

CSIRO Submission

National Marine Pest Biosecurity Review

The effectiveness of the current national marine pest biosecurity arrangements and how they could be improved

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Background

CSIRO undertakes research in the following areas relevant to the delivery of cost-effective biosecurity outcomes

- Marine biological collections and providing public access to data and its management
 - Systems based approaches to risk analysis – including the identification of biosecurity risk from shipping
 - Predictions systems for arrival, establishment and spread of pests and diseases
 - Autonomous systems and sensor network development for surveillance and detection
 - Community based biosecurity decision making in the face of multiple values and uncertainty
 - Development of more effective policy instruments
 - Eradication strategies
 - Biological control for management of long-term pests
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The CSIRO Biosecurity flagship is committed to providing the capability to support Australian governments and Industry manage the risks posed by marine pests. In this submission we have attempted to present to the review a number of options where we think innovation could possibly improve the national approach. We are available to discuss these suggestions if the review team requires further clarification.

Issues and options

Australia's marine estate is huge and equal in extent to our land, yet comparatively little is known about marine environments. What is known is that a range of exotic organisms have established in Australia. Australian marine communities already include over 400 exotic marine organisms and some of these have significant impacts (Hewitt & Campbell 2010).

Australia's position as a significant trader in both bulk and containerised commodities means that we have particular exposure to risks from organisms in ballast water. There are also a large number of vessel movements related to private vessels, fishing vessels, barges and drilling rigs. Fouling of organisms on the hulls of these vessels is also a significant pathway for the establishment of exotic pests in Australia. Without management we are vulnerable to further incursions of organisms which could damage our fisheries, ports and the emerging aquaculture industry. It could also significantly impact the marine environment, reducing its amenity and impacting on tourism.

Because of these threats in the mid 1990's the Australian government instigated a range of measures to better manage marine Biosecurity. CSIRO was closely involved with supporting this

policy development through the Centre for Research on Introduced Marine Pests (CRIMP) in Hobart. Significant progress was made by the then Department of Agriculture Fisheries and Forestry in developing policy frameworks and implementing systems to manage international ballast water and emergency response. Australia led the world in responding to the marine pest issue.

In recent years this progress has slowed. Nationally coordinated management of domestic ballast water, considered since 2001, has not been implemented. The National Monitoring Network was established in 2005 (National System for the Prevention and Management of Marine Pest Incursions 2010) but has never been fully resourced. Management of hull fouling is only now progressing to a trial scheme for commercial shipping. Resources are scarce and governments need to allocate funds across competing priorities. There are also policy agendas to stimulate the economy by removing unnecessary regulations and reducing subsidies to industries. These issues have combined to slow momentum in this area.

Thus this review is timely. It is an opportunity to reassess the magnitude of risks and the appropriate responses to managing them. It is an opportunity to revisit the scientific basis of the underpinning risk frameworks based on experience of their operation for the last 14 years. And it is an opportunity to refocus the system to meet today's needs.

Specific areas that we think the review should consider are as follows:

Risk basis of the national system

To understand the design of the current system you need to understand its central feature. The cornerstone of the policy response during the period 1997 to present has been to base the national system on a species specific approach (Barry et al 2007). In this approach risk is calculated in a "bottom up" manner by assessing the risk of different organisms and combining these in a logical manner. The species specific approach has a significant attraction. It potentially allows the policy maker to only impose costs and trade restriction when demonstrably necessary, consistent with our international obligations. It was also consistent with the scientific thinking of the day which sought to characterise and understand the nature of marine invasions.

Much of the planned infrastructure such as risk tools for domestic and international ballast water movements, port sampling protocols and regimes and next pest lists were framed and designed with the species specific approach in mind.

But a species specific approach imposes significant costs. It is extremely difficult to predict which organisms will actually establish let alone have an observed negative impact. (Hayes and Barry 2007). And the list of potential invaders is large, with thousands of species. This uncertainty is often irreducible (for example whether a particular species can establish), which means that it is hard to rule out species. 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.

An alternative approach the review should consider is to treat marine pests as a diffuse biological contamination. In the terrestrial environment, if a person bought a bucket of soil on a plane to Australia from overseas and proposed to dump it outside of Sydney airport they would be fined and the soil would be confiscated and treated. The organisms in the soil would not be identified and risk assessed. Rather the diffuse risk that they represent is recognised and managed.

Australia can potentially manage ballast water and hull fouling in a similar way. For ballast water we would not accept untreated water being discharged in Australian ports. What constitutes treatment is defined pragmatically based on available good practice. For example ballast water exchange is currently an acceptable treatment. As new treatment options become available this can be changed. This approach is effectively what is occurring with international ballast water at the moment, so the change is mostly philosophical.

For hull fouling the change is more significant. Under this new approach Australia does not accept fouled vessels coming into our waters. The issue here is to define fouling in a constructive way. Consider a vessel that follows good practice in the application of anti-fouling coatings. While some fouling will remain, for example in niche areas, consider defining this level of fouling as acceptable. This choice has a number of implications. First, it sets an unambiguous standard about the level of fouling that Australia will accept. It is easy to communicate and sends a clear message. Second, the approach means that vessels that follow good practice will typically be compliant. This will raise standards in the industry. Third, the approach is achievable by available technology. Fourth, industry and recreational boats will have greater certainty. A similar system is currently being phased in by the New Zealand government (Georgiades & Kluza 2014).

