funding towards the development of the National System, there was strong support for a continued national approach to managing marine pest biosecurity.

In their submissions most jurisdictions commented on the lack of long-term resources within their jurisdiction for marine pest biosecurity activities. Jurisdictions particularly noted the lack of available funding to implement the National Monitoring Strategy (chapter 6). Natural Resources Kangaroo Island noted that current national arrangements do not support regional management of priority marine pest issues.

*Current marine biosecurity arrangements do not allocate state or federal funding to regional priorities or actions (even though a marine pest incursion is usually a localised phenomenon). Without funding, there is no capacity for NRM Boards to empower regional communities to manage marine biosecurity issues according to local priorities.*

**Natural Resources Kangaroo Island, Issues Paper submission 15**

*The Department of Fisheries has invested considerable resources in implementing port monitoring ... However, providing long term ongoing funding for these activities is problematic ... a system, and/or funding, is needed that ensures all jurisdictions can monitor high risk or high priority areas on an ongoing basis.*

**Department of Fisheries Western Australia, Issues Paper submission 09**

*NSW has no resources identified to implement the monitoring as required under the National Monitoring Network Strategy.*

**NSW Department of Trade and Investment, Issues Paper submission 22**

*The major issue[s] constraining marine pest management in Queensland have been identified as:  
- lack of sufficient resources...*

**Biosecurity Queensland, Issues Paper submission 19**

*The effectiveness of current arrangements for the detection, eradication and containment of invasive marine pests is limited due to the magnitude of the management task and the limited resources available. Tasmania ... has resources to do little more than do a limited range of activity such as engage in national policy processes and do some public education.*

**Tasmania Department of Primary Industries, Parks, Water and the Environment, Issues Paper submission 12**

*To date the NT has implemented the National System however due to the lack of commitment to the National System from other states it will become increasingly difficult to justify this continued expenditure.*

**Northern Territory Department of Primary Industry and Fisheries, Issues Paper submission 14**

## 3.3 Consideration

### 3.3.1 Improving the underlying framework

The development and implementation of a national strategy will provide a more effective platform for future efforts to improve national marine pest biosecurity than revising or modifying the National System.

Implementation of the shared responsibility principle is vital to the development of effective national marine pest biosecurity arrangements. This implementation relies on key elements that are not supported by the current National System framework:

- a clear understanding of the roles and responsibilities of all stakeholders in national marine pest biosecurity
- non-government involvement in determining priority activities, and in developing and implementing national marine pest biosecurity arrangements
- a clear understanding of how the IGAB will be implemented in the marine pest sector.

Formal design and development of the National System commenced in 1999. The National System was agreed in principle by all Australian governments and the Marine Pest IGA was developed to provide formal agreement to detail what the National System would be and who should be responsible for its development and implementation. National Introduced Marine Pest Coordination Group (NIMPCG) was charged with overseeing the development of the National System. NIMPCG delivered outputs towards the development of the National System with membership that included governments, industry and environment groups. Although there is some debate as to whether this arrangement was completely effective, it did achieve positive results under a working arrangement which represents the shared responsibility principle.

In 2009 the National Biosecurity Committee sought to clarify the effect of the IGAB and NEBRA's development on the Marine Pest IGA and confirm the future framework for national marine pest biosecurity arrangements. NBC confirmed that the Marine Pest IGA would remain in force until the draft agreements (IGAB and NEBRA) came into effect, after which:

- emergency response aspects of the Marine Pest IGA would be covered by NEBRA (chapter 5)
- the non-emergency response aspects of the Marine Pest IGA would be maintained by a national strategy for marine pests.

The MPSC is tasked with development of priorities under the IGAB and continuing development of the National System. However, the development and implementation of the National System is not underpinned by formal government-to-industry agreements, a national strategy or by a marine pest specific government-to-government agreement. This is in contrast to some other biosecurity sectors, where the collective aims and responsibilities of stakeholders are outlined in emergency response deeds and strategies, such as the Australian Weeds Strategy, the Australian Pest Animal Strategy and the National Plant Biosecurity Strategy.

The MPSC is currently developing a national marine pest biosecurity strategy, and should, with industry and environmental stakeholders, consider the relevance of the National System. The department advocates setting aside the National System, rather than seeking to integrate the strategy and the National System. The strategy should recognise the significant past efforts (of governments, industry and environment groups) towards the National System's development and identify how the outputs delivered under the banner of the National System will be utilised in future national marine pest biosecurity. Development of the strategy provides the opportunity for a clearer vision, objectives and implementation of responsibilities for national marine pest biosecurity arrangements.

### 3.3.2 Resourcing for national marine pest biosecurity activities

A major concern expressed by stakeholders is the lack of funding available for marine pest biosecurity within the existing biosecurity framework. Stakeholders consider resourcing of activities under the National System difficult to maintain and decreasing, with resourcing for new activities harder to obtain. This has resulted in inconsistent implementation of the National System, particularly high-cost surveillance activities under the National Monitoring Strategy (chapter 6). It has also resulted in underutilisation of past and current efforts towards improving marine pest biosecurity, including the suite of national guidelines for biofouling management (section 4.2) and outputs from surveillance for marine pests (chapter 6).

Stakeholders should appropriately resource their involvement in national marine pest biosecurity to fulfil their roles and responsibilities. To enable stakeholders to justify resourcing their involvement, a clearer understanding is required of those roles and responsibilities and how they contribute to the effective operation and improvement of national marine pest biosecurity arrangements. Developing the economic case for action based on Australian experiences with, and estimates of, marine pest impacts on the marine environments is hampered by limited funding for marine pest research and coordination. The department's consideration of potential impacts have necessarily highlighted extreme overseas examples of marine pest impacts (section 1.3), and continues to rely upon expert opinion of potential consequences to the Australian marine environment.

A national strategy developed with stakeholder consultation and with clear and considered implementation plans will provide more certainty of the purpose and value of funding marine pest biosecurity activities. However, the strategy will need to be developed with the premise that stakeholder funding for marine pest biosecurity may remain limited. It should not be assumed that a significant increase in stakeholder funding (including government funding) will be a result of the strategy's development. The NBC and MPSC should consider the development of a national marine pest biosecurity investment strategy or plan within the context of the NBC's broader considerations of national biosecurity investment across all portfolios.

The Australian Government should use the National Biosecurity Committee process to identify appropriate mechanisms for ongoing funding for priorities identified in the development of the strategy. Potential resource sources for implementation of the strategy include:

- cost-sharing arrangements for surveillance and monitoring activities, such as those currently being considered by the MPSC
- national partnership payments—payments in advance of the jurisdictions implementing reforms, recognising the administrative and other costs associated with undertaking reform
- specific purpose payments—grants from the Australian Government to the states, usually subject to conditions as to how the money is spent, which the states administer.

### **Recommendation 2**

A national marine pest biosecurity strategy should be finalised and implemented to set a new direction for the national management of marine pests and replace the National System for the Prevention and Management of Marine Pest Incursions. This should include the development of national monitoring and surveillance strategies to replace the National Monitoring Strategy.

## Chapter 4

# Prevention

Biosecurity prevention activities are the collective actions undertaken to minimise the entry, establishment and spread of pests and diseases into a region. For this report, the region under consideration is Australia's coastal environments and seas to the limit of the Commonwealth's jurisdiction.

### 4.1 Focus on prevention

Prevention is a primary tool for the Australian Government over the broad range of biosecurity activities that it oversees. Prevention and its effectiveness is a key area of focus for the department, because an effective prevention system significantly reduces the frequency of pest and disease arrivals in Australia.

Prevention is also considered to be the most cost-effective approach to biosecurity management. It reduces the need for reactive measures, including activities associated with attempting to eradicate pests and diseases, or attempting to contain pests and diseases to particular parts of Australia. These reactive measures can involve significant expense and do not reduce the risk of a subsequent introduction of the same pest or disease.

Prevention is considered the most cost-effective option in marine pest biosecurity because of the low probability of successful eradication once a marine pest is established and the difficulty in containment of marine pests if eradication is not possible.

#### 4.1.1 Value of prevention

Arthur, Summerson and Mazur (2015) examined the costs and effectiveness of prevention, eradication, containment and asset protection and found that, while the current prevention activities do have significant costs, they are generally preferred over relying on eradication, containment and asset protection. To compare the costs of prevention and eradication approaches, they compared these to the cost of living with incursions of marine pests. The cost of living with marine pests includes:

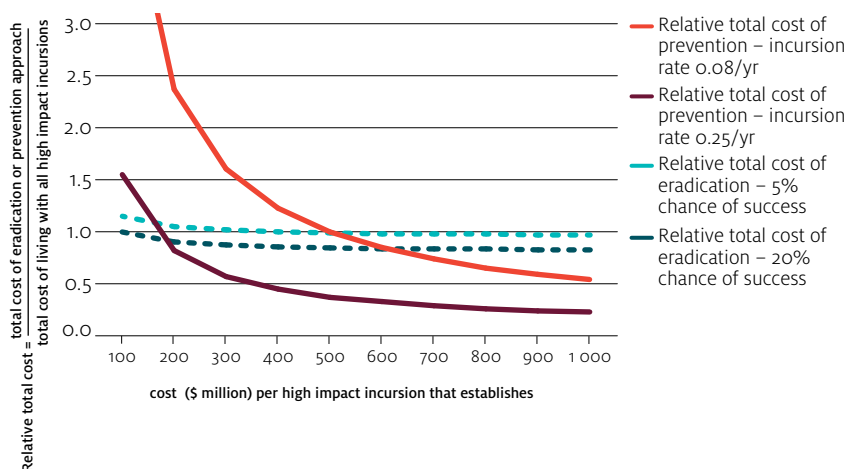
- any containment costs and the costs of asset protection for Australian marine industries and environments
- the cost of environmental impacts
- non-market costs such as recreational use values and non-use values, including option values, bequest values and existence values.

Arthur, Summerson and Mazur (2015) calculated the costs of current prevention measures relating to ballast water requirements for vessels entering Australian waters at around \$37million per year. These costs are entirely attributed to the shipping industry.

Arthur, Summerson & Mazur (2015) assumed ballast water prevention was likely to reduce incursion rates by at least 80 per cent. The overall cost of prevention also includes the cost of living with incursions that are not prevented.

The marine pest incursion rate has a large impact on the value of prevention measures. For example, given a prevention effectiveness of 90 per cent, and an incursion rate of 0.25 high-impact pests per year, prevention was the cheaper approach if the total cost per high-impact incursion was above about \$180 million. For an incursion rate of 0.08 high-impact pests per year, prevention becomes the cheaper approach when the cost per incursion exceeds \$500 million. Figure 5, which is modified from Arthur, Summerson and Mazur (2015), shows these results. Prevention approach becomes cheaper than living with the impacts of all high-impact marine pest incursions when the relative cost ratio (vertical axis) falls below 1.00. Arthur, Summerson & Mazur (2015) also undertook a similar analysis where only the costs to government in administering the current ballast water regulations (\$800,000 per year) were considered as the cost of prevention. In that analysis the prevention approach becomes cheaper at much lower cost per high impact incursion.

**FIGURE 5** Cost comparison of prevention and eradication to living with the impacts of marine pests for a cost of prevention of \$37 000 000 per year and a cost of eradication of \$20 000 000 per incursion



Even though the cost of any future biofouling regulatory approach has yet to be established, Figure 5 shows the potential value of biofouling prevention versus eradication. If a future biofouling regulatory approach is assumed to have similar costs to industry as the current estimated cost of ballast water management (\$37 million per year). Then the lower curve on Figure 5 gives an indication of the value of prevention for such a system, provided the approach reduces the incursion rate by 90 per cent. At an incursion rate of 0.25 high impact pests per year through biofouling, prevention becomes the cheaper approach when total average cost per high-impact incursion exceeds \$180 million.

This analysis enables an assessment of the relative value of approaches along a scale of costs per high impact incursion. However, the scarcity of impact information relevant to Australian marine pest biosecurity makes it difficult to determine where on the cost scale (horizontal axis) to consider the relative value of approaches.

The Arthur, Summerson and Mazur (2015) analysis used a cost per incursion of up to \$1 billion. While known marine pest incursions around the world have resulted in some impacts towards the upper limit used by ABARES, this review found little documented evidence of impacts of this magnitude in Australia. Although there is little documented evidence, this doesn't mean that there is little impact because:

- impacts on industry may not be costed
- environmental impacts are hard to establish in the absence of quality information on the environment before the presence of an exotic marine species
- environmental impacts may not become evident until many years after a pest's first detection

Furthermore, it is not possible to accurately determine the potential economic (or other) impact of exotic marine species that may arrive in the future.

Non-market costs of marine pests may be substantial and estimating them in monetary terms would allow a more definitive economic assessment of the value of prevention (section 1.4.2). Arthur, Summerson and Mazur (2015) summarised that a more informed determination of the economic value of a prevention system may require an assessment of how much the public values preventing establishment of exotic marine species. Arthur, Summerson and Mazur (2015) estimated a cost of \$37 million per year to industry for current ballast water management requirements. A relevant question is whether Australians are collectively happy to pay approximately \$1.50 per person per year (passed on to the Australian economy through higher shipping costs) to significantly lower the rate of entry of exotic marine species by ballast water.

### 4.1.2 Value of eradication

Arthur, Summerson and Mazur (2015) also examined the costs of an eradication approach against the costs of living with the impacts of marine pests. The analysis used assumptions for the success rate for eradication attempts of 5 per cent and 20 per cent, and the cost of eradication attempts of \$5 million and \$20 million. This reflects the high difficulty and cost of eradication from marine environments.

The total cost of an eradication approach includes the cost of the eradication attempts and the cost of with living with marine pests when eradication attempts fail. The assumed success rate of eradication attempts has the most influence on the relative cost of an eradication approach. At a 5 per cent success rate the eradication approach costs about the same as living with the impacts of all marine pests. At a 20 per cent success rate the eradication approach is a better option than living with the impacts of marine pests, if the expected impacts is higher than \$100 million per incursion (Arthur, Summerson & Mazur 2015).

The costs of any surveillance to support an eradication approach are included in the cost of eradication attempts. The effectiveness of the current National Monitoring Strategy in supporting early detection and eradication attempts are discussed in chapter 5 and chapter 6.

When eradication is unsuccessful in Australia, which it often is in the marine environment, the absence of a clear and agreed framework for containment and ongoing management of marine pests (and cost-sharing deeds) means that investment in managing established marine pests is uneven and lacking. If a marine pest becomes established and expands to its full extent its impact will include the cost of any management actions to control it, plus the costs of any residual impacts—these are equivalent to the costs for protection of assets such as industrial water cooling systems (Rajagopal & van der Velde 2012).

### 4.1.3 Point where prevention or eradication becomes better value

Figure 5 shows that below a cost of about \$180 million per incursion, the prevention approach is more expensive than living with the impacts of all marine pests. At the same incursion cost, an eradication approach with a 5 per cent chance of success is worse than living with the impacts of all marine pests. Using this information, it is logical to assume that, if the average cost per incursion is less than \$180 million, then it would be better value to not manage prevent or eradicate marine pest incursions, but to instead live with the impacts. However, the department cannot support living with the impacts of all marine pests because:

- the consequences of marine pests in the Australian environment are uncertain
- Australia has international obligations to minimise the impacts of invasive species
- marine asset holders would prefer exotic marine pests not affect their assets so they do not have to live with the impacts and use resources for marine pest management
- some stakeholders and the community expect the department to try to prevent marine pests entering so that impacts on the environment and industry are minimised.

### 4.1.4 Cost-effectiveness of eradication versus prevention

A cost-effectiveness analysis estimates the money spent per marine pest establishment avoided. Arthur, Summerson and Mazur (2015) noted that in order to assess the cost-effectiveness of eradication versus prevention approaches it is critical to define the management objective.



If the objective of the approaches is to minimise establishments of high impact marine pests, then a point can be estimated where an amount of money spent on eradication attempts achieves the same reduction in establishments as the prevention approach. The break-even point requires a 90 per cent chance of eradicating all high impact marine incursions, but this is unlikely to be achievable regardless of the amount of money spent (Arthur, Summerson & Mazur 2015).

If the objective is to minimise establishments of all exotic marine species regardless of their impact, the cost-effectiveness analysis identifies that an eradication approach cannot achieve the same outcomes as a prevention approach Arthur, Summerson and Mazur (2015). This is because eradication would only ever be attempted for potentially high impact marine pests, while prevention covers all exotic marine species. Hence prevention (rather than eradication) is the only realistic way to achieve this objective.

While prevention is generally the preferred approach to eradication, even with a prevention approach in place eradication could still be considered as a backup when incursions are not prevented (Arthur, Summerson & Mazur 2015). This is because eradication attempts for specific incursions could have positive benefit-cost ratios. However, a major consideration for the addition of an eradication approach is how much or whether to invest in an 'early warning' system to improve the likelihood of eradication being successful (chapter 5; chapter 6).

### 4.1.5 Options for prevention

Prevention activities aim to minimise the opportunities for successful transport and survival of marine pest species on a given vector. Activities that reduce the occurrence of species associated with a vector are more likely to meet that goal successfully. The major pathways for the introduction of marine species into Australia are ballast water carried in vessels and biofouling on vessels (or in internal parts of vessel exposed to sea water). These are direct pathways for the introduction of marine pests.

Other pathways for the introduction of marine pests include deliberate importation of marine organisms, marine debris or the unauthorised entry of vessels. The deliberate import of marine organisms is an indirect pathway because it involves people using the organisms in ways not intended when originally imported, such as using fresh seafood products imported for human consumption as bait or disposing of unwanted aquarium stock into waterways.

The appropriate application of prevention measures for these pathways are discussed in this chapter, with a focus on ensuring those measures address vectors that present the highest relative risk, closely align to international standards, and are effective.

#### Recommendation 3

The Australian Government should prioritise its resources towards minimising the likelihood of marine pests entering, becoming established and spreading in Australia.

## 4.2 Biofouling

Biofouling is the accumulation of aquatic organisms (micro-organisms, plants and animals) on surfaces and structures immersed in or exposed to the aquatic environment.

Biofouling is a significant pathway for the introduction and spread of marine pests and may also be involved in the spread of disease (Gollasch 2002; Hewitt et al. 2004; Lewis, Watson & ten Hove 2006; Revilla-Castellanos et al. 2015).

Most stakeholders believe, and evidence suggests, that biofouling poses a greater threat to Australia's biosecurity than ballast water (Eldredge & Carlton 2002; Hewitt et al. 2004; Ruiz et al. 2000). Australia currently regulates ballast water risks under the *Quarantine Act* and will continue to do so through the *Biosecurity Act 2015* (section 4.3). There are currently no legislative requirements under the *Quarantine Act 1908* expressly dealing with biofouling, and the Commonwealth does not have regulatory requirements for vessels to have managed biofouling prior to entering Australian waters.

Since 2005 the Australian Government has been working with the marine industry and other stakeholders to develop options to better manage biofouling risk. A biofouling consultation Regulation Impact Statement (consultation RIS) (DAFF 2011a) was developed in 2011 to analyse the costs and benefits of voluntary and regulatory options.

Regulatory options for managing biofouling were further examined in a draft biofouling decision Regulation Impact Statement (draft decision RIS). This document has not yet been released.

This review provides recommendations to strengthen the management of international and domestic biofouling. The voluntary and regulatory options contained in the draft decision RIS will be updated to take these recommendations into account.

### 4.2.1 Current arrangements

#### International (vessels arriving from overseas)

After a vessel enters Australian waters, there are several powers under the *Quarantine Act 1908* which can be used to take action in response to biofouling on vessels in certain circumstances. These include powers to issue directions requiring a vessel to be subject to a specified treatment. Whether these powers are available will depend on the particular circumstances of each case and whether the conditions prescribed under the *Quarantine Act 1908* to exercise the appropriate power have been met. There is no Commonwealth legislative requirement for vessels to manage biofouling before they enter Australian waters. The Australian Government encourages operators to maintain their vessels' hull cleanliness in line with the National Biofouling Management Guidelines, which align with the IMO biofouling guidelines.

