STOPPING NEW INVASIVE SPECIES

PRIMARY SUBMISSION

Submission to the inquiry into the adequacy of arrangements to prevent the entry and establishment of invasive species likely to harm Australia's natural environment conducted by the Senate Environment and Communications References Committee

September 2014

invasive species council

Note: This updated primary submission replaces the preliminary submission made by the Invasive Species Council in August 2014. Substantive changes to the submission are the addition of summaries at the start of each chapter and an expanded section summarising the case studies. This submission is supported by a compilation of case studies that is also submitted to the inquiry.

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CONTENTS

1. INTRODUCTION

- The Australian environment has suffered major losses due to invasive species. In the past five years, two more Australian animals have gone extinct, almost certainly due to invasive species.
- In this submission we provide data and case studies that indicate ongoing, serious and systemic flaws in environmental biosecurity.
- Lack of transparency in biosecurity decision-making and insufficient published documentation makes it difficult to obtain detailed information. We urge the committee to gather as much information as possible, and recommend reforms to enable ongoing public and parliamentary scrutiny.
- While Australia claims to have a world-leading 'enviable biosecurity system', our record on environmental biosecurity demonstrates the opposite.
- Unless we greatly strengthen environmental biosecurity, new invasive species will continue to arrive and establish with deadly consequences for the Australian environment.
- Australia has one of the worst animal extinction records in the world, due mainly to invasive species. Invasive species threaten >70% of nationally listed threatened species and >80% of nationally listed ecological communities.
- Australia's most recent State of the Environment report gave the worst possible rating for invasive species impacts on biodiversity, and found that management measures are ineffective.
- In many ways environmental biosecurity is much more challenging than agricultural biosecurity, with a far greater scale and complexity of threats compared to those for industry.
- Conservation requires protecting hundreds of thousands of species and complex ecosystems while organisms of value to industry are relatively few. Conservation values are mostly irreplaceable and unquantifiable in contrast to those of industry.
- Much less is known about biodiversity than about cultivated species and invasive threats to them. There are high levels of uncertainty about the environmental impacts of most invasive species.
- Fewer management options are available in more complex natural environments than those for much simpler agricultural systems. Environmental biosecurity relies on government and community investment for the public good, while commercial incentives drive industry approaches and provides better resources.
- Environmental biosecurity is more socially and politically challenging due to a multitude of stakeholders, conflicting agendas, and a lack of policy analysis. Some of the most damaging environmental invaders are ignored for social or political reasons.

In the past five years, two more Australian animals have disappeared forever – the Christmas Island pipistrelle and the Christmas Island forest skink. Their pathway to extinction is unclear but the causes were almost certainly invasive species, including yellow crazy ants that have transformed the Christmas Island ecosystem. Yellow crazy ants first arrived on the island many decades ago (between 1915 and 1934) but became a problem only in the 1990s, triggering a 'rapid, catastrophic shift in the rain forest ecosystem' due to their killing of millions of red land crabs.

Although the yellow crazy ant cataclysm on Christmas Island is not of direct relevance to this inquiry – because the ants have been on the island for many decades – it is of relevance that there have been multiple recent incursions of this ant into eastern Australia. Since 2001 it has been detected at more than 30 sites in Queensland. It was also detected at one site in NSW and eradicated. A lacklustre, slow-to-start and scantly funded eradication program in Queensland was abandoned last year, probably for budgetary reasons. There has been no feasibility assessment or cost-benefit analysis released to justify this decision. The Commonwealth has now provided $2 million for an eradication effort just in the Wet Tropics, where these ants could be devastating to world heritage values. But even if that one effort is successful, the breaches of quarantine that have resulted in so many recent incursions are likely to continue for there has been no serious attempt to block the pathways for entry of these ants into Australia. There has been little work with the source countries, no yellow crazy ant-specific risk assessments, no targeted surveillance program. Although there is a national threat abatement plan for tramp ants, there is no national body responsible for coordinating action or even compiling information.

This is one of many cases warranting close scrutiny by the inquiry for what it shows about the state of environmental biosecurity in Australia. In this submission we provide case studies of an additional nine incursions and list several others detected since 2000, which in combination indicate serious systemic flaws in environmental biosecurity. As outlined in the next section (and detailed in the book *Feral Future*[1]) the Australian environment has suffered major losses due to invasive species. The rate of new incursions detected since 2000 suggests we have not yet learnt the lessons from past mistakes.