This approach moves away from a “black list” approach that considers lists of the species that are unacceptable as fouling. This is taxonomically challenging and involves significant costs and training of staff. And it potentially does not cover off the risk, as the lists are uncertain and usually incomplete. Instead the approach could implement a “white” list of organisms that are acceptable as fouling, even if they are at levels beyond those associated with good practice. This would allow management of particular issues that arise. An example is work CSIRO has completed for Chevron (e.g. Heersink et al 2014).

These approaches can be implemented consistently and will not impose costs and delays on users if they follow good industry practice. They will also be cheaper to administer. What constitutes good practice can be refined by the industry and government working through organisations such as the IMO. Australia can potentially manage ballast water and hull fouling in the same way.

Domestic ballast water controls

Implementation of domestic ballast arrangements are problematic. Systems that rely on ballast exchange are costly when ports are nearby, as vessels need to go offshore for long enough to perform the exchange. Biologically, there are also often natural vectors between nearby ports so the value of mitigation is reduced. In summary nearby ports are costly to manage, and the value of that management may be compromised.

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.

This approach potentially offers significant advantages over a species specific assessment. It does not rely on a complex risk assessment and associated administration. It does not need expensive port surveys to underpin the risk assessment. And it mitigates more of the risk. It manages the risk of translocation for all species beyond those on an administrative list.

Jurisdictions could still impose additional within region restrictions as they see fit. For example a localised incursion could still be managed by specific controls and inspections. But these would be more tactical considerations rather than an overall strategy.

Risk characterisation

The review should consider moving away from defining risk in terms of vessel characteristics, such as length of stay or history of fouling coatings. These attributes are associated with the risk but are not the primary mechanism. For example, a vessel may be low risk in terms of its attributes but be heavily fouled. Thus a standard based on the level of fouling is unambiguous and directly related to the risk. Vessel attributes are more useful to target compliance systems. The exact amount of information that is needed to do this should be traded off against the administrative burden to users and jurisdictions.

Surveillance and monitoring

The review should consider the role of surveillance in Marine Biosecurity. We understand there is a separate project being undertaken by ABARES to support this and several CSIRO staff have been interviewed by ABARES as part of this project.

We note that the National Monitoring Network (NMN), established in 2005, requires that 18 sites around Australia be regularly monitored to determine initially what, if any invasive marine species are present and then to identify new incursions as they occur (National System for the Prevention and Management of Marine Pest Incursions 2010). Unfortunately, 11 of those sites have never been surveyed with cost being the commonly cited reason (Sierp 2013). Clearly, this structure, in which state jurisdictions are responsible for providing the resources required to maintain the monitoring network is not working.

The risk return from port monitoring needs to be considered holistically with other elements of the review. High levels of uncertainty means that the information from port monitoring may still not be decisive enough to provide significant compliance cost saving. In addition the difficulties of activities in the aquatic environment mean that the majority of pests will not be eradicable even if they are detected. But new technologies such as fixed sensor networks, sensor packs deployed on mobile platforms (Autonomous Underwater Vehicles – AUV's), and highly sensitive identification tools through routine scanning for environmental DNA using next generation sequencing may

provide new options for cost effective and regular surveillance of ports and other threatened locations.

Cost sharing models

In terrestrial Biosecurity, post border surveillance, is rarely actively done for most environmental threats. Most surveillance relates to organisms that threaten industry efficiency or market access. This surveillance is often cost shared which introduces a discipline in the decision making about investment. If an industry doesn't see return from surveillance investment they will not invest in it. The review should consider the basis of market failure in marine Biosecurity surveillance and consider the possibility of incorporating industry agreed cost sharing.

Strategic assessment

While baseline data was collected in the late 1990's through the port survey program there have been few follow up studies to allow a strategic assessment of the changes that have occurred and to assess the impact of government policies (Sierp 2013). The review should consider mechanisms for doing this.

Responses and Management

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 is 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 – Aqueal 2008). Research is needed to develop these tools.

For incursions that are beyond eradication, few effective management options are available. The most effective has traditionally been biologically based approaches introducing highly specific biological agents to suppress pest populations. There has been some research in this field in the control of the Northern Pacific sea star (Goggin 1998) and the European Shore Crab (Thresher et al 2000) by CSIRO, but this work ceased before completion. The use of sex-ratio-distorting genetic technologies is another method that could be used either separately or in conjunction with classical biological control to control invasive marine species and is currently being tested for the control of carp (Thresher et al 2014). Greater understanding of potential use of biocontrol and/or biotechnology for the control of marine invasive species that are already established in Australia is therefore required. The review should consider this.

Community engagement

Marine biosecurity remains a complex issue because of its broad impacts on our society and the multiple stakeholders involved from recreational fishers, through indigenous values to commercial shipping. As such, a multi-disciplinary approach will be required for its development. There is need for a more coordinated communication and community collaboration to broaden the understanding of issues and commitment to safeguard Australia's marine resources from pests and diseases. This should include the development and encouragement of citizen science to detect and identify new invasive marine species. Much of the infrastructure is already present with such websites as Redmap (<http://www.redmap.org.au>), which invites the Australian community to spot, log, and map marine species found in Australia.

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