The objectives of the IMO biofouling guidelines are to provide practical guidance on measures to minimise the risk of transferring invasive aquatic species from ships' biofouling. The guidelines recommend that a biofouling management plan and records of biofouling management practices be recorded and carried onboard.

For many decades tributyltin was the key active ingredient in anti-fouling coatings used to prevent biofouling on vessels. Tributyltin was highly effective but later discovered to be highly toxic to non-target marine biota. The IMO adopted a worldwide ban on tributyltin in 2001, resulting in levels of biofouling on vessels increasing dramatically.

The IMO biofouling guidelines also state that to maintain a ship as free of biofouling as practical the ship should undertake in-water inspection, cleaning and maintenance. In 2013 Australia and New Zealand adopted the *Anti-fouling and in-water cleaning guidelines*, which replaced the Australian and New Zealand Environment and Conservation Council's *Code of Practice for Antifouling and In-water Hull Cleaning and Maintenance* (ANZECC 1997). The new guidelines state that, where practical, vessels should be removed from the water for cleaning, in preference to in-water operations. In some cases, the guidelines accept in-water cleaning as a management option for removing biofouling, providing the risks are appropriately managed.

Western Australia and the Northern Territory also implement their own requirements to manage the risk of biofouling on vessels entering their respective territories, which apply in some circumstances to vessels arriving from overseas.

Western Australia enforces biofouling management powers under the *Fish Resources Management Act 1994* (FRMA) and the *Fish Resources Management Regulations 1995* (FRMR), which have offences relating to transferring live non-endemic or noxious 'fish' (including invasive marine species) into and within WA. The WA Department of Fisheries recommends vessel operators use its new biofouling risk assessment tool Vessel Check ([vesselcheck.fish.wa.gov.au](http://vesselcheck.fish.wa.gov.au)). Vessel Check provides a detailed report to vessel operators with recommended management actions to reduce the vessel's marine biosecurity risk to an acceptable level. The WA Department of Fisheries also recommends the use of a biofouling management plan and record book that meets all requirements of the IMO biofouling guidelines. In addition to the FRMA and FRMR, vessel operators contracted for particular resource projects must comply with relevant ministerial conditions under the *Environmental Protection Act 1986* (WA). This may include managing vessels for invasive marine species. If vessel operators cannot demonstrate a vessel is low risk for invasive marine species, they will be expected to undertake specified management actions, which may include an inspection for invasive marine species.

The Northern Territory Government introduced a vessel inspection protocol in 1999. The protocol applies to recreational vessels entering Northern Territory marinas. Any vessel that has travelled in international waters and is unable to demonstrate that the hull has been cleaned or antifouled or has been out of the water in Australia for a period greater than or equal to 14 days is asked to undergo a hull inspection and treatment of internal seawater systems to kill any marine pests. The Northern Territory Government covers the costs associated with hull inspections and treating the internal seawater systems of the vessels. No formally communicated operational policies exist for inspecting other vessel types.

## National arrangements (vessels moving within Australia)

Under the National System, a suite of national biofouling management guidelines (available from [marinepests.gov.au/marine\\_pests/publications/Pages/default.aspx](http://marinepests.gov.au/marine_pests/publications/Pages/default.aspx)) have been developed for a range of marine sectors including:

- recreational vessels
- non-trading vessels
- commercial fishing vessels
- petroleum production and exploration industry
- commercial vessels
- the aquaculture industry
- marinas and slipways (currently being developed).

These voluntary guidelines provide maintenance recommendations to help vessel operators manage the level of biofouling on their vessels.

Vessels moving within Australia are subject to the biofouling management regulations and policies of jurisdictions, including those of WA and NT previously described.

## Oil and gas industry environmental management plans

The Commonwealth *Offshore Petroleum and Greenhouse Gas Storage Act 2006* requires petroleum titleholders to detail the control measures that will be used to ensure the environmental impacts and risks of petroleum activities in Commonwealth waters are minimised. This includes the risk presented by marine pests through biofouling. Control measures proposed by titleholders are detailed in an environmental management plan, which must be assessed and accepted by the National Offshore Petroleum Safety and Environment Management Authority (NOPSEMA) before a petroleum activity commences.

## 4.2.2 Stakeholder concerns and views

### Need for biofouling regulation

Overwhelmingly, submissions reiterated that marine pest biosecurity policy should focus on prevention activities as the most cost-effective approach to resource allocation and reducing risk. Biofouling was identified as a major gap in Australia's marine pest biosecurity arrangements and a pathway that, if managed effectively, could lead to substantial risk reduction. Stakeholders noted that biofouling of vessels continues to provide a steady source of potential exotic marine species. Addressing this risk could reduce the severity of impact of marine pests by reducing the likelihood of future incursions.

During consultation, industry indicated support for a pragmatic and science-based approach to biofouling regulation. Industry reiterated that many operators have already adopted practices to minimise biofouling on hulls for operational efficiencies which is the key driver for biofouling maintenance (not biosecurity). They also indicated an increasing awareness of the need to manage biofouling in niche areas such as sea chests.

Many submissions considered the current arrangements ineffective and recognised a need for stronger requirements for the management of biofouling on vessels and structures arriving in Australian waters from overseas. At workshops and in submissions, stakeholders agreed that a consistent and pragmatic regulatory approach that encouraged good hull management would reduce risk and provide for consistency with international approaches. Issues paper submissions from the CSIRO and ES Link advocated reassessing evidence of consequences, magnitude of risks and the appropriate options for managing them. However, key challenges were identified with the ability to predict the likelihood of introduction, establishment and spread, and consequences of marine pests. Views were split about the consequences of marine pests in Australia. Some stakeholders believed that, if the consequences were significant, then the effects on the economy would have been seen. Others suggested that no one has looked closely or tried to measure consequences, and in the absence of understanding the health baseline of the environment, consequences of not managing biofouling could be overlooked and vastly underestimated.

At workshops, stakeholders suggested marine pest risk from China may increase because trade and vessel traffic is predicted to increase. Given the long history of north-west Pacific species introductions into Australia such as the northern Pacific seastar (*Asterias amurensis*), this change in trading patterns and shipping movements could lead to new exotic marine species introductions.

*National mandatory standards need to be developed and implemented, rather than relying, in many cases, on voluntary self-regulation.*

**Australian Museum, Issues Paper submission 02**

*There is currently no legislation or guidelines to manage the marine pest risk associated with biofouled international vessels arriving into Australian Ports. NSW DPI supports the development of Commonwealth regulation to manage this issue through Commonwealth legislation.*

**NSW Trade and Investment, Issues Paper submission 22**

*However, until new biosecurity legislation is implemented, there is no current management of international vessel biofouling at the national level. As biofouling vectored marine pest species make up to 70% of the risk for vessel vectored marine pests, this is a concerning gap that is likely to take several years to address.*

**Department of Fisheries Western Australia, Issues Paper submission 09**

*The key message of my submission is that the review needs to return to first principles and re-examine the evidence of environmental and economic impacts of invasive marine species and justify, accordingly and consistently, the need for, and costs of, a national marine pest program, its elements or some of its elements, and industry compliance.*

**ES Link Services, Issues Paper submission 04**

*The lack of a regulatory regime for biofouling is a major gap in Australia's biosecurity and environmental law.*

**Invasive Species Council and Australian Marine Conservation Society,  
Discussion Paper submission 15**

Submissions also noted that any measures developed should capture biofouling risk from all vessels. Stakeholders stressed that all vessels pose a level of risk for biofouling species to be introduced, become established and spread. Many commented that biofouling accumulation rates on vessels differed depending on operational profiles, maintenance activities and voyage patterns. Stakeholders suggested that a biofouling management plan approach would alleviate this issue by allowing operators to manage vessel-specific risks and enable the Australian Government to use the plans to inform risk assessment for inspection activities and compliance.

A particular concern was a perceived lack of awareness among recreational boaters about their role in marine incursions. It was proposed that boaters, if better informed, would be likely to undertake activities to minimise the spread of marine pests. Stakeholders from Western Australia, South Australia and Queensland in particular indicated that boaters had a genuine interest in protecting their marine environment resources. There was also discussion about whether the recreational sector should be regulated; however, it was unclear how this could be done effectively.

Stakeholders agreed that the Australian Government should address the biofouling risk posed by all vessel types entering Australian waters. Some stakeholders suggested that this should include vessels undertaking domestic movements. It was also suggested that gathering information about biofouling maintenance activities and voyage patterns could inform control measures.

*Only the larger sectors are regularly targeted however their risks have been relatively mitigated. The other sectors need attention especially biofouling on high risk international yachts.*

**Australian Shipowners Association and Shipping Australia Ltd, Issues Paper submission 08**

*There are no mandatory controls on biofouling, which is a particular issue in regard to recreational vessels, which are a relatively high risk vector (Kinloch et al. 2003) and the one of most concern on Kangaroo Island as most vessel traffic to KI is by yachts and motor cruisers.*

**Natural Resources Kangaroo Island, Issues Paper submission 15**

## Effectiveness of current voluntary measures

The effectiveness of the reliance on current national biofouling management guidelines developed under the National System was questioned in submissions. Some stakeholders commented that the voluntary measures, while well intentioned, have not been supported by sufficient community engagement to facilitate their effectiveness. Other parties viewed guidelines as insufficient and suggest there is not enough incentive for all vessel operators to comply with a voluntary set of recommendations, regardless of how well they are communicated.

A few respondents noted the operation and effectiveness of the guidelines has not been reviewed since they were first introduced. One stakeholder commented this is critical to assess whether the guidelines are effectively mitigating the risk of marine pest incursions. Another stakeholder questioned the value in such a process when little effort has been made to educate operators about the guidelines.

*The current arrangements rely on voluntary guidelines, which may be well-intentioned, but when there is insufficient community engagement associated with them, they are likely to be largely ineffective.*

**Natural Resources Kangaroo Island, Issues Paper submission 15**

*These sectoral guidelines should be reviewed to ensure that they are effectively mitigating the risk of marine pest incursions as was the original intention, and, if those risks are not being effectively managed, other measures should be developed.*

**Tasmania Department of Primary Industries, Parks, Water and Environment,  
Issues Paper submission 12**

*At the outset it is worth noting that it is unfair to judge the success, failure of [sic] otherwise of a voluntary system where there has been very little to no concerted effort to educate, pollicise or, in fact, fairly evaluate uptake.*

**Maritime Industry Australia Ltd, Discussion Paper submission 05**

## Cost of compliance versus cost of inaction

The shipping industry expressed concerns about potential increased costs incurred by vessel operators from proposed biofouling regulations contained in the consultation RIS, especially if regulations went beyond international standards. They highlighted the implications and impediments this may have on trade. During workshops they suggested that a cost-effective approach would be to implement best practice hull management requirements for biofouling that would manage a greater proportion of organisms.

During workshops, representatives of the oil and gas industry indicated there was a high cost of compliance with marine pest requirements in Western Australia but acknowledged that a critical focus for marine biosecurity is to minimise impacts through preventative actions. There were concerns about high costs incurred to manage for species lists, when there is a lack of information on species-level impacts. It was suggested that risk management should be targeted towards those species that have a higher likelihood of causing impact.

One stakeholder expressed concern that the uncertainty of requirements for in-water cleaning and a lack of dry-dock capacity to treat larger vessels meant that business went overseas as large vessels can only be dry-docked in Singapore.

Some stakeholders highlighted that because incursions can operate on decade-long time scales it can be hard to determine consequences, and suggested the shipping industry should implement best practices in line with assumed consequences. One stakeholder noted there will never be enough information on the impact of marine pests but this does not preclude governments and stakeholders taking action to manage biofouling risk.

*NSW considers the current national arrangements are not effective in preventing marine pests from arriving in Australia via biofouling on ships hulls, this being evidenced by numerous reported detections of marine pests of concern on international arriving vessels in Australian Ports (via CCIMPE).*

**NSW Trade and Investment, Issues Paper submission 22**

*The cost of industry compliance should be considered against the opportunity cost of inaction, such as the potential loss of local fisheries to invasives and disease, including downstream multiplier effects on supporting industries/businesses.*

**Australian Museum, Issues Paper submission 02**

*Targeted measures to address high risk vessels such as international yachts and mobile infrastructure that are not adequately encompassed by the IMO Guidelines should be considered.*

**ES Link Services, Discussion Paper submission 08**

## The species-based approach

The species-based approach to biofouling regulation is based on assessments of the risk of different exotic species, and regulating vessels based on the likelihood of carrying a species of concern. The regulatory approach currently proposed in the consultation RIS is a species-based approach. The approach uses a biofouling risk assessment tool to ask questions about biofouling management practices to rate a vessel's general biofouling risk. Based on risk level, a vessel would be allowed entry, given operating time restrictions or refused entry. If a vessel seeks to extend its operating time beyond the imposed restrictions, it must have an inspection to clear it of all marine species on a Species of Concern list (SOC list). That inspection may take place either in Australian waters or overseas.

Strong concerns were raised about the proposed use of a species based approach and a SOC list. Stakeholders viewed the SOC list as subjective and noted that positively identifying a suite of species would be taxonomically challenging and involve significant costs for industry. Stakeholders noted the costs for the Australian Government to maintain and update a SOC list would be considerable and ongoing. The administrative burden of managing vessels with operating time restrictions under this regulatory model would also be significant.

Species of Concern lists were identified by a number of stakeholders as highly subjective. Stakeholders suggested that the draft SOC list contains a number of species that are not invasive and excludes a number of species that are considered invasive. This reflects of the different views held by experts on which species are high risks and whether they meet criteria for a SOC list. Stakeholders acknowledged that resources aren't readily applied to studying consequences of marine pests and that quantifying ecosystem-level and environmental impacts of species on the SOC list is difficult.

The value of a species-based approach was maintained by some stakeholders. It was suggested that a short species of concern list could be integrated with a 'level of fouling' approach. For example, species such as Asian green mussel can act as an indicator for other marine pests. Therefore, a list of indicator species could be used when measuring the effectiveness of preventative measures. It was also suggested that a species-based approach may hold value for management of domestic vessel movements.



Concerns were raised about the logistics of vessel inspections in port environments and the potential health and safety concerns associated with this. A lack of taxonomic expertise across Australia was also recognised in submissions as a key barrier. However, a few stakeholders commented that data gathered by museums (for example, Atlas of Living Australia) may be underutilised and significant opportunities exist to increase data sharing in this space. Another submission considered that a potential solution lies in support for taxonomic research and training, and development of tools to facilitate species identification (chapter 6).

*Attempts to prioritise species have been undertaken but they are methodologically difficult, and have high uncertainty. The species specific approach is also data intensive, requires active administration and uses specialised expertise in taxonomy.*

### **CSIRO, Issues Paper submission 20**

*The current national approach to research and development related to invasive marine species appears fragmentary, ad hoc, and with no clear scientific justification for the assignment of projects. Recent projects contracted out by the Department of Agriculture have no visibility and seemingly no practical application, nor do results appear subject to critical scientific review. The deeply flawed Species Biofouling Risk Assessment is one example, and this has been put forward the basis for proposed Australian Biofouling Management Requirements.*

### **ES Link Services, Issues Paper submission 04**

*The concerns relating to identification and treatment of 'Species of Concern' – both in terms of costs and training are considered valid. However, there is a need to provide increased knowledge and awareness of marine pest species to stakeholders, as well as supporting ongoing taxonomic specialists through the Australian Museum (or similar) to maintain our knowledge of species and appropriate management intervention where required.*

### **Burnett Mary Regional Group, Discussion Paper submission 07**

*One of the benefits of a risk based approach, such as level of fouling, is that action could be required without the need for formal species identification however this approach may require enabling amendments of state marine pest legislation – Qld legislation is currently species based.*

### **Biosecurity Queensland, Discussion Paper submission 04**

*The SOC list should be determined by a clear set of criteria and be evidence based, hence giving confidence that it is not subjective. In managing the risk posed by introduced species, it is essential to distinguish marine pests from native Australian species including as yet undescribed native species. Identification of species in real time is challenging, but this should not be a reason to seek short cuts to avoid the challenge. The solution to the taxonomic challenge lies in training, support for taxonomic research and the development of tools to facilitate identification.*

### **Australian Marine Sciences Association, Discussion Paper submission 09**

## The IMO biofouling guidelines 'level of fouling' approach

The IMO biofouling guidelines focus on effective management practices to minimise biofouling accumulation (level of fouling) on vessel hull and niche areas. The guidelines recommend vessels carry a biofouling management plan onboard that outlines practices to manage a vessel's biofouling. These practices may include applying an up-to-date anti-fouling coating, installing a marine growth prevention system and having marine pest inspections after extended stationary periods.

There was widespread agreement among stakeholders that the Australian Government should encourage sound biofouling management practices for vessels entering Australia through regulatory requirements for vessels to implement a biofouling management plan and record book (consistent with the IMO biofouling guidelines). Many stakeholders commented that implementing this approach would be the most cost-effective and simple regulatory method for reducing the risks of biofouling. It was acknowledged that consistency with international developments (in New Zealand and California) to manage biofouling, which are also based on the IMO biofouling guidelines, is important to avoid confusion among the international shipping industry and reduce the potential cost of meeting different regulatory requirements. It was discussed that waiting for an IMO convention on biofouling would take significant time and is not a viable option.

There was a divergence in views as to whether the IMO biofouling guidelines should be mandated for both commercial and recreational vessels. Some stakeholders commented that the IMO recommendation for a biofouling management plan should be required in both sectors and noted that an additional guidance document specifically for the recreational sector had been developed. Alternatively, some stakeholders suggested that a mandatory biofouling management plan should only apply to the commercial fleet, which is more used to a regulatory regime, and that a focused outreach programme to encourage the use of the guidelines would be more suitable for the recreational sector.

*Biofouling risks are best managed by good biofouling management practices, which include use of effective antifouling systems and routine out-of-water cleaning and maintenance. The IMO Biofouling Guidelines provide recommendations and a mechanism to promote and enforce good biofouling management practice and these should be adopted to manage this vector.*

**ES Link Services, Discussion Paper submission 08**

*The best way to ensure in the long term that the risk of vessels introducing further marine pests into Australian waters or translocating marine pests domestically, is to ensure greater understanding and uptake of the effective technical measures to minimise the existence of biofouling.*

**Maritime Industry Australia Ltd, Discussion Paper submission 05**

*It is strongly suggested that Australia develop and adopt minimum standards (such as the IMO Biofouling Guidelines) and regulations for biofouling management practices across all jurisdictions.*

**Burnett Mary Regional Group, Discussion Paper submission 07**

*IMO Biofouling guidelines, including on-board management plan and record book as it would be freely accessible by any international vessels without having to search for Australian specific requirements. Also as the IMO updates their requirements it would not make the Australian requirements out of date.*

**Aquatic Biosecurity, Discussion Paper submission 12**

*The latter [adopting IMO Biofouling guidelines] is the most practical BFM approach for all Australian and internationally flagged vessels >400GRT, and it helps ensure uniformity and more widespread industry acceptance.*

**Intermarine Consulting, Discussion Paper submission 10**

*The latter [adopting IMO Biofouling guidelines] as it simplifies compliance and therefore should optimise resources.*

**Gladstone Ports, Discussion Paper submission 11**

## **Domestic inconsistencies in biofouling management**

Stakeholders commented that the different management practices within and between jurisdictions causes increased costs, time delays, uncertainties and misunderstandings. One submission raised concerns about the species-based approach being implemented in some jurisdictions and the effect this could have on increasing inconsistencies for biofouling management. Other stakeholders suggested that use of species lists may be appropriate for addressing aspects of domestic vector management, including to protect high value environmental assets such as Barrow Island. Industry and jurisdictions noted that biofouling regulation should be consistent around Australia, be based on risk and be practical.

Stakeholders also suggested that if domestic ballast water risks are being addressed by the Australian Government then so should domestic biofouling risks. Stakeholders called for the Australian Government to take the lead and develop a minimum biofouling requirement for domestic vessel movements. There was a lot of discussion about the most appropriate approach. Ideas included:

- the Australian Government establishing legislation that achieves consistency with international standards set by the IMO
- the Australian Government implementing an approach based on the Australian Maritime Safety Authority's regulation of domestic commercial vessel safety
- the Australian Government establishing an overarching framework for states to implement
- awareness raising focused on higher risk vessels, including recreational craft.