We urge the committee to dig forensically into the examples of recent incursions to identify the flaws that have led to a continued flow of new invasive species into Australia. Because biosecurity decision-making is often secretive (and those involved in processes are often government employees and not free to speak out), and because limited information is published, we have found it difficult to obtain detailed information about many aspects of these cases. We urge the committee to obtain as much information as possible and recommend reforms that facilitate ongoing parliamentary and public scrutiny.

There has been very little parliamentary scrutiny of environmental biosecurity. Since 2000, there have been more than a dozen senate inquiries into specific biosecurity failures or perceived inadequacies, all initiated for industry reasons. Just one had relevance to the natural environment (Asian honeybees but the focus was mainly economic) and one broad inquiry into biosecurity occurred more than 10 years ago.

We wish the inquiry well. It is one of the most important environmental inquiries the committee has conducted. Unless environmental biosecurity is greatly strengthened, new invasive species will continue to arrive and establish with deadly consequences for biodiversity.

1.1 AUSTRALIA'S ENVIRONMENTAL BIOSECURITY TRACK RECORD

There is considerable rhetoric about Australia's 'enviable biosecurity system' and our relative freedom from harmful exotic species. While Australian biosecurity does have many world-leading features and our agricultural industries enjoy trade advantages due to freedom from many of the world's most damaging pests and diseases, there is nothing enviable about our record on environmental biosecurity.[2] Australia is a world leader in the extent of invasive species threats to the environment. Invasive species have already caused the extinction of more than 40 Australian mammals, birds and frogs, and are second only to habitat loss in the numbers of Australian species and ecological communities they threaten.[3] We lead the world in mammal extinctions due to invasive predators, and many more mammals are on the brink.[4] More than 70% of 1700 species listed as nationally threatened and more than 80% of listed ecological communities are imperilled by introduced animals, plants or diseases (Box 1). Invasive species such as fire-promoting weeds and hard-hoofed herbivores cause extensive damage, and have altered the ecological character of many landscapes – for example, weeds account for 43% of the 120 most widely distributed plant species in New South Wales.[5] Australia's most recent State of the Environment report (2011) gave the worst possible ratings for invasive species impacts on biodiversity: 'very high' and 'deteriorating', and found that management outcomes and outputs are 'ineffective'. One of many critical comments was that:

> Government responses to invasive species are uncoordinated at the national level, reactive, focused on larger animals, biased towards potential impact on primary industry at the expense of the total ecosystem, and critically under-resourced.[6]

The damage already done is mostly due to species that came into the country long ago when biosecurity systems were rudimentary and focused primarily on agricultural and health risks. But as this submission makes

[1] Low (1999)
[2] As one rough indicator, Australia has more than half the species in a List of 100 of the World's Worst Invasive Alien Species, not including the several which are Australian natives (Lowe et al. 2000).
[3] Invasive Species Council (2008)
[4] Fitzsimons et al. (2010)
[5] Stohlgren et al. (2011). Of 13 regions, NSW was second highest after North America, where aliens accounted for 51.3% of the 120 most widely distributed plant species.
[6] State of Environment 2011 Committee (2011)

clear, new invaders are still arriving at a rapid rate, and many are likely to cause great harm to the natural environment in the future. As well as the accidental and illegal introductions that are the focus of this inquiry, there are deliberate and legal introductions – for example many weeds – that are also a threat to biodiversity.

BOX 1. INVASIVE SPECIES STATISTICS

Numbers of exotic species

Exotic species	Plants	Vertebrates (not fish)	Freshwater fish	Invertebrates (not marine)	Marine organisms	Others (eg pathogens & fungi)
Introduced	~30,000	~650	~1200	Unknown	Unknown	Unknown
Naturalised	>3,000	~60	41	Unknown	250-500	Unknown

Invasive species threats to biodiversity

- Weeds and pests threaten 61% of nationally listed threatened species [7]
- Diseases (mostly exotic) threaten 15% of nationally listed threatened species[8]
- Invasive species threaten >80% of nationally listed ecological communities
- 95 bird taxa are threatened by invasive predators[9]
- Feral cats are the current dominant threat to threatened mammal species[10]

Extinctions due substantially to invasive species

- 25 mammals (19 species, 6 subspecies), including the Christmas Island pipistrelle, mostly due to cats and foxes
- 13 island birds (3 species, 10 subspecies) due mainly to rats, cats and pigs
- 4 frogs due to chytrid fungus
- 4 plants due to weeds
- 1 lizard

How Australia compares globally on invasive species

Australia ranks globally as one of the worst affected countries – in terms of numbers of invasive species and for the ecological damage sustained. (Global data is scarce, so comparisons are difficult.)