Overall, stakeholders agreed that action was needed to address the domestic spread through biofouling and that the next steps should be to address biofouling risks posed by all vessels. Stakeholder expressed uncertainty around marine pest management frameworks at the national and jurisdictional level and the capacity for jurisdictions to manage domestic biofouling. During workshops stakeholders considered that increased awareness of the risk of transfer of established pests via domestic biofouling, and on recreational vessels in particular, could have a significant risk mitigation effect. A comprehensive and coordinated outreach programme to encourage the use of biofouling management guidelines was discussed as a valuable starting point. Most stakeholders considered biofouling in the recreational sector as a significant cause of the spread of established marine pests around Australia.

Stakeholders contended that some jurisdictions' marine pest biosecurity legislation is based on controlling species identified on noxious species lists and that implementing a 'level of fouling' approach may require amendments to legislation.

NOPSEMA advised that the scope of the Department of Agriculture and Water Resources approvals/clearance processes required for vessels transiting between Commonwealth, state and port waters is not clear. The environment plans NOPSEMA receives for acceptance and approval reflect the inconsistent understanding of these processes and their effectiveness in managing the risks of marine pest translocations. This issue is further complicated by the voluntary nature of clearance processes for biofouling and uncertainty about the required level of compliance.

*The inconsistency of jurisdictional approaches to biofouling causes great difficulty to the maritime industry.*

**Australian Shipowners Association and Shipping Australia Ltd, Issues Paper submission 08**

*The current proposed approach (implemented in some jurisdictions), whereby there is a focus on particular species is costly, impractical and when you consider implementation on a domestic level, where you have established marine pests in some locations not existing in other locations, would result in inconsistent and piecemeal national implementation.*

**Maritime Industry Australia Ltd, Discussion Paper submission 05**

*Good biofouling management practice in Australia is also compromised by the hurdles posed by the APVMA for the registration of new antifouling products for use in Australia. As a consequence, the majority of antifouling systems on sale for use in Australia are 'old technology' systems that are less effective and, for many, more environmentally hazardous than modern systems available elsewhere in the world. The Government should work to streamline the registration process for new and more effective antifouling products to enable better domestic biofouling management.*

**ES Link Services, Discussion Paper submission 08**

## 4.2.3 Consideration

### Reasons for managing biofouling

Australia has international obligations and public expectations to manage the marine environment and minimise the impacts of marine pests. Attempting to minimise the likelihood of incursions through prevention activities is more cost-effective (and has a greater chance of success) than attempting eradication after a marine pest has established. Prevention measures that target pathways, such as biofouling and ballast water, are the primary measures the Australian Government can use to reduce marine pest risks to an appropriate level, which is very low but not zero. This is consistent with the approach used for animal and plant biosecurity risks.

The Australian Government should further prioritise its efforts and resources towards minimising the likelihood of marine pests entering, becoming established and spreading in Australia through biofouling on vessels arriving in Australian waters. Commonwealth powers under the *Quarantine Act 1908* may in some cases be used to manage biofouling risks once a vessel has entered Australian waters. One of the concerns with relying upon these powers to regulate biofouling is that it is reactive to addressing particular identified cases of quarantine risk after a vessel is

in Australian waters, rather than a proactive prevention model that requires vessels entering Australian waters to be a low risk of carrying marine pests. The current reliance on voluntary uptake of guidelines to reduce the risk of vessel biofouling was considered by many stakeholders as ineffective. Stakeholders suggested that voluntary arrangements in place through the National Biofouling Management Guidelines do not provide sufficient incentive for all industry sectors to manage their biofouling risk. Many stakeholders recognised a need for legislation to appropriately manage biofouling on vessels and moveable structures entering Australian waters.

The commercial shipping industry and the petroleum production and exploration sector in particular report increased costs, time delays, uncertainties and misunderstandings as a result of inconsistent biofouling management practices across jurisdictions. Maritime industries called for a consistent approach aligned with international standards for biofouling management.

Australia was a key party advocating establishment of a globally consistent approach to biofouling management. A decision to take an alternative action may be seen as moving away from that position and Australia's reputation in biofouling management could be negatively impacted. If more countries adopt the IMO biofouling guidelines as international standards, the levels of biofouling on international vessels will be minimised and the risks to Australia will be reduced.

### Implementing regulation that aligns with the IMO

A recent policy directive from the Office of Deregulation in the Department of the Prime Minister and Cabinet requires that if a system, service or product has been approved under a trusted international standard (such as the IMO biofouling guidelines) then Commonwealth regulators should not impose any additional requirements for approval in Australia, unless it can be demonstrated there is good reason to do so.

The species-based approach to regulation in the consultation RIS has two elements. Firstly, a biofouling risk assessment tool is used to rate a vessel's general biofouling risk and help determine if the vessel can enter, and any restrictions to be set on the length of time the vessel can operate in Australian waters. Secondly, if a vessel seeks to extend its operating time beyond the restrictions proposed in the consultation RIS, it must have an inspection to clear it of all species on a Species of Concern list (SOC list). If a species on the SOC list is found, then the vessel must be treated or cleaned. In Australia, dry-dock facilities have extremely limited capacity and do not cater for large commercial vessels. Further, a recent review of the operation of the *Anti-fouling and in-water cleaning guidelines* found that technology to support in-water cleaning is not yet fully developed and independently verified. For these reasons, large vessels would need to return to an overseas port to be dry-docked and effectively treated for any SOC list species found. The trade implications that might arise from these conditions should be considered. In general, stakeholders view the proposed approach contained in the consultation RIS, based on a SOC List, as impractical and feel it places an excessive regulatory burden on industry.

The IMO biofouling guidelines focus on effective management of vessel hull and niche areas to minimise biofouling accumulation as a whole, rather than focusing on specific species. Australia has implemented the general intent of the IMO biofouling guidelines through a suite of voluntary national biofouling management guidelines. However, under the IMO biofouling guidelines vessels are encouraged to carry onboard an effective biofouling management plan and record book and demonstrate active biofouling management of hull and niche areas to maintain biofouling at, or below, a prescribed 'level of fouling'.

Any national regulatory framework to manage biofouling should be consistent with the direction set by the IMO and include a requirement for vessels to implement an effective biofouling management plan. IMO biofouling guidelines are pragmatic and supported on an international level. Similar approaches to 'level of fouling' are being adopted by New Zealand and California. It is proposed that the Australian Government adopts international standards that closely align compliance and enforcement approaches to those in New Zealand and California.

A single set of requirements is needed, which should be widely promoted in order to avoid confusion by international vessel owners/operators. The shipping industry agrees that an approach based on the IMO biofouling guidelines is easier to understand and simpler to implement. A number of vessels already carry onboard a biofouling management plan, either as a stand-alone document or integrated in part or fully into the existing ships' operational and procedural manuals and/or planned maintenance system. Implementing an approach based on the IMO biofouling guidelines would also allow Australia to work with industry and the international shipping community to provide feedback to the IMO about the IMO biofouling guidelines in order to facilitate improvements to the IMO biofouling guidelines and improvements to international biofouling management practices.

Many commercial vessels arriving in Australia from overseas are already managing hull biofouling for fuel efficiencies. Niche areas on vessels, such as sea chests, remain a key marine biosecurity risk. Vessels are beginning to adopt management strategies for niche areas, but this is not as highly prioritised as hull fouling, despite minimising biofouling in sea chests being important for maintaining internal cooling system function.

Focusing efforts on a 'clean hull' approach provides a clear message to industry about Australia's biosecurity requirements. Treating biofouling as a pathway risk aligns with the department's approach to managing terrestrial biosecurity risks. A species-specific approach would be harder for vessel operators to maintain an awareness of, particularly given that a SOC list would need to be updated and changed over time. This is also complicated by the lack of taxonomic expertise in Australia to identify species, which contributes to the timeliness and accuracy of identifying specific species and is of particular concern if regulatory action was going to be undertaken. A lack of accuracy could lead to regulatory actions being contested by commercial parties.

During the period of this review, the department commissioned ABARES to update the draft decision RIS so that it meets current Australian Government requirements. This required that all options contained in the draft decision RIS be costed based on the regulatory burden placed on industry. The draft decision RIS is also being updated to take into account the most recent shipping traffic data (up to the end of 2014) and the effect that developments in other jurisdiction have on the regulatory burden estimate.

Preliminary advice from ABARES indicates that the regulatory burden of an approach based on IMO biofouling guidelines is significantly less than for the species-based approach contained in the draft decision RIS.

The department will need to update and finalise the draft decision RIS to progress the development of appropriate regulations to manage the risks associated with biofouling on vessels arriving in Australia. The draft decision RIS should be updated to reflect the recommendations of this report and outcomes of consultations conducted as part of the department's review.

## Manage the biofouling risk of all vessel sectors

The IMO recognises that all vessel types, including moveable structures, have the potential to introduce exotic marine species of concern. It has developed separate guidance for managing biofouling on both commercial and non-trading vessels, as well as recreational craft.

A number of stakeholders commented during this review that yachts and other recreational craft pose a significant biofouling risk because of their high residency time in Australia and overseas. Moveable structures (such as petroleum installations) are also considered high risk vectors for biofouling. Given the IMO's actions to address the full range of vessel types and through information provided during this review, it is recommended the department develop regulations to reduce to an acceptable level the biosecurity risks associated with biofouling on all vessels and moveable structures arriving in Australia.

Yachts, non-trading vessels, commercial fishing vessels and the petroleum production and exploration sector comprise a low percentage of overall visits to Australia. It may be appropriate for compliance activities to focus on vessel types or classes that pose the highest risk, thereby delivering a high level of risk return. An effective mechanism is needed to judge compliance or adherence to IMO biofouling guidelines and to independently assess if the acceptable adoption of IMO biofouling management plans and record books appropriately minimise vessel biofouling risk.

### Further considerations

There are no express provisions in the *Biosecurity Act 2015* giving the Commonwealth powers to manage biofouling on vessels entering Australia. The *Biosecurity Act 2015* does provide for biosecurity measures to be taken in relation to vessels if the level of biosecurity risk associated with them is unacceptable. Additionally, there may be scope for regulations made under the *Biosecurity Act 2015* to include provisions specifically addressing the risks associated with biofouling.

As previously discussed, the department considers a biofouling management approach aligned with the IMO biofouling guidelines provides a higher level of clarity for operators about their vessel's biofouling risk and the management actions they can take to reduce it. It is a pragmatic approach to reducing risk. The Australian Government, in partnership with jurisdictions, needs to further consider protection levels for high value assets or areas of national environmental significance such as the Great Barrier Reef in Queensland and Barrow Island in Western Australia. Biofouling management requirements for vessels entering these locations and staying for significant periods of time may need to be considered on a case-by-case basis.

There is a risk that implementing biofouling regulation at a Commonwealth level may create a regulatory layer that is inconsistent with regulations of policies of some jurisdictions. A 'level of fouling' approach could cause confusion for operators of vessels considered low risk upon entering Australia who then wish to move interstate to jurisdictions that may identify a vessels biofouling as a high risk based on a species-based approach. Implementing a regulatory approach at the national border would provide greater protection to the states and reduce the burden on jurisdictions by reducing future marine pest introductions. However, closer work with jurisdictions through the MPSC is required to develop nationally consistent biofouling management requirements.



## Domestic biofouling

The Australian Government does not regulate domestic biofouling. The 2008 independent Review of Australia's Quarantine and Biosecurity Arrangements (Beale et al. 2008) recommended that:

*In relation to biofouling, the Commonwealth's legislative reach should be restricted to international vessels arriving in Australia, with states and territories retaining responsibility for domestic biofouling requirements.*

The development of biofouling regulations on a level of fouling basis for vessels arriving in Australia may provide some impetus for consistent regulatory approaches to be adopted by jurisdictions. Whilst consistency is desired by industry and is a logical development, the establishment of a consistent management approach across jurisdictions may be difficult. The Australian Government will need to work in a coordination capacity with jurisdictions through the MPSC to clarify if and how this can be achieved. One consideration is that jurisdictions' regulatory framework may not enable the implementation of biofouling regulations on a level of fouling basis. The new Queensland *Biosecurity Act 2014* (Qld), due to commence in mid 2016, will declare 35 marine pest species as prohibited.

The Australian Government's efforts to limit the spread of biofouling domestically should focus on high risk vessel types and sectors. Initially, the Australian Government should promote education and awareness raising about biofouling management in line with the IMO biofouling guidelines for recreational vessels through the marine pest network (chapter 6).

Nationally consistent domestic biofouling regulations should be a longer term goal for marine pest biosecurity. However, the implementation of nationally consistent risk assessment tools for vessel operators may provide an effective step towards nationally consistent biofouling management and be achievable in a shorter timeframe. In June 2015, the WA government released a risk assessment tool called 'Vessel Check' that can be used by operators to assess their vessel's biofouling risk. The tool can be used by all commercial, non-trading, petroleum and commercial fishing vessel operators entering Western Australia from overseas or interstate locations.

### Recommendation 4

The Australian Government should develop regulations to reduce to an acceptable level the biosecurity risks associated with biofouling on all vessels arriving in Australia.

- a. The regulatory framework for vessels' biofouling should be consistent with the direction set by the International Maritime Organization and include a requirement for vessels to implement an effective biofouling management plan.
- b. Monitoring for compliance with biofouling regulations should be based on risk.

### Recommendation 5

The Australian Government should support national education and awareness activities to minimise the domestic spread of marine pests.



## 4.3 Ballast water

Most modern vessels use ballast water to maintain stability and structural integrity during cargo operations and voyages. Vessels uptake and discharge water to ensure the vessel can operate safely and efficiently in open seas. Whilst ballast water is essential for the safe, efficient and effective operation of vessels, it poses a significant biosecurity risk because it can transport marine pests from one location to another, where they may become established and spread.

Since 2001 the *Quarantine Act 1908* has been used to regulate the management of ballast water on vessels arriving in Australian seas. The *Biosecurity Act 2015* will come into effect on 16 June 2016. Until then, the *Quarantine Act 1908* remains the primary piece of Commonwealth legislation for managing biosecurity risks for ballast water.

The department did not seek comments on the content of the *Biosecurity Act 2015* as part of this review. However, how the *Biosecurity Act 2015* will be implemented was not excluded from the scope of this review and some stakeholders provided comment on this.

### 4.3.1 Current arrangements

#### Commonwealth ballast water arrangements

##### *Quarantine Act 1908* (valid until 16 June 2016)

The *Quarantine Act 1908* imposes requirements on overseas vessels relating to compliance with the Australian Ballast Water Management Requirements and the keeping of ballast water information. The Australian Ballast Water Management Requirements state that any salt water from ports and coastal waters outside Australian's territorial sea is considered a high risk for introduction of marine pests into Australian seas.

The **Australian Ballast Water Management Requirements** dictate that high risk ballast water must be managed for discharge in Australian waters. The only option for managing this type of ballast water is a mid-ocean exchange. In a mid-ocean exchange, the original ballast water is replaced with water from open ocean environments. Vessels can also load potable fresh water as an alternative to taking up port water as ballast. Fresh potable water is considered low risk and does not need to be exchanged mid-ocean to be approved for discharge.

Before arrival in Australia vessels must provide a pre-arrival report to the Department of Agriculture and Water Resources stating whether the Australian Ballast Water Management Requirements have been complied with. Upon request, further information relating to ballast water and compliance with the Australian Ballast Water Management Requirements must be provided. This information is assessed by officers from the department, who may then give directions regarding the storage, treatment and disposal of ballast water, including an approval or refusal to discharge. The vessel's ballast water management records are verified against the pre-arrival report by departmental officers during onboard quarantine inspections at Australian ports.

Ballast water sourced in Australian ports and carried by ships to other Australian ports is not regulated by the Commonwealth, but can be regulated by the state or territory in whose waters the ballast water discharge is to occur. Victoria is currently the only jurisdiction to regulate the movement of domestically sourced ballast water into their jurisdiction.

The Department of Agriculture and Water Resources supports the Victorian ballast water system by providing the Australian Ballast Water Management Information System (ABWMIS). This online tool allows vessel operators to conduct an instant risk assessment. If ABWMIS returns a low risk ranking, the vessel may discharge unmanaged ballast water in a Victorian port. If ABWMIS returns a high risk ranking, the vessel must manage the ballast water in accordance with Victoria's ballast water requirements before discharging in a Victorian port. ABWMIS accesses a set of risk tables that list the risk of ballast water transfers for seven established marine pests, between 127 Australian ports, for each month of the year.

## Ballast tank sediments

The Commonwealth does not allow the disposal of ballast tank sediments in Australian waters. If a vessel has accumulated sediments, the sediments may be removed to an onshore site for disposal or shipped outside Australian waters for disposal at sea.

### ***Biosecurity Act 2015 (commences 16 June 2016)***

The *Biosecurity Act 2015* has been developed so the Department of Agriculture and Water Resources can continue to manage biosecurity risks in a modern and flexible way. Chapter 5 of the *Biosecurity Act 2015* deals with ballast water management. Key aspects of Chapter 5 of the Act are:

- providing a regulatory framework that closely aligns with the International Convention for the Control and Management of Ships' Ballast Water and Sediments
- setting requirements for survey and certification, ballast management plans and record keeping for Australian flagged vessels so they will be in compliance with the requirements of the BWM Convention when it comes into force
- limiting the spread of marine pests that are already established in Australian waters through regulation of domestically-sourced ballast water on domestic voyages
- providing the foundation for a collaborative approach between the Australian Government, states and the Northern Territory to deliver an effective and consistent national ballast water biosecurity compliance network.

Once the BWM Convention is in force, a number of consequential amendments will need to be made to the *Biosecurity Act 2015* to give full effect to the BWM Convention. The major amendments will be to:

- put in place a compulsory ballast water discharge standard that vessels must meet according to a time schedule prescribed by the BWM Convention (many vessels will install a ballast water management system to comply with the discharge standard)
- require vessels to meet survey, certification, ballast water management plan, and record keeping standards prescribed by the BWM Convention.

## Ballast Water Management Convention

In 2004 the International Maritime Organization (IMO) adopted the BWM Convention that aims to prevent the spread of harmful aquatic organisms and pathogens from one region to another through ships' ballast water and sediments. Australia became a signatory to the BWM Convention in 2005 and will be in a position to ratify the convention once the *Biosecurity Act 2015* comes into force.

The BWM Convention will come into force one year after it has been ratified by at least 30 States that represent no less than 35 per cent of the world merchant shipping tonnage. As of 21 May 2015, 44 States have ratified the BWM Convention, representing 32.86 per cent of the world merchant shipping tonnage (IMO 2015). Australia represents approximately 0.4 per cent of world merchant shipping tonnage.

Even though the BWM Convention is not yet in force, Australia as a signatory must not act in a manner that defeats the BWM Convention's intended purpose.

To give multilateral treaties such as the BWM Convention full effect in Australian law, the Australian Parliament needs to enact enabling legislation. The *Biosecurity Act 2015* will put a framework in place to progress Australia towards full ratification of the BWM Convention. The *Biosecurity Act 2015* will also provide a framework for the Department of Agriculture and Water Resources to extend its regulatory reach to ensure consistent domestic ballast water regulations are in place to reduce the risk of transferring marine pests between Australian ports.

The BWM Convention will introduce a new discharge standard. A number of new Ballast Water Management Systems (management systems) have been invented to meet this standard. To be approved for use, management systems must meet the discharge standard and be approved by a member state of the IMO. The IMO's approval standards ensure that approved management systems provide a higher level of biosecurity risk mitigation than ballast water exchange.

The *Biosecurity Act 2015* and BWM Convention both allow for the approval of exemptions from managing ballast water if it can be demonstrated that the water from the port of uptake poses an insignificant risk to the port of discharge. The Department of Agriculture and Water Resources currently manages a Ballast Water Risk Assessment (BWRA) tool that can provide exemptions from managing ballast water for domestic movements only. An important component of allowing exemptions is availability of data on the locations of relevant marine pests so that ports can be identified as low risk.

### 4.3.2 Stakeholder concerns and views

There are four main issues considered in relation to ballast water management in Australia:

- the risk of introduction of marine pests that could affect the fisheries and aquaculture sectors
- the costs of domestic ballast water management
- managing domestic ballast water risk on a regional or port to port basis
- the appropriateness of marine species currently used to inform the risk assessments of domestic ballast water management.

#### Risk of pests that could affect fisheries and aquaculture

Ballast water can transport exotic marine species that may have a detrimental effect on Australia's fisheries and aquaculture industries. Marine pests can:

- compete with fisheries and aquaculture species for food and habitat
- foul and damage fishing and aquaculture equipment
- act as parasites on fisheries and aquaculture stock
- render fisheries and aquaculture stock toxic for human consumption.

Aquaculture groups wanted to discuss the biosecurity risk of marine species that may affect their businesses. Some of these stakeholders were particularly interested in how Australia can mitigate the threat posed by introduction or spread of species that can result in algal blooms or dangerous levels of toxic dinoflagellates.

The Australian Prawn Farmers Association expressed concern that regulations and ballast water management methods are not adequate to prevent exotic marine pests and diseases from entering Australian waters through ballast water. The association suggested that ballast water management methods may not be capable of mitigating risks posed by harmful algae, dormant cysts or microsporidians. The Association recommended that more research is needed to gain a greater understanding and awareness of what remains alive or dormant in ballast water.

*APFA is extremely concerned that despite Australia having regulations and inspections in place there is still a high risk that exotic organisms can enter via ballast water...*

**Australian Prawn Farmers Association, Issues Paper submission 18**

### **Cost of compliance with new ballast water regulations**

The proposed new ballast water legislation was commented on by many responders. Comments supported implementation of the *Biosecurity Act 2015* and the extended regulatory reach of the Commonwealth to cover domestic ballast water.

The shipping industry cited the costs of compliance as a key issue. Some potential cost saving measures suggested by shipping industry representatives were establishing co-management arrangements and allowing for exemptions from managing low risk ballast water for both international and domestic ballast water. To support exemption regimes, ongoing or periodic surveillance programmes were suggested to identify where marine pests currently reside to determine which Australian ports present low risk of transferring marine pests to other ports.

The shipping industry highlighted the period between the commencement of the *Biosecurity Act 2015* and the BWM Convention coming into force as a period of uncertainty and concern for the costs of compliance with domestic ballast water regulations.

*For the period between implementation of the Biosecurity Bill 2014 and the Ballast Water Convention, in our view, the only reasonable option is to exempt certain uptake and discharge locations from ballast water management requirements.*

**Maritime Industry Australia Limited, Discussion Paper submission 05**

*Much of the concern about the potential cost of compliance arises in relation to the time period between implementation of the Biosecurity Bill 2014 and entry into force of the Convention. This time period is unknown at this stage and is likely to only impact on smaller domestic vessels, those operators not aware of possible requirements under the Convention and in particular, large vessel on intra-state voyages through the GBR [Great Barrier Reef], currently still conducting exchange.*

**Maritime Industry Australia Limited, Discussion Paper submission 05**

## How to regulate domestic ballast water

The CSIRO suggested that domestic ballast water transfers could be regulated differently to the current approach that uses the port-to-port risk assessment in the ABWMIS. The ABWMIS issues exemptions from managing ballast water on journeys between Australian ports that are rated as low risk. The CSIRO suggested that a regional approach could be adopted where ballast water transfer between zones or regions requires a vessel to manage the ballast water with a mid-ocean exchange, but transfers within regions or zones would not. One benefit of this approach is that surveillance for established species in ports would not be needed. This means that any ballast water transfer between zones or regions would be high risk. However, this approach does not allow exemptions to ballast water management to be issued when the risk of transfer of established marine pests may be low between two ports in different zones. The current port-to-port risk assessment methodology that underpins the ABWMIS does allow exemptions.

*The review should consider a regionalisation of Australia for ballast management. Movement and discharge of ballast water between the zones would not be allowed without appropriate treatment. As an example, the simplest regions could be east and west Australia. The important point is that the regions provide adequate opportunity for treatment without undue delay or detour.*

**CSIRO, Issues Paper submission 20**

This issue was raised in the discussion paper and in workshops and received mixed feedback from stakeholders. Whilst some stakeholders supported the concept, most identified concerns with the complexity, and appropriateness of trying to identify appropriate ballast water management regions across Australia. Some of the specific concerns raised were that:

- the risk to a port comes from marine pests in the closest neighbouring ports and from ports that are environmentally similar but may be geographically distant.
- there is an underlying assumption that marine pests that become established in a region are likely to spread within that region by natural means (or pathways other than ballast water)
- identifying appropriate regions would be particularly difficult, though use of bioregions already identified for other purposes may provide a good starting point
- the adoption of a regional approach should still contain a risk assessment element, applied in a transparent way and allow unmanaged ballast water transfers when the risk is low.

## Species in domestic ballast water management

During the review workshops, participants discussed the nature of transfer of established species around Australia and noted that biofouling on vessels is a significant unmanaged pathway for marine species. Discussions then narrowed to the marine species subject to domestic ballast water regulation. *Sabella spallanzanii*, *Undaria pinnatifida* and *Crassostrea gigas* are three species that can provide a high risk ranking in the ABWMIS risk assessment for ballast water, which would require a vessel to manage their ballast water with a mid-ocean exchange to reduce the risk. These three species can also be transferred domestically through biofouling, raising discussion of whether regulating the transfer of these species in ballast water should progress if the risk of their transfer through biofouling remains unmanaged.

Issues were also raised about the economic and other consequences of marine pests that are subject to domestic ballast water regulation. Stakeholders talked of the previous process used to determine the species now in BWRA that underpins the port-to-port risk assessment in the ABWMIS. During the review the department requested information from stakeholders on the consequences of established marine pests on their operations. Some stakeholders believe that the marine pest consequences expected in the early 2000s have not materialised and it may be an opportune time to reassess the species included in the BWRA.

*In the interim, management of domestic ballast water should be restricted to demonstrably high risk voyages for species established in Australia that are of demonstrably high impact if spread to other parts of Australia. Of the current seven species used to inform the BWRA, four possibly warrant retention: Asterias amurens, Crassostrea gigas, Corbula gibba and, questionably, Undaria pinnatifida. The majority of voyages would therefore be exempt. Species could be added to this list if new species with significant impact do establish in particular ports.*

ES Link Services, Discussion Paper submission o8

### 4.3.3 Consideration

#### Risk of pests that could affect fisheries and aquaculture

The best way to manage the risk ballast water discharges pose to the fisheries and aquaculture industries is through implementation of the *Biosecurity Act 2015*. The Act will come into force in June 2016 to provide a framework for the department to manage international and domestic ballast water discharges and ratify the BWM Convention. After ratifying the BWM Convention, Australia should encourage other nations to ratify the BWM Convention to facilitate its entry into force as soon as possible.

Once in force, the BWM Convention will set a timeframe for vessels coming to Australia to install ballast water management systems. These systems will improve marine pest biosecurity management over the current ballast water exchange requirements, and are recognised as the best option for controlling pests and diseases that could affect fisheries and aquaculture such as toxic dinoflagellate cysts (Hallegraeff 1998).

#### How to regulate domestic ballast water

When stakeholders were asked for their preference between the port-to-port approach or the regional (zoned) approach to managing domestic ballast water transfers, there was no clear direction that would assist in determining a future policy direction. However, there was a clear sentiment that either approach should consider risk.

The advantage of a regional approach to managing domestic ballast water stems from its simplicity as it would not require port surveys to underpin risk assessments and would manage the risk of translocation for all marine species, not just listed species of concern. The fewer the number of regions used in a regional approach the simpler it will be and the lower the regulatory burden. However, fewer regions also results in less of the risk of domestic movement of ballast water being managed. Identifying the appropriate size and boundaries of regions would be a difficult and contentious task, and the incorporation of risk assessments into the approach would result in the approach being complex. If a regional approach also considers risk assessments, much of the advantage of the approach is lost and it may not achieve better outcomes than the current port-to-port model.

The port-to-port approach incorporates risk assessments into domestic ballast water management. The department also has functioning tools, including the BWRA and ABWMIS, to enable the delivery of the approach. Appropriate surveillance in ports enables the regulatory burden of the approach to be reduced through the provision of exemptions to vessels from managing ballast water for specific journeys, however continued industry desire for these needs to be confirmed (section 6).

The regional approach could be applied to specific circumstances where it more appropriately reduces the risk than requiring vessels to exchange ballast water during voyages between particular ports. One circumstance may be if vessels moving within the Great Barrier Reef region are required to exchange ballast water outside of 12 nm from land – placing them within the Great Barrier Reef.

### Cost of compliance with new ballast water regulations

A particular concern of the shipping industry is that the management of high risk domestic ballast water may involve high costs to vessels that are required to deviate from or delay planned voyages. Pre-arrival reporting for domestic ballast water movements may also impose a burden on industry, especially if a paper-based reporting system is used.

The department is developing an IT platform to be used for ballast water reporting for vessels arriving from overseas and also for vessels operating domestically. The IT platform will contain the current ABWMIS functions, which allow vessels carrying domestically sourced ballast water to apply for exemptions to the requirement to manage ballast water if the risk of species transfer is rated as low.

The new IT system will incorporate the Ballast Water Risk Assessment (BWRA) and the surveillance data requirements for the IT system will remain as they currently are. Where surveillance data are not present, the BWRA uses an environmental matching model to estimate risk. Changes to the way surveillance is performed for established marine pests could provide more cost-effective outcomes and reduce the costs of the domestic ballast water regulatory system. The current National Monitoring Strategy is expensive to implement and few ports have recent applicable surveillance data (chapter 6).

After the BWM Convention comes into force all vessels it applies to will have a defined period to install an approved management system. These management systems will provide a higher level of risk mitigation than the current requirement to exchange ballast water mid-ocean. The department has not confirmed the value of maintaining the risk-based exemption tool (ABWMIS in the new IT system) when ships have installed management systems. The management systems will have costs associated with their operation so there may be some interest from industry in maintaining an IT system where vessels on low risk journeys between Australian ports (or zones) can apply for exemptions from managing their ballast water to reduce the costs of ballast water management.

The department should continue to consult stakeholders on ways to improve ballast water regulatory systems so that risks are appropriately managed in the most cost-effective way.

### Species in the domestic ballast water management

Domestic ballast water management focuses on established marine pests. The BWRA currently includes 7 species. The assessment of the impact of these species was through an expert elicitation process that assessed actual or potential impacts on environmental, economic or human health values. The risk analysis focused on marine species that were selected by a hazard analysis process that was endorsed by the NIMPCG. It is intended that the list be updated as other potentially invasive species establish in Australian waters. The potential risk species are those that have ballast water mediated invasion history, have yet to reach the full extent of their potential range in Australia, and can be managed by ballast water exchange or treatment.

The Marine Pest Sectoral Committee has developed criteria to use when establishing a national priority marine pest list. The species on the current BWRA should be assessed against the listing criteria for established marine pests and retained in the BWRA if the species meet these criteria. Species that meet these criteria, and can also be spread through biofouling on vessels, should remain in the BWRA unless a decision is made by the states and territories that the domestic spread of established marine species via biofouling will not be managed.

#### Recommendation 6

The Australian Government should ensure implementation of domestic ballast water legislation is done in a cooperative partnership between the Australian, state and territory governments, commercial and non-commercial operators including ports and the shipping industry.



## 4.4 Other pathways and vectors

Although vessels are the main vectors for movement of introduced marine species, there are other vectors and pathways by which exotic marine species may arrive in Australia, including:

- deliberate introductions of live exotic marine species
- trade of seafood products
- marine debris (including ghost nets)
- suspected irregular entry vessels (SIEVS).

These pathways are managed through import permits, import restrictions or other Australian Government activities.

### 4.4.1 Current arrangements

#### Deliberate introduction of live animal and plant organisms

The biosecurity risks of deliberate introductions of live organisms into Australia are currently managed through permits and import restrictions based on biosecurity legislation.

Importation of live animal and plant organisms requires an import permit issued by the Department of Agriculture and Water Resources. Small quantities of live tropical lobsters from the Torres Strait Protected Zone for human consumption and other animal organisms for scientific research and public display purposes are permitted to be imported. Those imported organisms for research and display purposes are permanently contained under quarantine controls.

Permitted species of live marine and freshwater fish may only be imported for the live trade from approved countries and under strict biosecurity import conditions. Other aquatic animal species are not permitted to be imported to Australia for human consumption, aquaculture or the aquarium pet industry (Department of Agriculture 2015a).

Live marine plants may be imported into Australia provided the species has been assessed by the department for its potential to become a weed in Australia or risk of introducing a plant disease. The department evaluates new species through the weed risk assessment process, as outlined on the department's website (Department of Agriculture 2015c).

All aquatic live plant material entering Australia requires quarantine intervention on arrival, including an assessment of documentation and inspection of the imported material for quarantine risk material. In most cases, live plant material (excluding tissue culture) will require additional quarantine measures such as fumigation with methyl bromide. Submergent plant species (that is, plants which normally grow with their leaves below the water surface or floating on the surface) are immersed in an insecticide solution, followed by an additional immersion in a copper sulphate solution.

In addition to the biosecurity requirements, deliberate introduction of live animal and plant organisms need to meet Australia's requirements under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Department of the Environment maintains a list of species that are approved for live import. This list is known as the Live Import List (*List of Specimens Taken to be Suitable for Live Import pursuant to section 303EB (1) of the EPBC Act*). Species not included on this list cannot be brought into Australia live.

Domestically, all state and territories have regulations relating to keeping, breeding and selling aquarium species. They also have regulations governing movement of aquaculture stock and equipment both within and between states and territories. These regulations vary between jurisdictions.

The department uses intelligence, screening and surveillance through border security protocols to manage the risks posed by deliberate illegal introductions.

## Import of seafood products

The Department of Agriculture and Water Resources imposes restrictions on imported seafood products to manage biosecurity (disease) risks. A range of measures are used to manage biosecurity risks associated with importation of other aquatic animal commodities (for example, bait fish and fish meal). An import risk analysis may be used to assess these risks and identify risk management measures.

## Marine debris

The Department of the Environment and various community organisations undertake measures to prevent, manage and mitigate the effects of marine debris, but these are largely from the perspective of marine pollution and avoidance of injury to wildlife.

To help mitigate potential biosecurity risks from marine debris, in 2014 the Department of Agriculture and Water Resources entered into a Memorandum of Understanding with Tangaroa Blue to collect and record information about debris that washes up on Australia's beaches that might be a biosecurity risk (Department of Agriculture 2014).

Fishing nets that have been lost accidentally or deliberately abandoned at sea are commonly referred to as ghost nets and have been encountered in Australian coastal environments. These and other forms of debris have been found to carry exotic marine species.

A threat abatement plan for the impacts of marine debris on vertebrate marine life was approved in 2009 and one of its objectives was to contribute to the long-term reduction of marine debris. Policies and processes for land-based disposal of intercepted ghost nets have also been developed.

The department heard in the review workshops that Indigenous rangers in northern Australia take an active role in locating and managing ghost nets when they wash ashore. The northern Australian fishing fleet is also active in managing ghost nets when they are encountered at sea. Fishing vessels haul ghost nets on board and return them to port for land-based disposal.

## Suspected irregular entry vessels

Suspected irregular entry vessels (SIEVS) are vessels attempting to enter Australian waters without authorisation. Some of these vessels may be in poor repair and without an adequate anti-fouling coating. These vessels may carry significant biofouling (Willan et al. 2000).

Vessel arrivals that are detected and apprehended in Australian waters undergo biosecurity management controls to mitigate the risks before being brought to a place in Australia, if that is to occur. Where in-shore arrival is to occur, biofouling is one of a range of biosecurity risks that are managed before and during the arrival and detention process.

#### 4.4.2 Stakeholder concerns and views

Some stakeholders regarded the Live Import List as a useful tool for managing species entering Australia, although one government agency expressed reservations about the development of the list for marine species. The greatest concerns related to gaps in post-border vector management.

*The live import list for marine species is based on families and may not have given sufficient appropriate consideration to all biosecurity risks (including pathogens).*

**Government of South Australia, Issues Paper submission 13**

*This is a useful tool to restrict the species that are imported into Australia, but doesn't govern management of aquatic species once they are imported into Australia.*

**NT Department of Primary Industries and Fisheries, Issues Paper submission 14**

*...there appears to be limited investigative and compliance action by the Australian Government when such species are detected post-border, which can foster further smuggling or deliberate mislabelling of imports. Only where such species are listed as noxious under SA legislation ... can compliance actions for illegal keeping be undertaken by SA authorities.*

**Government of South Australia, Issues Paper submission 13**

While some stakeholders considered imports for the aquarium trade as high risk, the aquarium industry considered this perception unjustified and that other pathways pose a much higher risk. However, it did support national education programmes similar to the 'Don't dump that fish' campaign to educate consumers about the risks of releasing aquarium stock into the wild.

*Concerns are also held about importation of aquarium fish that may then be released into the wild. i.e. their health status, their ability to be an oyster predator or simply complete for the same food.*

**Oyster Committee, NSW Farmers Association, Issues Paper submission 05**

The aquaculture industry was concerned about the risk of imported seafood products, particularly where imported products were being used for unintended purposes such as raw prawns for bait or where they might harbour diseases or antibiotic resistance. The industry was concerned that there remains a potential for exotic marine organisms to enter Australian waters and that import restrictions should be strengthened.

*AFPA is extremely concerned that despite Australia having regulations and inspections in place there is still a high risk that exotic organisms can enter via ballast water; through the use of imported prawns as bait, through dried shrimp or Australia's ALOP and testing regime of 5% of imported shipments.*

**Australian Prawn Farmers Association, Issues Paper submission 18**

*The seafood industry would like to note other methods of marine pest and disease organisms potentially entering Australia, and it considers the risk posed by these methods is not being adequately managed at present.*

**Northern Territory Seafood Council, Discussion Paper submission 01**

### 4.4.3 Considerations

The department heard that the introduction of new and potentially devastating diseases is a major concern for the aquaculture and seafood industries. Although disease management in these industries is out of the scope of this review, marine pests can be a potential vector for diseases. It is important to maintain a focus on preventing the entry of marine pests into Australian waters through all pathways.

Restrictions on importation of live marine organisms through the Live Import List and on seafood and other marine based products through the import risk analyses processes are important primary biosecurity control measures for marine pests and need to be continued.

The department heard that some consumers are not aware of the potential marine biosecurity risks posed by releasing unwanted marine aquarium stock into waterways. Morrisey et al. (2011) also identified limited awareness by wholesalers and retailers of biosecurity risks other than disease implications and a perception within the aquarium trade that if imported species had been quarantined there was no further biosecurity risk.

Awareness could be significantly improved by specific engagement of the aquarium industry through the proposed marine pest network. Further, national promotion of education campaigns such as 'Don't dump that fish' may be a useful catalyst to increase both industry and community awareness. The proposed marine pest network could provide a valuable mechanism to achieve those aims.

Although prevention of marine debris and SIEVs entering Australian waters is beyond the scope of this review, these pathways do present biosecurity risks. The department should work with organisations active in managing marine debris and SIEVs to ensure there is appropriate awareness, training, guidance material to assist personnel in managing potential marine pest risks when these events occur.

#### **Recommendation 7**

The Australian Government should continue to manage marine pest entry pathways through import controls.

#### **Recommendation 8**

The Australian Government should develop guidance material to assist management of marine pest risks through pathways other than ballast water and biofouling.

## Chapter 5

# Eradication of marine pests

The focus of national marine pest biosecurity efforts on prevention measures will reduce but not stop marine pest incursions. The national biosecurity system will still need to respond to new pest incursions and minimise the impacts of pests already established in Australia. National eradication programmes are one method of managing the impacts from marine pests that become established.

National eradication attempts are often referred to as emergency responses. These responses encompass the planning and operational activities from the time the potential pest is detected until the pest has either been eradicated or a decision is taken that eradication is either no longer feasible or cost-effective.

National eradication programmes are considered and planned with the likelihood of success and the cost-benefit of a successful eradication as primary considerations. Eradication of a pest from the Australian environment avoids the need for ongoing management of the pest and prevents future social, environmental and economic impacts that may have occurred. However, eradication of established marine pests is only feasible and cost-effective in rare circumstances.