- Highest number of mammal extinctions due to invasive species (34% of global extinctions since 1500)[11]
- Highest number of invasive trees and shrubs (29% of global total)[12]
- Probably the highest or second highest number of naturalised plant species[13]
- One of the highest densities of exotic plant species[14] and extent of widespread weeds[15]

Note: These statistics deal only with exotic species already well established in Australia.

[7] Evans et al. (2011)
[8] Evans et al. (2011)
[9] Garnett & Crowley (2000)
[10] Woinarski et al. (2014).
[11] Woinarski et al. (2014)
[12] Richardson & Rejmánek (2011)
[13] Vitousek et al. (1997), Simberloff et al. (2012). According to the latter, the US has < 3000 naturalised plant species, so probably fewer than Australia.
[14] Vitousek et al. (1997). Third to New Zealand and Coterminus US, but more recent information suggests Australia has a higher density than the US.
[15] Stohlgren et al. 2011.

1.2 DIFFERENCES BETWEEN AGRICULTURAL AND ENVIRONMENTAL BIOSECURITY

In many ways, environmental biosecurity is much more challenging than that needed for primary industries. The 'one biosecurity' approach to biosecurity advocated by the 2008 Beale review requires recognising differences as well as similarities in biosecurity for industry and environmental purposes.[16] Although many invasive species affect both agricultural and environmental assets and warrant a joint approach, protecting nature differs in many ways from protecting industry assets, including in the following ways.

The values to be protected: Conservation requires a biosecurity focus on the hundreds of thousands of species, and their populations and interactions that constitute ecosystems. In contrast, industry biosecurity is focused on protecting far fewer economically valuable species. The values at stake for industry are quantifiable in economic terms and often replaceable (by new breeds, species or enterprises). The values at stake in conservation are typically irreplaceable – each species and ecosystem is important – and 'there are no generally accepted methods for valuing' them.[17] This means they are more likely to be ignored or undervalued when biosecurity priorities are decided.

Scale and complexity of threats: Because of the diversity and complexity of the natural environment, there are far more invasive species that threaten or potentially threaten environmental values than production values. For example, a 2003 analysis found that about twice as many weed species were a 'major problem' in natural ecosystems (798 species) as were a major problem to agricultural enterprises (426 species).[18] The threats are often more complex, influenced by interactions between species, ecological processes (such as fire regimes) and other threats such as habitat fragmentation.

State of knowledge: The 2008 review of biosecurity found that 'Australia has a relatively poor knowledge of the biosecurity threats to its natural environment', largely due to 'the absence of commercial incentives' and low priority for government funding.[19] Much more is known about cultivated species and the invasive threats to them than about biodiversity and invasive species threats. [20]

Predictability and timeframes: While impacts on individual cultivated species can be predicted with reasonable accuracy, there are high levels of uncertainty in predicting impacts in the natural environment due to complex interactions, long timeframes and lack of knowledge. . Invasive impacts in the natural environment may not be observed for decades due to lag effects, lack of monitoring or their insidious nature. A cow killed by a new pathogen is much more easily detected than a dead bird in a forest. The combination of great uncertainties, long timeframes and limited management options warrants a highly precautionary approach.

Management approaches and options: There are many more management options in relatively simple, delimited agricultural systems than there are in complex natural environments. Weeds in agricultural systems are generally much more detectable than in complex habitats such as rainforest and weeds cannot be controlled with broadacre mechanical or chemical control in many natural situations. In response to the recently introduced myrtle rust, plant industries can use fungicides, breed resistant varieties or use tolerant species, none of which are options in the natural environment. There are commercial incentives for industry management of invasive species but environmental biosecurity relies on government and community investment for the public good.[21]

Stakeholders and resources: A multitude of stakeholders, often with conflicting agendas, make environmental biosecurity a much more socially and politically challenging policy area than industry biosecurity. Some of the most damaging environmental invaders are ignored because of economic or social reasons that are rarely

[16] Beale et al. (2008)
[17] Biosecurity Advisory Council (2011)
[18] Groves et al. (2003)
[19] Beale et al. (2008)
[20] Burgman et al. (2009)
[21] Beale et al. (2008)

subject to cost-benefit analysis – invasive pasture grasses, for example. Commercial incentives and government support also mean that industry biosecurity is better resourced than environmental biosecurity.