## 5.1 Current arrangements

As part of the national biosecurity system, Australia has a number of arrangements for detecting and responding to marine pest incursions. These response arrangements also seek to ensure Australia is prepared, should an incursion occur, to effectively mobilise and deploy the resources required for a response.

### 5.1.1 National agreements and decision-making bodies

#### National Environmental Biosecurity Response Agreement

The National Environmental Biosecurity Response Agreement (NEBRA) was developed under the IGAB to cover biosecurity incidents not included in pre-existing response deeds. It sets out national arrangements for responses to nationally significant biosecurity incidents that primarily impact the environment and/or social amenity. NEBRA does not cover incidents that are covered under existing deeds, such as the Emergency Animal Disease Response Agreement (EADRA) or Emergency Plant Pest Response Deed (EPPRD) and excludes weeds.

The Department of Agriculture and Water Resources is the lead agency responsible for the administration and application of the NEBRA at the Commonwealth level. The department is also the custodian of the NEBRA and is responsible for overseeing its implementation and coordinating cost-sharing arrangements for emergency responses. To date, there has not been a response to a marine pest incursion that has resulted in a full national response under NEBRA.

### **National Biosecurity Management Group**

The National Biosecurity Management Group (NBMG) is the peak decision-making body for national eradication programmes. It comprises senior officials from Australian, state and territory governments and industry partners (where applicable) and is chaired by the Department of Agriculture and Water Resources. The NBMG is constituted for each specific environmental biosecurity incursion. Under the NEBRA the NBMG decision-making process involves technical and operational advice from a consultative committee appointed by the Australian Chief Veterinary Officer. Based on the consultative committee's advice, the NBMG considers whether the marine pest is of national significance, is likely to be eradicable and whether a response should be subject to the cost sharing arrangements outlined in the NEBRA.

If during a national response the NBMG concludes that eradication is not feasible or cost beneficial, then the national response is stood down. The response may transition to management and control, implemented by the affected jurisdictions.

### **Consultative committee for marine pest emergencies**

The consultative committee appointed by the Australian Chief Veterinary Officer is the national consultative forum through which Australian governments with marine responsibilities participate in managing nationally significant marine pest emergencies. Depending on the nature of the marine pest emergency, the Australian Chief Veterinary Officer may include representatives from government and industry on the consultative committee. It is likely that the Consultative Committee for Introduced Marine Pest Emergencies (CCIMPE) would be appointed by the Australian Chief Veterinary Officer as the consultative committee for all marine pest emergencies.

A consultative committee is convened to confirm a marine pest emergency and provide advice to the NBMG on whether the emergency is of national significance, whether the pest is likely to be eradicable and whether it would be cost beneficial to mount a national incident response. If the consultative committee considers that the pest emergency meets those requirements, the NBMG will be convened to consider a national cost-shared response. The consultative committee will also advise the NBMG on the merit of actions in the response plan developed by the affected jurisdiction to eradicate the marine pest.

In addition to responsibilities under NEBRA, CCIMPE validates marine pest monitoring data resulting from approved monitoring designs under the National Monitoring Strategy, receives and distributes information on non-emergency detections of marine pests and provides advice to the MPSC as required.

## 5.1.2 Systems and infrastructure to support eradication

In addition to the arrangements under NEBRA, Australia has other resources in place to facilitate national marine pest responses.

### National Monitoring Strategy

One of the objectives of the National Monitoring Strategy is to provide early detection of marine pest incursions, to trigger and inform emergency response arrangements in the event of an incursion (chapter 6).

### CCIMPE Trigger List

The CCIMPE Trigger List is a list of exotic marine species that are of national concern (due to potential impacts on economic, environmental, public health or social amenity values) to Australia. The criteria used to develop the CCIMPE Trigger List are not consistent with the criteria for determining pests of national significance under the NEBRA. As a result, the CCIMPE Trigger List is no longer used to guide emergency response actions and a new national priority marine pest list is being developed by the Marine Pest Sectoral Committee.

### Emergency Marine Pest Plan

The Australian Emergency Marine Pest Plan (EMPPPlan) was developed in 2005 to describe the intended generic response to a marine pest emergency within Australia. The EMPPPlan Control Centres Management Manual outlines the phases of an emergency response to an introduced pest of national significance and the activities that should be undertaken by an affected jurisdiction. The MPSC has agreed to replace the EMPPPlan with a package of species-specific manuals that provide technical information about the pest, principles for its control and relevant control policies.

The Department of Agriculture and Water Resources, on behalf of the National Biosecurity Committee, is currently examining the management of established pests of significance in a broader context through the discussion paper, *Modernising Australia's approach to managing established pests and diseases of national significance* (Department of Agriculture 2015b).

### National Introduced Marine Pest Information System

The **National Introduced Marine Pest Information System** (NIMPIS) is a web-based information system. NIMPIS was originally developed by the CSIRO and established as a tool to provide Australia's marine pest managers with information to support management decisions in response to the detection of a marine pest.

The Department of Agriculture and Water Resources now hosts NIMPIS, and subject to available funds, manages the development and operation of NIMPIS on behalf of the MPSC, which has ultimate responsibility for the system.

NIMPIS contains biological, ecological and distribution information on approximately 110 marine pest species known to have been introduced to Australia or considered to be a risk of future introduction. Maps showing the potential range in Australia of approximately 30 species are also available.

## 5.2 Stakeholder concerns and views

### 5.2.1 Feasibility of eradication

Several submissions referred to the unlikely success of programmes that seek to eradicate a marine pest species once it has established. Underlying difficulties with eradication of pests in the marine environment were considered to be exacerbated by a lack of tools and technical knowledge to mount a cost-effective national eradication in Australia. The use of most chemicals in the marine environment to remove exotic marine pests was also suggested to have a deleterious effect on the natural marine environment.

There was wide consensus from stakeholders that Australia's ability to respond to new incursions was compromised by the lack of a functioning early detection system. The inconsistent implementation of the National Monitoring Strategy (chapter 6) across jurisdictions was considered a major contributor. However, stakeholders noted that even if the monitoring strategy was fully implemented the frequency of monitoring (every two years) is insufficient for an effective early warning system to support eradication. A number of stakeholders suggested that under the current system a detected species is likely to be well established and unable to be eradicated.

*Eradication or containment is considered more likely when a pest is detected within a year of the initial incursion.*

*Monitoring under the current arrangements is cost prohibitive and ineffective in providing an early detection tool – every two years doesn't work.*

**Melbourne workshops**

*We know that once an invasive marine species establishes a population it is extremely difficult to eradicate.*

**Australian Museum, Issues Paper submission 02**

*There are currently no effective national arrangements for, or successes in detecting, eradicating or containing invasive marine pests.*

**ES Link Services, Issues Paper submission 04**

*Like cane toads and rabbits, getting rid of marine pests is virtually impossible, although Australia has had some limited success in eradication.*

**OceanWatch Australia, Issues Paper submission 06**

Stakeholders sought improved early detection capability through an effective national early warning system that includes new technologies.

*The lack of any national mechanism to facilitate the early detection of new incursions compromises the ability for an effective response as new species are well established by the time of detection.*

**ES Link Services, Issues Paper submission 04**

*No national emergency detection system for marine pests in the NMN exists as by the time survey results could be carried out according to the National Monitoring Strategy (NMS) (2 years), pests could already be established without the possibility to mount an eradication attempt.*

**Australian Shipowners Association and Shipping Australia Ltd, Issues Paper submission 08**



*The lack of an effective early detection system nationally limits the ability of first responders to eradicate new species.*

**Government of South Australia, Issues paper submission 13**

*Technology and tools to respond to significant marine pest incursions is currently primitive. Eradication of marine pests can be achieved but is difficult and can be very costly. We need a much better understanding of when such eradication programs are both feasible and cost effective and how to manage such eradication programs through to effective completion. The handful of successful incursion responses to date have had significant costs (e.g. Black-striped mussel in Darwin harbour – Ferguson 2000; Northern Pacific Sea star in Tasmania – Aquenal 2008). Research is needed to develop these tools.*

**CSIRO, Issues Paper submission 20**

### **5.2.2 Effectiveness of NEBRA for national responses to marine pest incidents**

Some respondents considered that NEBRA arrangements do appear to be effective in managing responses to incursions of exotic marine pests to Australia.

Some stakeholders also expressed the need for greater clarity in application of NEBRA, which could result in confusion and delays to mobilising national responses. The areas mentioned included thresholds for significance and whether the definition of ‘established pest’ can be interpreted at a state or regional level. A range of stakeholders had concern with the application of NEBRA for managing significant range extensions of marine pests, and any related requirements on jurisdictions to report and contain those range extensions.

*Eradication: Relatively ineffective. Of those new species introductions that have taken place mentioned above, and domestic translocations for marine pest species already in Australia, eradication is generally abandoned as a technique and national funding under the NEBRA for emergencies has not been enacted for marine sectors.*

**Australian Shipowners Association and Shipping Australia Ltd, Issues Paper submission 08**

*There are no compliance or enforcement arrangements in place at the regional level due to a stated acceptance that once a pest species colonises a number of sites it is deemed to be ‘established’ in the State and no effort is expended in preventing further spread.*

**Natural Resources Kangaroo Island, Issues Paper submission 15**

*With the NEBRA in place, incursions that are significant range extensions are unlikely to be funded for response. Additionally there is limited or no work being undertaken to manage existing species, which needs to focus on local control, containment and applied research.*

**Government of South Australia, Issues Paper submission 13**

*The Invasive Species Council and the Australian Marine Conservation Society believe that there needs to be improved governance in managing marine pests. The fact that progress has been patchy and slow is a major indicator of the weakness of current arrangements under the National Biosecurity Committee. While cooperation between state/territory and federal governments can be difficult to achieve, increasing the level of priority should catalyse progress. The failure of marine monitoring network exemplifies the problem.*

**Invasive Species Council and Australian Marine Conservation Society,  
Discussion Paper submission 15**

As discussed in chapter 2, the roles and responsibilities of industry in marine pest biosecurity is a particular concern for a number of stakeholders. Ports Australia was one peak industry body which considered potential emergency responses activities (such as the quarantine of a port) as a major potential impact of marine pest incursions. Clarity around when, or if, biosecurity activities such as quarantining a port may be undertaken is not provided in any underpinning national agreement (or deed-like arrangement) between governments and industries.

*Incursion of a declared pest is a risk to business, as well as the environment of ports. It would limit the ability for vessels to move freely (thus limiting trade) and is likely to have impacts on local ecology.*

**Ports Australia, Issues Paper submission 11**

*Even when a pest is detected, there are sometimes significant delays in enforcing action, or allowing actions which have been proven to be ineffective such as in-water cleaning.*

**Ports Australia, Issues Paper submission 11**

### 5.2.3 Information on marine pests of concern is out of date

Stakeholders that commented on NIMPIS considered it to be useful but incomplete and becoming further outdated. Stakeholders proposed that NIMPIS needs to be kept current in order for it to remain useful and suggestions were made to establish links with other marine information systems such as Range Extension Database and Mapping project (Redmap) and the Atlas of Living Australia.

*NIMPIS is an excellent resource but needs updating, the rapid response tool manuals require updating but are not widely known about and vessel translocation data held by Lloyds is not readily accessible. Determining vector transport levels is difficult to ascertain.*

**Australian Shipowners Association and Shipping Australia Ltd, Issues Paper submission 08**

*The Australian Government should engage citizen scientists, recreational groups and established community groups (e.g. Reef Watch and Redmap) in passive surveillance and set-up arrangements for analysis / processing of data.*

**Workshop discussions**

*The Australian Government could coordinate the development of a standardised, national approach for surveillance, develop national branding and tie in with existing data efforts through museums and the taxonomic network.*

**Workshop discussions**

*Taxonomists are retiring and not being replaced – the data that is gathered by museums may be underutilised (e.g. Atlas of Living Australia). There's an opportunity to increase data sharing.*

**Workshop discussions**

The department heard that uncertainty regarding the current status and use of pest of concern lists is problematic and confusing for both jurisdictions and industry; a number of older lists are still circulating. A national list would provide greater clarity and jurisdictions could then choose to make specific additions for local considerations. There was also a call for greater utilisation of taxonomic expertise when developing such lists. The MPSC is currently developing a national priority marine pest list, which is outside the scope of this review.

## 5.2.4 Communication of marine pest detections

Some submissions sought clarity about the process for reporting detections, in particular who reports should be made to and what information is required. This theme was repeated in stakeholder workshops. Stakeholders who commented on CCIMPE considered its processes to be effective, but suggested CCIMPE deliberations could be more open. A number of stakeholders sought greater communication of committee and jurisdiction responses to reported detections, including response actions taken, the success of the activities and who paid for them.

*The secrecy attached to deliberations of CCIMPE on detections is also counter-productive in not creating awareness of possible incursions within the “educated” community. A significant example is the detection of *Didemnum perlucidum* in Twofold Bay in 2010 which was not widely communicated or unknown when the species was later found in WA.*

**ES Link Services, Issues Paper submission 08**

*Improve marine pest governance arrangements by improving transparency in decision-making, involving the community sector, undertaking broad public education and creating a collaborative institution tasked with marine pest preparedness and prevention.*

**Invasive Species Council and Australian Marine Conservation Society,  
Discussion Paper submission 15**

*The Committee considers information about the following should be more widely available: What is the process if an unwanted pest is discovered? Who is involved. How this would be communicated to industry.*

**Oyster Committee, NSW Farmers Association Issues Paper submission 05**

## 5.3 Consideration

### 5.3.1 Should eradication be an aim of national marine pest biosecurity

The difficulty of eradication in the marine environment and the low probability of success lead to questions of whether investment of resources in national marine pest preparedness and response is valuable, and whether eradication is a worthwhile aim of national marine pest biosecurity. Removing eradication as a management option for national marine pest biosecurity may provide some benefit to the overall effectiveness of the system. This may force the system to focus on prevention, to develop effective containment plans and remove the need to address confusion among stakeholders about national emergency response arrangements and responsibilities.

Despite the eradication of an established marine pest only being likely in rare circumstances, eradication in those circumstances is an important option for national marine pest biosecurity. The response to the 1999 detection of the black-striped mussel (*Mytilopsis sallei*) in Darwin marinas is an example where eradication was a viable and successful management option. Arthur, Summerson & Mazur (2015) described the eradication of marine pests as extremely challenging because of difficulties in their detection and applying eradication methods in the marine environment. Successful eradication would almost certainly require very early detection of an incursion before the marine pest covers an area that is too large to contemplate eradication (perhaps as little as 1 hectare) (Arthur, Summerson & Mazur 2015).

Consideration of whether to attempt to eradicate a detected marine pest is largely separate from consideration of whether national marine pest biosecurity should invest in early warning to support the likelihood of successful eradication. The decision to attempt eradication will remain, regardless of how a marine pest is detected or the level of investment towards an early warning system (chapter 6).

Early detection of marine pests is vital to increasing the likelihood of successful eradication attempts. Therefore, consideration is required as to whether to invest in an early warning system to improve the likelihood of eradication being successful (Arthur, Summerson & Mazur 2015). Potential aspects of an early warning system were considered in Arthur et al. (2015) and are also addressed in chapter 6 of this report. The value of any early warning system is an important consideration. Arthur et al. (2015) noted that it is unclear whether any amount of money towards monitoring and surveillance would lead to successful eradications.

Investment in national active surveillance programmes through the NMS to support eradication attempts does not currently represent an effective use of national biosecurity resources (chapter 6). Passive surveillance methods using a wider range of stakeholders could provide more cost-effective support for early detection and eradication, and the development of new technologies may improve the cost-effectiveness of national surveillance programmes that aim to support eradication (chapter 6).

Eradication should remain an option for national marine pest biosecurity managers and current national emergency response arrangements need to be tested to improve the collective understanding of their appropriateness. The Australian Government should support activities that increase the understanding of incursion scenarios that are likely to result in a national response under NEBRA.

### 5.3.2 Application and implementation of NEBRA

The NBC is currently developing interpretive guides for NEBRA and recently endorsed principles for the interpretation of 'national significance' and 'national interest'. This will help all relevant parties have a clearer understanding of the application of NEBRA provisions and the decision-making processes that lead to a national response for a marine pest incursion.

Current understanding of feasibility of marine pest incursions and the lack of data currently being collected through the national marine pest biosecurity system does not support rapid decision-making to initiate national eradication responses:

- There is a lack of readily accessible up-to-date information on the presence and absence, and range of marine pests, which complicates assessment of feasibility. To remain an effective national preparedness tool, NIMPIS needs to develop the capability to dynamically source and compile the latest research, intelligence and surveillance information. It also needs to be able to use contemporary technologies to make that information readily available to users. These functions are considered further in chapter 6.
- Consideration of whether a pest is likely to be re-introduced after eradication is complicated by a lack of understanding of the range of established marine pests and the need for greater understanding of the effectiveness of our prevention systems.
- Development of cost-benefit analyses requires expert assessment of the likely impacts of a marine pest. Summerson et al. (2013) conducted a cost-benefit-analysis of response options to an incursion of black-striped mussel into Australia. However, as discussed in chapter 1, and highlighted in Arthur, Summerson and Mazur (2015), there are few studies on the environmental impacts of marine pests in Australia to support those assessments.
- Understanding of the feasibility of successful eradications is improved with the experience gained from eradication attempts and response exercises; however, there have not been any full eradication attempts under NEBRA and no national marine pest emergency response exercises.
- Funding to continue a national eradication programme in response to marine pest incursions is likely to be beyond the financial delegation of the NBMG and will require ministerial approval. The cost estimations for successful eradication from Crombie, Knight and Barry (2008) and Summerson et al. (2013) suggest that \$5 million is unlikely to be sufficient to eradicate a marine pest in most incursion scenarios considered. Under NEBRA the NBMG is required to seek ministerial approvals to commit any funds over \$5 million (total aggregate) per year towards national emergency responses.

Through the Marine Pest Sectoral Committee the Australian Government should conduct scenario testing of 'Part V: National Approach' of NEBRA to clarify the application of NEBRA to marine pest incursions. An aim of scenario testing should be to enable all relevant parties to hear and discuss the considerations and deliberations of jurisdictions, consultative committees and the NBMG in the decision-making process that leads to a national marine pest incursion response. Outputs from scenario testing could be:

- greater understanding of the detail of information, and certainty, required for a NEBRA response to marine pest incursions
- greater understanding of the likelihood of any marine pest incursion resulting in a national response under NEBRA, informing whether the agreement requires alteration and whether eradication should continue to be an aim of national marine pest biosecurity
- development of a marine pest specific interpretive guide for NEBRA
- development of appropriate scenarios for NEBRA response exercises.

A NEBRA emergency response exercise should be conducted to test NEBRA's effectiveness as a response arrangement for marine pest incursions and stakeholder preparedness for a national response, including implementation and coordination of cost-sharing arrangements.

### 5.3.3 Involvement of stakeholders in national responses

The role of industry and other non-government stakeholders in national emergency responses is underpinned by national biosecurity principles outlined in government-to-government agreements such as the IGAB and NEBRA. However, industry's role is not formalised through a government-industry agreement.

NEBRA does provide for contributions to the response being sought from private beneficiaries on case-by-case basis. However, the complexities of identifying practical, equitable, non-distortionary and efficient payment mechanisms creates uncertainty as to whether this provision would be able to be applied in the marine pest sector.

Emergency response exercises may also identify the need for greater industry involvement, in particular by ports, in emergency response decisions and arrangements. The potential for an emergency response to require the quarantine of ports needs greater consideration. There is potential for significant costs to port operations resulting from the flow-on effects of port quarantines, particularly where stockpiling capacity is limited and mineral resources and petroleum activities rely on near-continuous port operations.

Determining whether all relevant parties understand the potential costs of port quarantines, and who will bear those costs, is an example of an area where closer collaboration is required between regulators and industry. There may be an opportunity for ports and regulators to work together to reduce port insurance premiums by demonstrating ports' involvement in marine pest prevention and monitoring activities towards reducing marine pest biosecurity risks. However, discussion with port authorities suggests uncertainty as to whether insurance cover is currently provided for quarantine of a port following marine pest detections.