Some implications of these differences

- Biosecurity policy needs to be shaped by ecological principles and address biodiversity priorities, rather than be an add-on to agricultural biosecurity.
- Because of ecological uncertainties and limited management options, applying the precautionary principle is vital.
- Biosecurity policy units and advisory bodies need more ecologists and conservationists.
- Biosecurity should be a high and joint priority for both environmental and agricultural agencies.
- There needs to be more research into potential environmental invaders, the impacts of invasive species on biodiversity and their environmental management.
- The imbalance in resources for industry and environmental biosecurity needs to be redressed with increased public funds going to public good biosecurity priorities whilst maintaining competent industry biosecurity capacity.
- There is need for an environmentally meaningful way of quantifying and prioritising environmental threats and comparing threats across sectors.
- Post-border biosecurity needs to be much more preventive and ecologically defensive.
- Environmental biosecurity needs meaningful involvement of the community and environmental NGOs in policy development.

2. RECENT BIOSECURITY PERFORMANCE

- Listed in this section are species with the potential for environmental harm detected since 2000 at large in the environment (incursions) and at the border or illegally in the possession of people (interceptions). These figures likely represent only a proportion of actual incursions due to lack of surveillance and reporting.
- Incursions – established in the wild (naturalised):
  - Not permitted in Australia – 24 species consisting of three vertebrate species, ten invertebrates, eight plants and three pathogens.
  - Permitted for keeping in parts of Australia – 12 species that have escaped or been released into the wild and may have established breeding populations, mostly aquarium fish.
- Incursions – not established in the wild (exotic non-fish vertebrates only):
  - 29 exotic species (249 individuals) from 1999–2010 exotic vertebrates with an assessed moderate to serious risk of establishment. The number increased significantly from 1999-2010.
- Interceptions – exotic vertebrate species (not fish) detected at the border or in human possession:
  - Seized, surrendered or stolen from private keeping – 67 species and > 780 individuals detected from 1999-2010, most of which were kept illegally as pets.
  - Smuggled animals intercepted at the border – around 40 species from 1999–2010 (only a proportion of interceptions due to limited AQIS data).
  - Stowaways intercepted at the border – > 60 species with moderate to extreme risk of establishment from 2003–2010, three-quarters of which were sea arrivals.
- The interception patterns show significant problems with illegal and legal keeping of exotic vertebrates in Australia.
- Species identified on DAAF Australia's 'most unwanted' list : 386 interceptions from 2009–2012, including 94 of the giant African snail and 152 of the lesser auger beetle.
- Information about incursions and interceptions is held by disparate sources or does not exist for many species, so most of the data provided in this submission is far from comprehensive.
- The quality of information provided by different states and territory agencies varies considerably, and the data collected by the national biosecurity agency is deficient and lacks detail.
- This lack of data greatly undermines the capacity to analyse pathway risks and trends. We need to develop nationally agreed protocols for collecting data and establish a publicly accessible data repository.
- There has also been limited analysis of current gaps in environmental biosecurity and a lack of reviews of responses to incursions. There has been almost no scrutiny on environmental biosecurity performance by the Australian Parliament in contrast to considerable scrutiny of agricultural biosecurity issues.

In this section we consider recent biosecurity performance in terms of six categories of exotic organisms of biosecurity concern detected since 2000 as incursions (organisms detected at large in the environment) or interceptions (detected at the border or in human possession).

Incursions (detected at large in the environment)	**Naturalised** (established in self-sustaining populations in the wild)	Organisms not permitted in Australia (including species that have been or are in the process of being eradicated)
		Organisms permitted for keeping in part or all of Australia
	Not naturalised	Organisms not permitted in Australia
Interceptions (detected at the border or in human possession)	**Illegal**	Organisms seized, surrendered or stolen from private keeping
		Smuggled goods intercepted at the border
	Accidental	Stowaways intercepted at the border

2.1 INCURSIONS

Relevant to ToR (a)(i): the extent of detected incursions, including numbers, locations and species, and their potential future environmental, social and economic impacts

We list 36 examples of incursions detected since 2000 that have resulted in the establishment of organisms likely to cause environmental harm.