Without a deed-like arrangement between governments and industry for emergency response, arrangements in the marine pest sector are less certain than in its plant and animal biosecurity counterparts. Emergency response exercises will also clarify whether an emergency response deed is required and whether such an arrangement could operate in the marine pest environment. Industries may seek emergency response deeds to provide greater certainty for emergency response arrangements. This may also enable insurance coverage required by ports to be more specific and focused, leading to reduced premiums.

### **Recommendation 9**

Marine pest emergency response activities should continue to be implemented under the Intergovernmental Agreement on Biosecurity and the National Environmental Biosecurity Response Agreement.

### **Recommendation 10**

The Australian Government should support a national marine pest emergency response exercise.

## Chapter 6

# Supporting arrangements

A biosecurity system that makes decisions based on science must have clear mechanisms to collect, receive and use scientific information from all relevant sources. An ideal arrangement should have input, cooperation and support from a wide range of stakeholders including government, industry and the community.

Australia's national marine pest biosecurity arrangements need the support of a two-way link between science and policy. A formal mechanism is required to ensure marine pest policy decisions are informed by science, and resources invested in marine pest biosecurity research, development and scientific analysis are used effectively.

The National System outlines four supporting arrangements that are currently coordinated by the Marine Pest Sectoral Committee: monitoring; research and development; communication; evaluation and review. Stakeholders identified deficiencies with each of these arrangements. They also sought greater Australian Government facilitation of more collaborative arrangements between stakeholders that will continuously improve national marine pest biosecurity.

## 6.1 Current arrangements

### 6.1.1 Monitoring

National monitoring for the management of marine pest risks is detailed in the National Monitoring Strategy (NMS), which was established under the National System and agreed by the Natural Resource Management Ministerial Council in 2006.

The NMS is a programme of active surveillance designed to detect high risk species at priority locations around Australia. The intent of the strategy is that 18 prioritised locations be monitored for a target list of 55 species every two years, with other locations also monitored regularly.

The NMS is described in detail in the Australian marine pest monitoring guidelines (National System for the Prevention and Management of Marine Pest Incursions 2010a) and the Australian marine pest monitoring manual (National System for the Prevention and Management of Marine Pest Incursions 2010b).



Information from undertaking surveillance activities in accordance with the NMS is intended to guide marine pest management actions that:

- trigger and inform emergency response arrangements
- make decisions on the ongoing management and control of established marine pest populations, including informing National System risk assessments
- review and improve other measures that form part of the National System
- inform broader policy decisions.

Australia's policy approach to monitoring for marine pests, the rationale for data collection, governance arrangements and how the data collected will be used to inform decision-making are outlined in the Australian marine pest monitoring guidelines.

The Australian marine pest monitoring manual is a 'how to guide' for monitoring in the context of the National System. It describes the procedures to be used in designing and implementing a monitoring programme to meet agreed minimum quality standards. The manual is supported by a monitoring design package which includes design templates, user guides and tools to assist survey designers meet the quality standards.

Under the NMS, 18 locations across Australia (at least one in each jurisdiction) are identified as the minimum sites for ongoing monitoring. The sites were determined based on the risk of introduction of new pests to these locations and the risk of translocation of pests from these locations to other ports in Australia. Under the NMS, these locations are collectively known as the National Monitoring Network (NMN).

The monitoring target species list contains 55 species that were agreed by NIMCPG in 2006 as presenting a high risk to Australia as a whole, based on their significance and ability to establish and spread. Monitoring designs for a particular location include the species most likely to be introduced and become established at that location, based on temperature and salinity tolerances.

Under the NMS, the Australian Government provides an overarching coordination role and the jurisdictions are responsible for implementing monitoring programmes within their jurisdiction in accordance with the requirements outlined in the manual. The Australian Government, through the Department of Agriculture and Water Resources, provides a central point for information about national monitoring arrangements and collates, coordinates and reports on monitoring outcomes. It also:

- chairs and provides the secretariat for the Monitoring Design Assessment Panel (MDAP), which, with jurisdictional representatives, assesses monitoring designs and implementation plans
- administers the centralised monitoring results database and public interface (NIMPIS)
- participates through CCIMPE in the assessment of results from MDAP approved monitoring.

### 6.1.2 Research and development

The MPSC released the *National priorities for introduced marine pest research and development 2013–2023* under the National System banner. The document articulates priorities for marine pest research to provide direction for stakeholder investment in research and development.

A National Marine Pest Research Network, championed by the WA Department of Fisheries, was established in 2014–15. The network seeks to establish a more coordinated approach to marine pest research across Australia by utilising the skills and experiences of a national network of active marine biosecurity researchers. The National Marine Pest Research Network is external to the national biosecurity governance structure under the NBC.

### 6.1.3 Communications and engagement

The current framework for national communication and engagement is governed by the NBC through its oversight of IGAB implementation. IGAB Schedule 6 outlines policy directions and priority reform areas for biosecurity and communication and, through the NBC, the National Biosecurity Engagement and Communication Framework has been released. This framework is designed to improve cooperation between the IGAB parties to increase stakeholder awareness and enhance the effectiveness of biosecurity activities.

A number of tools and resources have been produced under the National System banner to enhance communication and engagement with marine pest biosecurity stakeholders:

- a suite of national biofouling management guidelines (section 4.2)
- marine pest identification guide
- [marine pest website](#)
- National Introduced Marine Pest Information System (NIMPIS).

Formal cross-jurisdiction communication on marine pest policy development and implementation occurs through MPSC processes. Industry is not formally represented at the MPSC; however, an industry consultation forum is held before each MPSC meeting. These sessions are designed provide industry partners an appropriate opportunity to raise issues of concern, gather industry feedback to inform MPSC decisions and to build relationships between jurisdictional and industry representatives (chapter 2). The MPSC also releases a bi-annual communiqué to communicate between the committee and stakeholders.

Communications related to emergency response activities occur primarily through CCIMPE process, with the MPSC receiving post-activity reports from jurisdictions and the CCIMPE secretariat (chapter 5). A dedicated [website](#) provides information on broader national pest and disease outbreaks, including current responses and links to further information on marine pests within the [marine pest website](#). NIMPIS also provides general information in addition to its function as an emergency response tool (chapter 5).

## 6.1.4 Evaluation and review

The National System was established with a supporting element of evaluation and review to provide a mechanism for continuous improvement of the system. The National System has not been formally evaluated or reviewed since its inception.

## 6.2 Stakeholder concerns and views

### 6.2.1 The National Monitoring Strategy is not effective

The department received many comments on the NMS; the majority identified issues with the NMS and suggested it was not effective.

The department engaged ABARES to undertake an independent analysis of the NMS (Arthur et al. 2015). The Arthur et al. (2015) study involved targeted stakeholder consultation conducted separately to this broader review. Stakeholders' comments in submissions, workshops and discussions for this review closely reflect those reported by Arthur et al. (2015). The major concerns were:

- the objectives for national monitoring and surveillance activities under the NMS are not clear, which is a deterrent to funding
- implementation of the NMS involves a significant cost, which is a further deterrent to funding and a major impediment to its implementation
- how information from NMS activities is used and who is responsible for those activities and who benefits is unclear
- sustainable funding is needed to undertake regular monitoring, and to maintain the skills base required for effective marine pest monitoring and surveillance.

*The current national monitoring system, which is based on a limited set of international shipping locations, will not achieve both routine ballast water risk management and early detection of incursions of new species. For the latter, the methodology of the current National Monitoring Strategy is too infrequent and spatially limited to be effective at detecting new incursions when they are feasible to eradicate.*

#### **Government of South Australia, Discussion Paper submission 16**

*There has been recent policy development in marine pest monitoring. This includes The National Marine Pest Monitoring Strategy, a National Monitoring Network Cost Sharing arrangement, the Australian marine pest monitoring manual and the Australian marine pest monitoring guidelines. Despite these policies, the goals of the national monitoring network are unclear and the network is not in effective operation.*

#### **Invasive Species Council and Australian Marine Conservation Society Discussion Paper submission 15**

Submissions identified monitoring as important to marine pest biosecurity. However, there were comments critical of the NMS being largely unimplemented and therefore ineffective. Ports Australia's submission on the issues paper questioned the focus of National System expenditure on monitoring programmes, given that they do not reduce the risk of an incursion and that eradication post-incursion is practically impossible.

The main reasons given for lack of implementation was the inability of jurisdictions to resource the programme; the cost of completing a survey according to the Australian marine pest monitoring guidelines being the key obstacle of the NMS. Jurisdictions that have undertaken monitoring to NMS standards signalled that they may be unable to continue to fund those activities.

Incomplete implementation of the NMS led some stakeholders to further question the value of the NMS and the value of continuing NMS monitoring at previously monitored locations. The incomplete implementation was identified as preventing stakeholders, even those that have undertaken NMS monitoring, from receiving potential benefits of collecting nationally consistent information on the locations of marine pests.

The shipping industry raised concern that there is a lack of data to enable exemptions to be granted from domestic ballast water management requirements under the *Biosecurity Act 2015* (section 4.3). Other stakeholders identified this as one of the effects of the NMS implementation not collecting nationally consistent information on the locations of marine pests.

The commercial fishing industry raised concern with the lack of knowledge of what exotic species are currently in marine environments, particularly where fishing industry operations and ports are closely located.

Stakeholders proposed to address some of these deficiencies by revising national marine pest monitoring and surveillance strategy to:

- clearly define the purpose and objectives of national monitoring and surveillance
- incorporate newer, more cost-effective technologies including those that enable early detection of pests
- accept a wider range of monitoring data to support determination of pest presence and absence status
- incorporate information gained from citizen science activities and promote those activities
- consider diver safety in monitoring and surveillance design and where possible incorporate diver-less methods
- involve taxonomists in the design of monitoring programmes
- revise the list of species for national monitoring and surveillance.

The NMS does provide benefits to industry that are outside the stated objectives of the NMS. Arthur et al. (2015) noted that private organisations that conduct marine pest monitoring frequently considered having a nationally endorsed target list, methods and manual are helpful for their business, helping them achieve confidence and consistency in their work.

## 6.2.2 Objectives for national monitoring and surveillance

While many stakeholders consider monitoring and surveillance important, the purpose of a national monitoring programme is not clearly established or articulated to them. The lack of clarity around the purpose of the NMS and concern around whether the NMS could ever achieve its stated objectives was identified as a disincentive to fund or carry out monitoring.

Potential objectives for national monitoring and surveillance were raised in stakeholders' submissions and discussed in the consultation workshops. The potential objectives for national monitoring and surveillance are summarised in Arthur et al. (2015) as being to:

- detect marine pest incursions as soon as possible to:
  - improve the likelihood of successful eradication
  - improve the likelihood of slowing spread to other domestic ports
  - allow time to prepare to deal with impacts of a new pest
- support a domestic ballast water management system aimed at reducing the risk of spread of marine pests between ports within Australia
- monitor changes to the marine environment including the presence of marine pests
- determine how well prevention measures are working
- measure the biodiversity outcomes of new port developments or significant changes in port activity.

Detecting marine pests as soon as possible through an early warning system was identified as an important objective in stakeholders' submissions and in many of the workshops. Improving the likelihood of successful eradication was often suggested as the primary purpose of a national early warning system. However, some workshop discussions questioned why national monitoring should seek to support early detection and eradication, given the frequency and cost of monitoring to achieve early detection and the general consensus that eradication of a marine pest once detected is very unlikely.

There was an almost unanimous view that the NMS is ineffective as an early warning system. Some stakeholders also noted that Western Australia and the Northern Territory have adopted their own monitoring systems, outside the NMS, that provide some early warning using primarily settlement plate arrays. DNA probes were also supported by many stakeholders as a potential cost-effective method that could provide some early warning.

*One of the key aims of a monitoring programme is early detection of pest introductions because eradication depends on early detection.*

**Australian Marine Sciences Association Discussion Paper submission 09**

*Monitoring would need to be at a frequency that allows early detection to inform ballast water guidelines as well as eradication if feasible.*

**Tasmania Department of Primary Industries, Parks, Water and Environment  
Issues Paper submission 12**

*Early detection of range extension of established marine pests and new introductions so that assessment of likely impact and appropriate management activities.*

**Maritime Industry Australia Limited Discussion Paper submission 05**

*...to help detect new bioinvasions at an early enough stage during the introduction-establishment process (i.e. before the chances for affordable eradication or control get diminished by population expansion or spread).*

**Intermarine Consulting Pty Ltd Discussion Paper submission 10**

Benefits of early warning to improve the likelihood of slowing the spread of a marine pest to other domestic ports can be similar to benefits of prevention measures. Early warning to support slowing the spread of marine pests was identified in consultations with stakeholders as valuable if information from early warning detections is utilised. There must be a clear understanding of what measures could be adopted to slow the spread of detected marine pests. The primary benefit was identified as delaying the time when impacts of the pest are experienced and managed as a widespread pest. An example provided for fouling organisms was coordinated education and awareness raising activities targeted at recreational vessel users and their activities that may spread a detected marine pest.

Stakeholders also identified potential benefits to some industries, in particular aquaculture, for early warning of marine pest incursions to allow time to prepare and deal with impacts. This may provide industries with more time to prepare for management of marine pests and develop technologies or management approaches to reduce the potential consequences.

Monitoring to inform domestic ballast water management requirements was supported in many submissions and workshops. The benefit of these activities was primarily identified as updating the BWRA and facilitating the reduction of compliance costs for vessel operators (section 4.3). However, Maritime Industry Australia Limited's discussion paper submission considered this monitoring may only be relevant before the BWM Convention comes into force.

*Again, this issue is only an issue for the period between implementation of the Biosecurity Bill 2014 and the Ballast Water Convention. Keeping in mind we will be moving from no ballast water management to full ballast water management, in our view there is no justification for the cost associated with the implementation of a monitoring programme for this intervening period.*

**Maritime Industry Australia Limited Discussion Paper submission 05**

A concern raised during some consultations is the potential for inequitable application of cost recovery mechanisms to resource national monitoring activities, particularly where monitoring activities have multiple objectives, which may lead to cross-subsidisation by ports or the shipping industry. Monitoring or surveillance targeted to domestic ballast water management purposes may have a clearer cost recovery model. However, Arthur et al. (2015) noted that previous experience of maritime industries in funding baseline monitoring suggests the need for strong reassurance that monitoring systems will be fully implemented and benefits to industry are clear.

Many submissions recognised a need for monitoring activities to support understanding of the effectiveness of national marine pest biosecurity prevention measures. However, the effectiveness of environmental surveillance, particularly under the NMS, to inform assessment of prevention measures was questioned in workshop discussions. Some stakeholders sought the establishment of a marine pest baseline to enable a reference point for future monitoring activities, which would aid analysis of the effectiveness of marine pest management measures.

*The aim of monitoring should be both as an information gathering exercise to establish any trends in colonisation, for reporting functions of government to inform new marine development proposals and an emergency response alert network.*

**Aquatic Biosecurity Discussion Paper submission 12**

*Monitoring should be achieved nationally once every 10 - 15 years for all species in the National Monitoring Manual and Guidelines and for all 18 NMN locations but regularly for a suite of species Nationally using inexpensive plankton tows and DNA identification techniques.*

**Aquatic Biosecurity Discussion Paper submission 12**

*National data should be focussed on the data showing the presence and absence of marine pests and vessel logistics for decision making by states and the Northern Territory.*

**Aquatic Biosecurity Discussion Paper submission 12**

*...to determine the effectiveness of existing and future BWM & BFM effort (requires monitoring for the unwanted spread of the targeted pests that are already present in one Australian port or region).*

**Intermarine Consulting Pty Ltd Discussion Paper submission 10**

A number of proposals were suggested to achieve national monitoring objectives, with most of these attributable to the desire for more cost-effective monitoring. The proposals include:

- incorporate newer, more cost-effective technologies, including those that enable early detection of pests
- incorporate information gained from citizen science activities and promote those activities, including existing programmes such as Fishwatch, Reef Watch and Redmap with commercial and recreational divers and the fishing industry
- involve taxonomists in the design of monitoring programmes
- reduce the number of species targeted for monitoring
- adopt different methods or systems to achieve different monitoring and surveillance objectives
- utilise information collected by stakeholders for various other purposes
- coordinate monitoring through a single agency on behalf of jurisdictions
- develop cost recovery models
- develop the experience of field staff to improve the likelihood of invasive species being detected.

*Monitoring to a lengthy target list of supposed species of concern that are not yet established in Australia, but are unlikely to arrive, adds to the resource burden and achieves little.*

**ES Link Services Discussion Paper submission 08**

*More cost-effective monitoring can be promoted by:*

- Improving the marine taxonomy, duration and gene-sequencing abilities at Australian museums and associated institutions/collectives;*
- Developing smarter marine pest DNA/RNA ‘sniffing’ methods, covering as many targeted pests as possible;*
- Reviewing and testing the ‘multi’ settlement-collector designs, deployment and positioning methods, with the aim of achieving better designs, monitoring locations and seasonal timings, for more reliably detecting the presence of targeted marine pest species.*
- Ensuring adequate community marine pest information and outreach to commercial and recreational fishing, aquaculture and diving operators, clubs and associated groups (i.e. the people most likely to come across marine pests during the course of their work or favoured leisure activities).*

**Intermarine Consulting Pty Ltd Discussion Paper submission 10**

*Education, awareness and the ability to detect invasive marine species by the “educated eyes” of the community has also led to detections of incursions at a stage where eradication and containment may be possible.*

**ES Link Services Discussion Paper submission 08**

### **6.2.3 Research and development is not coordinated or funded**

Many submissions raised concerns with the lack of dedicated funding streams for, and coordination of, marine pest research and development. Some stakeholders stated that this has resulted in disjointed research efforts and funding provided to projects that lack national and strategic focus.

*The current national approach to research and development related to invasive marine species appears fragmentary, ad hoc, and with no clear scientific justification for the assignment of projects.*

**ES Link Services Issues Paper submission 04**

Several submissions also discussed the lack of data underpinning the National System, including quantification of risk pathways, knowledge of existing species in high risk areas, knowledge of contemporary management options for marine pests and lack of monitoring data.

Stakeholders that commented on the *National priorities for introduced marine pest research and development 2013–2023* noted that it is not accompanied by a strategy for obtaining funding to undertake the research and development priorities. This concern was closely related to comments on the general lack of funding, particularly ongoing, currently available for marine pest biosecurity research. The South Australian Government noted in its issues paper submission that some research and development funding options, such as Fisheries Research and Development Corporation and Caring for Our Country, have excluded the marine pest sector from their scope.



*The Australian Priorities for Marine Pest Research and Development document has been finalised but there is currently no implementation strategy to get the projects started as the funding issues for the marine pest sector have not been determined.*

**Australian Shipowners Association and Shipping Australia Limited  
Issues Paper submission 08**

*We support the stakeholder view that areas of marine pest biosecurity which should be consistently resourced include research and development including long term monitoring, on-going management activities and public education.*

**Australian Marine Science Association Discussion Paper submission 09**

*The Caring for our Country (CFOC) programme specifically excluded regional marine biosecurity activities, which was a serious flaw given the lack of alternative funding sources and the critical need for community engagement for an effective biosecurity defence strategy.*

**Natural Resources Kangaroo Island, Issues Paper submission 15**

The lack of coordination of research and development was identified by stakeholders as a symptom of a system which does not place enough value on the collective skills and resources of scientists and the benefits that could be realised by harnessing their coordinated efforts. The Australian Marine Pest Research Network, championed by the WA Department of Fisheries, was supported by stakeholders and identified as a positive development towards coordination of marine science expertise that should be supported by the Australian Government.

*NSW recently met with WA Fisheries and recommends the further development, including Commonwealth support (as appropriate), of the WA proposed National Marine Pest Research Network.'*

**NSW Trade and Investment Issues Paper submission 22**

*Significant expertise related to all aspects of marine biosecurity science and management exists nationally but is widely dispersed through multiple agencies and institutions. This current ad hoc arrangement could substantially benefit from an overarching body of experts representing these skills as the coordinated sum of these skills is significant.*

**Australian Museum Discussion Paper submission 06**

As discussed in chapter 2, stakeholders suggested that the Australian Government needs to improve its leadership and coordination role. Three areas identified within the research and development space were:

- national coordination of marine biosecurity research to help ensure marine pest biosecurity and associated research is maintained as a priority, is supplementary and complementary and avoids duplication
- ensuring research funding can be obtained from national funding bodies (such as Fisheries Research and Development Corporation and Australian Research Councils)
- use of environmental and political scanning at an international level to identify global opportunities for knowledge and awareness raising, and communicating these to all jurisdictions and stakeholders.

## 6.2.4 Engagement with stakeholders and investment in communication activities has reduced

Submissions from government, industry and community sectors sought improvement to engagement and communication in national marine pest biosecurity arrangements. Stakeholders sought the implementation of the shared responsibility principle and improved mechanisms to enable stakeholder collaboration and involvement (chapter 2).

The department received proposals from governments and industry stakeholders about working with industry to achieve better biosecurity outcomes. These involved generic changes to the Australian Government's approach to interactions with industry and more specific suggestions for changes, including:

- adopting a collaborative and collegiate approach; seeking to be more inclusive rather than exclusive
- employing a partnership approach to addressing marine pest biosecurity issues that relate to industry
- recognising and utilising the value of peak industry bodies beyond collectors of opinions and information for governments
- improving partnerships and engagement of national peak industry bodies
- improving the speed of communication from national governance committees on items of interest to industry
- including industry on the MPSC (chapter 2).

Comments about engagement with industry often focused on governance arrangements and the operation of the MPSC. Industry not being present when decisions are made that affect them is sustaining a perception that they are no longer true partners in managing national marine pest biosecurity risks (chapter 2). Consultation through the MPSC's industry consultation workshop was viewed as a forum for information exchange rather than a workshop for collaborative resolution of national issues. This is despite stakeholders from both government and industry sectors seeking more significant national engagement.

Stakeholders raised the need for ongoing funding to enable effective communications with the community to increase engagement and collaboration, to promote the importance of marine pest biosecurity, increase understanding of these issues and commitment to the appropriate biosecurity management of Australia's marine resources.

Some aspects of national marine pest biosecurity were identified as being particularly affected by the low level of ongoing resourcing for national engagement and communications activity:

- a lack of focus on regional marine pest biosecurity priorities and measures, in part because of a lack of engagement with coastal natural resources management regions in developing and implementing national strategies
- some higher risk sectors, including the recreational boating sector, are not being engaged
- sector-specific communication frameworks developed to guide the messaging and delivery of awareness and education campaigns to industry and community groups by jurisdictions are being underutilised

- momentum built by successful communication projects in the commercial fishing industry and in the recreational boating sector has lapsed because of a lack of ongoing resourcing
- communication to industry is becoming increasingly reliant on peak industry bodies.

Several stakeholders proposed that information needs to be more readily available on:

- sharing of information on marine pests, including what pests have been found and where
- improving explanations of the rationale and risk implications of the addition or removal of pests from various lists
- how to report detections of marine pests, the process when a new pest is discovered and how this is communicated to industry and the community
- environment and political scanning of marine pest issues to facilitate greater public discussion and awareness on marine pest biosecurity, through leadership by the Australia Government and communication of those issues to jurisdictions.

### 6.3 Consideration

The Australian Government should increase its role in coordinating and facilitating research and development, monitoring, and communication and engagement in national marine pest biosecurity.

This coordination should commence with the development of a marine pest network to establish a framework for increased collaboration between governments, industry and the community, in particular the scientific community.

Current national monitoring arrangements need to be significantly revised. Monitoring is vital to effective marine pest biosecurity, but the reasons for some current monitoring objectives are unclear. The current monitoring is expensive, difficult and potentially dangerous. The primary aim of future national monitoring activities needs to be achieving objectives that are justified and agreed by stakeholders using the most cost-effective techniques and methods. The marine pest network should have an important role in the future effectiveness of these activities.

Monitoring and research and development rely on Australia's scientific community. These two aspects are closely related and integral to continuously improving marine pest biosecurity. However, many stakeholders indicated Australia's marine pest biosecurity research and development is under-resourced, underfunded and not coordinated. The Marine Pest Network should be established to help ensure Australia's internationally respected scientific community becomes more closely involved in national marine pest biosecurity strategy and policy development. The network will also help ensure that national marine pest biosecurity activities involve less ad hoc engagement of scientific expertise, and more strategic collaborative research and development targeted at improving national marine pest biosecurity.

### 6.3.1 The National Monitoring Strategy

The NMS should not be progressed and new objectives for national monitoring and surveillance developed with stakeholders. The NMS has not met its objectives, despite monitoring having been conducted according to NMS standards in some National Monitoring Network (NMN) locations. Continued funding from ports and jurisdictions for implementation of the NMS at NMN locations is unlikely, particularly not at the level required for full implementation of the NMS. The cost and lack of clarity of objectives, purpose and benefits from undertaking monitoring and surveillance effectively prevents the NMS, and therefore the National System, from being fully implemented.

Stakeholders' comments on the NMS deficiencies are largely supported by the ABARES report. Arthur et al. (2015) provided a number of reasons why the NMS is not effective, including:

- The NMS has not been fully implemented. Despite agreement by the Natural Resource Management Ministerial Council to the NMS in 2006, there has been uneven implementation of monitoring programmes to approved national standards across jurisdictions. Only five of the 18 priority ports have been monitored at least once, including ports in the Northern Territory, Western Australia and South Australia. No NMN ports on the Australian eastern seaboard have been monitored. However, two non-NMN ports in Queensland have been monitored since 2008 (Arthur et al. 2015).
- Cost of implementing the NMS is too high and allocations of funding to do so are likely to be reduced. Implementation of monitoring at the priority national monitoring locations reportedly cost between \$175 000 and \$355 000 (CSIRO, cited in Arthur et al. 2015).
- The NMS is designed as one system to meet a range of needs but has not effectively achieved any of them. Multiple objectives of national monitoring and surveillance cannot be cost-effectively achieved with one set of methods and survey design.
- The NMS does not provide a clear link between monitoring and surveillance and the benefit and actions resulting from undertaking those activities.
- The objectives are not clearly defined and understood by all stakeholders; monitoring is therefore conducted without a clear understanding of the potential beneficiaries.
- The NMS does not achieve comparability between ports.
- There is no overarching document that outlines the elements of the NMS.

A national monitoring and surveillance strategy will be a vital element of the national marine pest biosecurity strategy being developed by the MPSC, which the department recommends should replace the National System (chapter 2). A national monitoring and surveillance strategy should be developed as part of the broader national marine pest biosecurity strategy being developed by the MPSC. The NMS should be set aside in a similar manner to the replacement of the National System with a national marine pest biosecurity strategy (chapter 2).

Setting aside the NMS will require revision of the responsibilities of existing committees, panels and groups with roles under the NMS and National System for monitoring and surveillance. However, this will need to be determined with input from appropriate stakeholders, and the National Biosecurity Committee will need to approve any amendments to responsibilities of governance committees. The national monitoring and surveillance strategy (as a component of the national marine pest biosecurity strategy) should provide the overarching document that outlines new objectives, new arrangements and revised responsibilities for monitoring and surveillance activities. The national monitoring and surveillance strategy should also align with the National Framework for Surveillance and Diagnostics under the Intergovernmental Agreement on Biosecurity.

### Develop new objectives for national monitoring and surveillance

Clear objectives of future national monitoring and surveillance activities need to be determined with all stakeholders in order for it to be cost-effective, resourced and implemented by those stakeholders.

There are multiple potential objectives of national monitoring and surveillance, but the purpose of each agreed objective needs to be clearly articulated and understood. A clear link between any monitoring and surveillance towards the objective and the benefits and actions arising from them is needed. If benefits and actions cannot be identified the objective should be questioned.

The identification of agreed objectives and benefits, will inform appropriate design and identification of target locations, to cost effectively achieve those objectives. Arthur, Summerson & Mazur (2015) suggest that the prioritisation method used to determine the 18 priority NMN locations for the NMS provides a valuable tool, but may need to more explicitly consider the benefits of surveillance. The NMN locations are unlikely to remain the appropriate locations to meet agreed objectives of national monitoring and surveillance.

Identifying monitoring and surveillance methods available to achieve each objective also needs to be considered with stakeholders to ensure each agreed objective is achievable using cost effective, practical and appropriately resourced methods.

Funding options need to be explored once there are clear benefits and defined actions to result from monitoring and surveillance activities. A clear link between the outputs, benefits and defined actions will also support identification of options for funding sources and increase the likelihood of funding to undertake those activities.

For the purpose of this section, and the discussion of potential objectives, monitoring and surveillance are considered separate based on these definitions:

- Surveillance is the systematic investigation, over time, of a population or area to collect data and information about the presence, incidence, prevalence or geographical extent of a marine pest. Surveillance includes active (such as the NMS) and passive (such as citizen science) approaches (COAG 2012b).
- Monitoring is the act of observing or recording performance. A monitoring programme involves the systematic examination of programme coverage and delivery; assessing the extent to which a programme (such as a regulatory regime) is meeting its objectives.

The department considers that the objectives of national monitoring and surveillance need to be discussed with relevant stakeholders. The department reviewed some of the potential benefits of national monitoring and surveillance objectives, which were primarily relevant to Australian Government roles and responsibilities.

## Detect marine pest incursions as soon as possible

Detecting marine pests as soon as possible after an incursion means surveillance being conducted frequently and on an ongoing basis. Therefore, each activity must be inexpensive so that the overall programme is cost efficient.

The NMS involved an active surveillance method with a frequency of every two years, which was neither frequent nor cheap. Active surveillance under the NMS has not resulted in the detection of an incursion of a target exotic marine species not previously recorded in Australia.

Arthur et al. (2015) noted some cheaper active surveillance methods that may be adopted, including DNA probes and settlement plate arrays, but questions remain about the efficacy of these methods.

Settlement plates are relatively cheap to use, but the relationship between pest density and detection on settlement plates is currently not clear and their role in early detection, relative to alternative techniques like visual surveys, requires further investigation (Floerl et al. 2012 cited in Arthur, Summerson & Mazur 2015). Early detection systems limited to settlement arrays will be limited to detection of fouling species (Arthur et al. 2015).

Active surveillance using DNA detection methods may represent a more cost-effective solution; however, DNA probes are not effective in meeting all potential purposes of early detection. DNA probes can indicate that DNA from a target species was detected at a sample site, which has benefits and uses. Difficulties arise in trying to extrapolate whether the DNA is from living, unviable or dead organisms; from established pests in the environment or from vessels (biofouling or ballast water); from juvenile or adult individuals. Therefore, DNA detection methods often need to be followed up by more traditional visual techniques to confirm that a marine pest has established and enable informed decisions on potential management options.

Decisions about the purpose of early detection need to be resolved with jurisdictions, scientists and industry; however, passive surveillance should be supported by the Australian Government regardless of the agreed use of active surveillance. Passive surveillance, including community awareness raising for citizen science programmes, provides additional benefits to national marine pest biosecurity beyond detecting marine pest incursions.

Arthur et al. (2015) reported that passive surveillance, such as citizen science programmes, has led to the detection of new marine pests in Australia. Citizen science programmes benefit from having 'many eyes on the water' and become more effective when supported and focused. Support for these programmes could be provided through education and awareness raising activities and allocation of resources towards passive surveillance coordination through the proposed marine pest network. This support can have additional benefits such as voluntary adoption of prevention measures as marine users become more aware of marine pest risks, and can provide valuable information on species presence, absence and spread.

The value of detecting a marine pest early is linked to understanding what will be done if a marine pest is detected. Response plans are vital. A package of rapid response manuals for established pests are being finalised through the MPSC.

The species-specific manuals provide technical information about the pest, principles for its control and relevant control policies. The package also includes a generic manual, which describes the principles for an emergency response for an introduced marine pest that is considered a pest of national concern but for which a species-specific manual does not yet exist.

Detecting a marine pest early in its incursion theoretically increases the likelihood of successful eradication. Therefore, there may be a temptation to try to detect marine pests as soon as they establish in Australia and implement surveillance infrastructure and programmes to increase the likelihood of detecting an incursion as soon as possible and a successful eradication.

The current national arrangements to support early detection are not effective at increasing the likelihood of marine pest detection at a stage that enables successful eradication. Arthur et al. (2015) noted that as a result of this a number of jurisdictions have implemented their own surveillance programmes to support early detection.

A key issue with assigning national resources and efforts towards surveillance for early detection is the expectation that marine pests can be detected at an eradicable stage. Arthur et al. (2015) highlighted a comment from one stakeholder that simplistically describes part of the problem:

*'If you can detect it, you can't eradicate it, and if you can eradicate it, you can't detect it.'*

The expense of national active surveillance programmes need to be justified for early detection and eradication. It is not clear whether these programmes increase the chances of finding marine pests at an early enough stage of invasion to make a difference compared with having no programme (Arthur et al. 2015). However, this may improve with developments in surveillance technology and techniques and adoption of more cost-effective approaches to active surveillance.

To make any agreed national active surveillance programmes for early detection of marine pests more cost-effective, they should be limited to marine pests on the national priority marine pest list (currently being developed by the MPSC). The outcomes of national emergency response exercises and scenario testing of NEBRA will help in understanding the circumstances under which national emergency responses are most likely. This information can be used to focus any national active surveillance programme that seeks to support eradication on particular pests or locations.

Emergency response exercises and scenario testing of NEBRA may reveal the likelihood of eradication attempts for marine pests being undertaken under NEBRA (chapter 5). These exercises could inform considerations of the need for amendments to NEBRA or other arrangements and, the value national programmes for early detection of marine pests may depend on what pre-agreed action (other than eradication) would be taken as a result of detections. Improving the likelihood of slowing the spread of marine pests to other domestic ports and allowing time to prepare to live with the impacts of marine pests are potential purposes for early detection and form part of the options for managing established marine pests. The NBC is consulting with stakeholders on a proposed national framework for managing established pests and diseases of national significance. Consultation is being undertaken through a discussion paper, *Modernising Australia's approach to managing established pests and diseases of national significance*, released on 1 June 2015. If endorsed by AGSOC, the final framework will inform national activities related to established marine pests. It will be relevant to development of the national priority marine pest list and the finalisation of species-specific rapid response manuals (which provide technical information about specific pests and principles and policies for their control) and the collaborative arrangements between government and stakeholders.



## Surveillance to reduce the cost of domestic ballast water regulations

Active surveillance is an important source of data for the Ballast Water Risk Assessment (BWRA) to operate effectively and reduce the cost of domestic ballast water regulations. However, the value of BWRA operating effectively is largely dependent upon vessel operators continuing to seek exemptions from managing ballast water on domestic voyages. If the value of BWRA remains high, then the identification of cost-effective approaches for surveillance to inform it becomes an important consideration.

Arthur et al. (2015) reviewed the NMS and recommended that a more targeted, standards based surveillance approach be considered. A standards based approach would need to focus on ballast water uptake areas, which are likely to be much smaller than the entire location currently covered in the NMS. The use of DNA-based detection of target species has the potential to produce a more cost effective surveillance programme compared with the current NMS. A system based on concentration of pests in the water would have a much greater chance of generating surveillance consistency between ports. The first detection of a range extension of a pest to a new location could also be used by jurisdictions to inform their own marine pest management systems and allow a relatively earlier detection of the range extension than the current NMS.

The development of the BWRA included decisions about the period that surveillance data should remain valid to inform the BWRA. Where a decision is made that previous surveillance data are no longer valid, the BWRA reverts to using an environmental matching protocol.

In the absence of port surveillance data, the BWRA uses environmental matching protocol that assumes if a pest could survive in a donor port then it is present for the purpose of the risk assessment. This results in conservative risk assessments for voyages from unsurveyed ports.

The NMS was designed to, among other things, to provide port surveillance data to support the BWRA. However, as previously discussed the NMS has not been implemented for a variety of reasons and the current design of the NMS is inappropriate for this purpose.

An active port surveillance programme specifically designed to inform the BWRA based on relatively new surveillance technologies is potentially feasible. The new technologies could include those that can detect the DNA of target species in the water column. Such a DNA based system would need to be trialled to confirm its reliability. Such a system should be more efficient than the current NMS.

The impact on the costs to industry could also be significant. More cost-effective surveillance techniques based on a minimum standard are likely to be applicable to a greater number of ports and have the potential to significantly reduce the number of high risk journeys in the current ballast water risk tables that are estimated using the BWRA's conservative environmental matching protocols. The costs of surveillance techniques will need to be compared to the costs saved by the reduced number of high risk journeys to ensure undertaking the surveillance is cost-effective. The department is currently undertaking work using recent shipping data to identify which ports, if surveyed, would result in the highest potential savings for industry with respect to undertaking ballast exchange on high risk voyages.



An interesting observation of the current BWRA is that if black-striped mussel (*Mytilopsis sallei*) became established in Australia and was added to the BWRA, all voyages between unsurveyed ports would become high risk and require ballast water exchange. This is because of the very high salinity and temperature tolerances of this species. The establishment of black-striped mussel in Australia would result in very high compliance costs for industry in the absence of port surveillance data. This highlights the need for prevention measures and the importance of cost-effective surveillance systems to inform the BWRA.

It is not clear how industry would like to proceed with management of domestic ballast water following entry into force of the BWM Convention. After the global fleet has completely transitioned to the use of ballast water management systems, currently estimated to be around seven years after the BWM Convention enters into force, there will be two broad options for the management of domestic ballast water transfers. The first is to require all vessels to operate their ballast water management system on all domestic voyages that require the release of ballast water into a port. Under this option the BWRA, ABWMIS and port surveillance would not be required. However, ballast water management systems cost money to operate. The current BWRA and proposed regulatory system under the *Biosecurity Act 2015* are capable of allowing exemptions to the requirement to use a ballast water management system on domestic voyages if the voyage is deemed to be low risk. The question to resolve with industry then becomes what are the costs of operating ballast water management systems for all domestic voyages versus the potential savings from having exemptions to ballast water management requirements on low risk domestic voyages. The department needs to work with the shipping industry to better understand the long-term direction of the domestic ballast water regulatory system. In the meantime, a specific surveillance programme that reduces the costs to industry of compliance with domestic ballast water arrangements needs to be considered.

### Determine how well prevention measures are working

The effectiveness of prevention measures is a key area of focus for the department, because effective national prevention measures significantly reduce the frequency and number of marine pest arrivals in Australia. Arthur et al. (2015) identified the use of vessel monitoring programmes as more appropriate to determining the effectiveness of prevention measures than the current environmental surveillance under the NMS.

Monitoring vessels can give an indication of the efficacy of prevention measures and provide information to enable the continual improvement of these measures. In the case of the proposed biofouling regulation (section 4.2), vessel monitoring could provide information on changes to the level of biofouling on vessels before and after implementation of regulations. It could also enable identification of biofouling species that are entering Australia and the rate at which they are entering. This information is more valuable for determining the effectiveness of prevention measures than the current environmental surveillance (end-point surveillance) under the NMS. It also allows more direct identification of deficiencies in prevention measures, and would enable the department to work with the industry to identify appropriate improvements to prevention measures. Ongoing monitoring of vessels would also be required to confirm the continuing efficacy of the measures given constantly changing vessel arrival patterns and technology development.

Vessel monitoring could also be used to determine how effective ballast water exchange or ballast water management systems are at managing particular species. The BWM Convention allows sampling of ballast water treated with ballast water management systems to determine if the discharged water meets the BWM Conventions' D2 standard. However, the D2 standard relates to the concentrations of marine organisms of certain size classes and the concentration of specific human bacterial pathogens. If the discharge meets this standard, irrespective of the species present, then the discharge will be deemed compliant under the BWM Convention.

It is important to distinguish pathway monitoring from checking vessels for compliance. Compliance checking focuses on whether vessel operators have undertaken any required management activities, whereas pathway monitoring informs a broader understanding of whether the required management activities are effective at reducing the level of risk posed by that pathway.

Although pathway monitoring can provide information on the incursion rate for marine pests, it does not inform any changes to establishment rate of marine pests in Australia. Improving understanding of the impact prevention measures have on minimising impacts of marine pests, including the establishment rate of marine pests, does require some environmental surveillance. To achieve this aim Arthur et al. (2015) recommend linking results from vessel monitoring to more intensive surveillance programmes at a small number of ports to improve the cost-effectiveness of the programmes.

Surveillance of the environment (end-point surveillance) can be used to detect changes to the marine species present and provide information on changes to marine pest incursion rates over time. However, it is difficult to accurately attribute the detection of a marine pest to a particular pathway and the assessment of whether a particular prevention measure is effective.

Endpoint surveillance, such as that outlined in the NMS, can detect the establishment of pests in ports. They can also help establish overall incursion rates of exotic marine species through repeated surveys over a relatively long period. However, endpoint surveillance only provides some insight into changes, rather than informative data to determine the effectiveness of prevention measures. For example, the effectiveness of the current voluntary national biofouling management guidelines (section 4.2) relies on many factors not least communication activities and awareness raising. Even if awareness is high and the guidelines are well known, end point surveillance programs provide little information about the rate of adoption and uptake, and hence their effect on minimising risk. This would rely on inferences being drawn from estimated incursion rates.

The development of the marine pest network provides the opportunity to link pathway monitoring with environmental surveillance to improve understanding of the affect of prevention measures on incursion rates and establishment rates of marine pests.

## Measure the biodiversity outcomes of new port developments or significant changes in port activity

Marine pests are often found where there has been a significant environmental disturbance (Clark & Johnston 2009). This is because they are often the first species to colonise newly disturbed environments. Marine pests are generally well adapted to thriving in ports in other parts of the world and are transported to new ports where the environmental circumstances can be similar. For instance, ports are generally sheltered environments with little wave action, are situated around population centres which often adversely affects water quality, are often estuarine (have rivers flowing into them creating varying salinity) and have man-made structures that offer hard substrates for colonisation.

Native species are not as well adapted to colonising disturbed port environments, especially where they are in competition with exotic species that have wide environmental tolerances arriving in ballast water or through biofouling.

Arthur et al. (2015) noted that some stakeholders held the view that new port developments or major redevelopments of existing ports should have associated surveillance to determine the biodiversity outcomes of the development.

New port developments or substantial expansion of existing assets usually requires some form of assessment and approval from relevant jurisdictions. Jurisdictions could require surveillance for biodiversity outcomes as part of the conditions of approval of the development. They could also include a requirement for separate surveillance for exotic marine species. The development of an active surveillance system to detect species of biosecurity concern will not have the same objectives as surveys to determine biodiversity impacts.

The relevant jurisdiction should remain responsible for deciding the requirements for undertaking biodiversity surveillance. The objective of the surveillance should be explicitly stated and the surveillance system designed accordingly.

### 6.3.2 Establish a marine pest network

The Australian Government should establish a national marine pest network to address many of the concerns about consultation and engagement identified by stakeholders. The marine pest network should facilitate research, surveillance, communication (education and awareness) and recording of marine pest detections in Australia.

The primary purpose of the marine pest network will be to bring a collaborative approach to address particular deficiencies in the supporting arrangements of the current national marine pest biosecurity system. This collaboration should involve a larger group of stakeholders with wider interests than those currently engaged in the National System or the Marine Pest Sectoral Committee.

Research and development is being conducted, but this is not resulting in significant benefits to national marine pest biosecurity. Coordination is needed to ensure the limited funding is increased and targeted. Industries and the community with a desire to be involved in national marine pest biosecurity are not effectively included by the current arrangements. There are also a significant number of respected scientists outside government agencies that don't have a formal avenue for input into national marine pest biosecurity.

The marine pest network will:

- be based on scientific endeavour and scientific objectivity
- initiate multi-organisational collaboration among Australian, state, territory and local government and non-government agencies
- strive for collaboration and complementary activities rather than competition
- work in the national interest.

The marine pest network should be developed to operate in a similar manner to the Australian Wildlife Health Network (now Wildlife Health Australia).

The department's experience through development of the Australian Wildlife Health Network suggests the marine pest network will need to be planned for progressive development over a few years.

The structure of the marine pest network could be:

- a national coordinator to manage the overarching governance arrangements
- a coordinating management group
- a technical support group
- a common information and communication technology platform to support national communications and education, and storage of information for the network.

### **Research and development component of the marine pest network**

The marine pest network should have a facilitation role in marine pest biosecurity research and development. The network should provide support and infrastructure to assist the aims of the Australian Marine Pest Research Network currently being developed and championed by WA. This support could result in the Australian Marine Pest Research Network becoming a component of the marine pest network. This will help ensure national marine pest research maximises resources and available funding and ensure it is targeted at national priorities, is collaborative and complementary.

The network will also have a role as a champion for research and development opportunities and provide a forum to link researchers, industry, potential funding agencies and policymakers.

### **Monitoring and surveillance component of the marine pest network**

Development of a national monitoring and surveillance strategy within the national marine pest biosecurity strategy will likely occur before establishment of the marine pest network. The role of the marine pest network in national monitoring and surveillance should be considered in the development of the strategy. The department considers that involvement of the marine pest network in monitoring and surveillance could include:

- support for developing a new national monitoring and surveillance plan with agreed objectives of national surveillance and monitoring activities
- coordination of development of a national citizen science network that combines and enhances surveillance activities and facilitates coordinated reporting and data sharing
- promoting and conducting education and awareness on marine biosecurity issues
- provide a consistent approach to obtaining information about the status of marine environments in Australia

- provide a consistent approach to responding and obtaining information on detections of marine pests (and to monitor whether these detections establish and spread)
- provide a consistent investigation and reporting mechanism for significant events or incursion
- increase knowledge on the status of various regions or compartments in the marine environment
- involvement in development of protocols for action following a positive DNA detections
- involvement in development of surveillance programmes to measure the biodiversity outcomes of new port developments or significant changes in port activity
- development of a nationally consistent system that results in more comparable and useable data being collected from across a variety of organisations.

### Communication and engagement component of the marine pest network

The current system limits rather than supports the coordinated efforts of stakeholders. The network should resolve some stakeholder concerns with engagement of industry, scientists and environmental groups by:

- providing an avenue for stakeholders to be involved in relevant marine pest network activities to the extent they wish to
- providing a link for all interested groups including the Australian and state or territory governments, commercial and non-commercial industries in the marine sector, academia and research organisations and community and environmental groups.

Increasing expectation for peak industry bodies to provide information and be engaged with marine pest biosecurity, fails to realise that these bodies are primarily there for the benefit of the industry. These bodies and industries' engagement, goodwill and desire to be good corporate citizens can only go so far. There is a need for all parties to work together to harness mutual benefits from marine pest biosecurity activities. The desire and motivation for industry to be involved cannot overcome issues of limited resources, competing (and often far greater) priorities and unclear benefits to their involvement. This has resulted in industry representatives choosing to engage in part due to concern with potential adverse marine pest biosecurity policy decisions and consequences to industry that are unintended or not considered by policymakers.

### 6.3.3 Revise the responsibilities of current committees relating to monitoring and surveillance, and research and development

A consequence of the development of the marine pest network will be the need for consideration of the current governance and infrastructure arrangements. The establishment of a marine pest network will require revision of responsibilities and interactions of committees including the MPSC, CCIMPE and MDAP.

CCIMPE was developed following the recommendation of the Joint SCC/SCFA Taskforce (1999) to replicate arrangements for managing emergency responses in place at the time for animal disease outbreaks. CCIMPE standard operating guidelines and terms of reference were last updated in 2006 and contain responsibilities and functions that do not relate to emergency response. CCIMPE's functions could be

limited to those required under NEBRA, and be convened only for detections of marine pests that could result in an emergency response under NEBRA or any future emergency response deeds developed (chapter 5).

The current responsibilities of CCIMPE that relate to non-emergency response that could be undertaken by the MPSC or the marine pest network once developed include:

- validation of surveillance results
- the distribution of non-sensitive surveillance results and the collection and distribution of information about detections of established marine pests.

The relationship between the MPSC and the marine pest network needs careful consideration by governments. The marine pest network coordinator could be an observer on the MPSC, and development of the network could enable the MPSC to focus on government policy issues such as a national approach to domestic biofouling management.

The current role of the MDAP focuses on the NMS survey designs. The continued need for the MDAP to operate as a stand-alone panel is questionable if the NMS is set aside and a new national monitoring and surveillance strategy is developed. The MDAP could become part of the marine pest network and have a broader role in analysis of surveillance.

The marine pest network could also support, coordinate or take over responsibility for some of the underutilised marine pest infrastructure and publications, including NIMPIS and the marine pest website and associated publications under the National System.

### **6.3.4 Research and development resources and funding**

While there was initial research and development funds (through the Natural Heritage Fund and Caring for Our Country) to support establishment of the National System, these funds are no longer available. This has meant that funds for marine pest biosecurity research are scarce and jurisdictions resource activities according to their own priorities and capacity.

The marine pest network should support the coordination of marine pest research and the development of mechanisms for either coordinating or funding marine pest research nationally. However, more needs to be done by governments to address the decreasing amount of funding and resources put towards research and development. A 2012 audit of national biosecurity research and development (Intergovernmental Agreement on Biosecurity - Research, Development and Extension Working Group 2012) identified only 15.4 full-time equivalent (FTE) staff in invasive marine species research and development across Australian, state and territory government agencies. Over 77 per cent of those staff are employed by the governments of Western Australia (5.8 FTE) and South Australia (6.1 FTE). No staff were identified in the CSIRO.

The MPSC's development of a national strategy needs to include a plan for how national research and development priorities that will be funded, and should work closely with the Marine Pest Research Network to do so.

### **6.3.5 Improve coordination of communication and engagement**

The success of a shared responsibility approach to managing a biosecurity system relies on significant communication and effective consultation with and engagement of stakeholders. This applies both at higher level decision-making forums and in the development and implementation of on-the-ground programmes targeting uptake of improved management practices by the community or industry.

The National Biosecurity Committee recently agreed to strengthen existing engagement mechanisms and explore avenues to improve engagement with stakeholders. The MPSC is currently developing a new communication and engagement strategy, based on the National Engagement and Communications Framework, to support this approach.

Effective communication and engagement will be particularly important to the success of managing domestic biofouling risk, which is not covered by nationally consistent legislation. The work of OceanWatch Australia in communicating and rolling out the *National biofouling management guidelines for commercial fishing vessels* to the commercial fishing sector is an example of successful communication and engagement in that area. However, funding and resources are no longer directed to this activity and momentum has been lost. Communication and engagement is not effective without effort and ongoing commitment of resources, but is essential to:

- raise awareness of marine pest biosecurity risks to increase public, industry and government support and funding
- engage industry and communities to voluntarily undertake preventive measures
- increase industry and community involvement in managing established marine pests
- facilitate detection of marine pests.

The reduction of available resources and funding has resulted in an increasing reliance on peak bodies' communication with their members. An expectation that peak industry bodies or community representatives have resources and capacity to fully engage their sector in national marine pest biosecurity issues should not be an assumption.

The Australian Government, through the MPSC, should consider the role of the marine pest network when developing the communication and engagement strategy. MPSC is responsible for implementing the National Engagement and Communications Framework for marine pests under the IGAB. Communications and engagement activities earmarked for the marine pest network need to complement rather than duplicate MPSC activities.

### 6.3.6 Evaluation and review

An effective biosecurity framework needs to have arrangements, capability and information to support evaluation of whether it is meeting its stated objectives and to adjust as required to enable continuous improvement.

The reducing national investment in marine pest biosecurity and the lack of data to underpin the components of national marine pest biosecurity need to be addressed to ensure national marine pest biosecurity arrangements can be evaluated and improved. The development of DNA surveillance tools and research to improve marine pest biosecurity risk assessments are examples of research and investment that can inform and improve national marine pest biosecurity policies and techniques.

In 2006–07 the Australian Government commissioned a project to identify indicators for evaluation of all components of the National System. Refinement of the indicators into a workable and affordable programme lapsed as research and development funds became scarce.

The current national marine pest biosecurity arrangements do not provide an effective platform for continuous improvement:

- the system is under-resourced
- there is insufficient monitoring data and other relevant indicators to measure performance
- the current system is focused on surveillance rather than improving risk management measures.

An effective biosecurity framework needs to be based on sound science and technical advice. This requires information being available to evaluate how well the system is performing, and ensuring collection and sharing of consistent data and information is an important aspect of continual improvement. This is particularly so in the marine context where the scientific understanding of marine pest biosecurity is relatively limited and recent, and much less data are available than for its terrestrial counterpart.

#### **Recommendation 11**

The Australian Government should support national monitoring of risk pathways to evaluate the effectiveness of biosecurity measures.

#### **Recommendation 12**

The Australian Government should establish a national marine pest network to develop strong partnerships that enable Australia to better identify, assess, communicate and manage the risks of marine pests. Membership should include industry, research and community members as well as representatives from all levels of government. The network should provide the national framework to:

- coordinate national communications activities, including education and raising awareness of marine pests
- facilitate passive surveillance activities from a wider range of sources such as community groups and industry, and facilitate coordinated reporting and data sharing of marine pest detections
- facilitate analysis of monitoring and active surveillance programmes
- facilitate national research and development activities, including functional support for the Marine Pest Research Network as a component of the network.

#### **Recommendation 13**

As a result of agreement to recommendation 12, the Australian Government, through the National Biosecurity Committee, should clarify the roles and responsibilities of committees and groups associated with national marine pest biosecurity as the marine pest network is established. This should include determining the appropriate functions of the Marine Pest Sectoral Committee and the Consultative Committee on Introduced Marine Pest Emergencies.



## Appendix A

# Scope of the Review of national marine pest biosecurity

The Department of Agriculture and Water Resources will conduct a review of national marine pest biosecurity arrangements and report to the Australian Government by 30 June 2015.

The review's report will provide recommendations for Australian Government investment that are effective, simple and provide a high return on investment to strengthen national marine pest biosecurity.

The department will consult with the public, other agencies of the Australian Government and key stakeholders in national marine pest biosecurity.

### Scope

This review will be limited to the Australian Government's responsibilities and activities in the national marine pest biosecurity arrangements. It will:

1. Assess whether the implementation of the National System for the Prevention and Management of Marine Pest Incursions (the National System) has:
  - a. provided effective and cost efficient procedures in relation to prevention, eradication, containment and on-going management of marine pest incursions, for the purpose of protecting Australia's marine environment and industries dependent on marine resources
  - b. facilitated consistency in Australia's border and post border controls for marine pest management and their consistency with relevant international standards
  - c. provided a consistent regulatory approach across Australia through legislation and/or nationally agreed standards, guidelines and protocols
  - d. provided cost-effective compliance and enforcement arrangements for industry, government and the community.
2. Recommend whether harmonised, collaborative and effective national marine pest biosecurity arrangements would be most effectively achieved by the Australian Government pursuing the implementation of the National System, or an alternative framework.

3. Identify, and prioritise elements of national marine pest biosecurity arrangements which require improvement, and recommend prioritised actions for the Australian Government to improve those elements.
4. Consider sustainable funding, Australia's international commitments, the government's support for the multilateral trade system and other relevant government initiatives in providing recommendations.

## Out of scope

The following elements are out of scope for this review:

- the content of the National Environmental Biosecurity Response Agreement
- the Intergovernmental Agreement on Biosecurity
- the National Biosecurity Committee
- cost sharing arrangements for monitoring at National Monitoring Network locations (noting that the Marine Pest Sectoral Committee is currently investigating options around cost sharing arrangements for monitoring at NMN locations)
- draft Commonwealth legislation (the Biosecurity Bill 2014) for the management of ballast water
- the intra-jurisdictional operation of state and territory regulatory instruments concerning marine biosecurity
- review of jurisdictional responsibility for monitoring
- the content of the Australian priority marine pests list (currently being considered by the Marine Pest Sectoral Committee)
- prevention and management activities related to terrestrial and freshwater invasive species
- prevention and management activities related to native marine species (such as the crown-of-thorns starfish (*Acanthaster planci*)).

# Glossary

Term	Meaning
Appropriate Level of Protection	The level of protection deemed appropriate by a country establishing a sanitary or phytosanitary measure to protect human, animal or plant life or health within its territory. Australia's Appropriate Level of Protection is expressed as providing a high level of sanitary and phytosanitary protection aimed at reducing risk to a very low level, but not to zero. This level of risk is consistent with the public's expectations for biosecurity management.
Ballast water	Water taken up by ships to assist with vessel stability and balance.
Biofouling	The accumulation of aquatic organisms (micro-organisms, plants and animals) on surfaces and structures immersed in or exposed to the aquatic environment.
Biosecurity	The management of the risks to the economy, the environment, and the community, of pests and diseases entering, emerging, establishing or spreading.
Biosecurity risks	The potential of a pest or disease entering, emerging, establishing or spreading in Australia; and the pest or disease causing harm to the environment, or to economic or community activities.

Compliance	Status whereby all aspects of product, facilities, people, programmes, and systems meet regulatory requirements and, where applicable, importing jurisdiction's official requirements.
Environment	Includes ecosystems and their constituent parts, including people and communities; natural and physical resources; the qualities and characteristics of locations, places and areas; and freshwater, estuarine and marine environments.
Established marine pest	A pest that, for the foreseeable future, is perpetuated within any area and which it is deemed not feasible (either technically or as a result of a benefit:cost analysis) to eradicate (NEBRA 2012).
IMO biofouling guidelines	Refers to the International Maritime Organization's guidelines for commercial vessels, <i>2011 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species</i> , and for recreational craft, <i>Guidance for minimizing the transfer of invasive aquatic species as biofouling (hull fouling) for recreational craft</i> .
Biofouling management plan	A plan which details the biofouling management measures to be undertaken on a vessel, as outlined in the IMO Biofouling Guidelines.
Invasive	Ability of an introduced species to spread across natural or semi-natural habitats by its own means and form dominant populations.
National Monitoring Strategy	Information contained with the national monitoring guidelines, available at the <a href="#">marine pest website</a> .
Vector	The physical means, agent or mechanism that facilitates the transfer of organisms, or their propagules, from one place to another.

# Acronyms and short forms

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ABWMIS	Australian Ballast Water Management Information System
AGMIN	Agricultural Ministers Forum
AGSOC	Agricultural Senior Officials Committee
ALOP	Australia's Appropriate Level of Protection
BWM Convention	The International Convention for the Control and Management of Ships' Ballast Water and Sediments
BWRA	Ballast Water Risk Assessment
BWTS	Ballast Water Treatment Systems
CCIMPE	Consultative Committee on Introduced Marine Pest Emergencies
COAG	Council of Australian Governments
DAFF	Department of Agriculture, Fisheries and Forestry
IGAB	Intergovernmental Agreement on Biosecurity
IMO	International Maritime Organization—the United Nations specialised agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships.
Marine Pest IGA	Intergovernmental Agreement on a National System for the Prevention and Management of Marine Pests (2005)
MDAP	Monitoring Design Assessment Panel
MPSC	Marine Pest Sectoral Committee
National System	National System for the Prevention and Management of Marine Pest Incursions

NBC	National Biosecurity Committee—the committee responsible for biosecurity matters, and tasked with managing a national, strategic approach to emerging and ongoing biosecurity policy issues.
NBMG	National Biosecurity Management Group
NEBRA	National Environmental Biosecurity Response Agreement
NIMPCG	National Introduced Marine Pests Coordination Group
NIMPIS	National Introduced Marine Pests Information System
NMN	National Monitoring Network
NMS	National Monitoring Strategy
NOPSEMA	National Offshore Petroleum Safety and Environment Management Authority
RIS	Regulation Impact Statement
SIEV	Suspected irregular entry vessels
SOC	Species of Concern

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### The 'Biosphere' Graphic Element

The biosphere is a key part of the department's visual identity. Individual biospheres are used to visually describe the diverse nature of the work we do as a department, in Australia and internationally.



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#### Department of Agriculture and Water Resources and Water Resources

Postal address      GPO Box 858 Canberra ACT 2601

Telephone            1800 900 090



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[agriculture.gov.au](http://agriculture.gov.au)