Table 1 lists 24 examples of 'incursions – naturalised' of organisms not permitted in Australia that have been detected since 2000 that are likely to have harmful environmental consequences. Ten are the subject of case studies in the attached document. These represent failures of biosecurity to prevent entry and establishment. Many also represent failures to eradicate.

The 24 species in Table 1 consist of three vertebrate species, ten invertebrates, eight plants and three pathogens. There are no marine species in the table but new marine incursions are much harder to detect and there is little systematic port monitoring.

Some of these species are likely to have been in Australia some years before being detected. Due to a lack of systematic surveillance and public reporting on incursions, the species in Table 1 probably represent only a proportion of potentially harmful incursions.

All organisms listed are or probably are currently established in the wild in Australia (Mexican feathergrass may not be, having been eradicated from two sites, and we are uncertain about the status of a couple of the weed species). All except three are thought to be new incursions for Australia. Yellow crazy ants, Argentine ants and African big-headed ants have long-established populations in some parts of Australia but the recent incursions are in new regions (islands in the case of the latter two species).

The actions taken in response to these incursions have ranged from no action at all to attempted eradication. There are national eradication programs (under cost-sharing arrangements) under way for five of the listed species. In two cases, a national eradication attempt was abandoned after a decision that it was no longer feasible and two were rejected as candidates for national eradication for this reason. There has been little or no action in probably at least eight cases.

Mistakes inevitably happen, but the multitude of new or repeated incursions of serious invasive threats into Australia and in most cases their subsequent establishment suggest systemic flaws in biosecurity. More than half are thought to be the result of accidental introductions – most probably arriving with cargo. Four are probably due to illegal introductions. In almost all cases, the specific pathway is not known.

Table 2 lists 12 examples of 'incursions – naturalised' of animal species that are permitted for private keeping in part or all of Australia that have escaped or been released into the wild and have or may have established breeding populations. Almost all are aquarium fish released illegally into waterways. Of 40 exotic fish species known to have established in Australian waterways, up to 30 were imported as aquarium fish.[22] One is the subject of a case study.

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Table 3 lists >20 examples of 'incursions – not naturalised'. They are exotic non-fish vertebrates only, detected in the wild from 1999-2010 and assessed as having a moderate to serious risk of establishment. Two are the subjects of case studies. The Asian black-spined toad was detected in the wild for the third time earlier this year and whether it has established a population in Victoria has not yet been confirmed or ruled out (case study 5).

The organisms listed in Table 3, with numbers summarised in Table 4, exemplify failures of biosecurity to prevent entry and escape or release but they also represent success in detection, and in some cases removal/eradication before establishment. They come from an analysis by Henderson and Bomford (2011),

[22] Lintermans (2004), Corfield et al. (2008)

who obtained data by requesting it from government agencies and from reports in the media. For animals not established in Australia, the number of species reported at large increased significantly over the decade analysed. Henderson and Bomford also received records for more than 7000 exotic fish detected in the wild (compared with 822 terrestrial vertebrates) but these are not included in their analysis (the majority of detected fish species were not identified by biosecurity agencies).

Table 1. INCURSIONS: organisms not permitted for import into or keeping within Australia, detected since 2000 as naturalised (including those since eradicated) with potential for environmental harm

There are case studies for each of the organisms in bold.

Organism	Years detected	Location	Likely pathway	Potential environmental impacts	Actions taken
Carder bee	2000	Qld, NSW	Presumed accidental - unknown	Pollination of weeds, promoting their spread.	No action.
Red imported fire ant	2001, 2006, 2014	Qld	Accidental introduction with cargo	Dominates areas, displaces native ants & kills small animals. New incursions put at risk the ~$300 million eradication program.	Eradication program (national cost-sharing) in progress.
Yellow crazy ant	2001 & multiple years since	Qld, NSW	Accidental introduction with cargo (most likely timber)	Dominates areas, displaces native ants & kills small animals. (Ecosystem meltdown on Christmas Island.)	Eradicated in NSW. Eradication abandoned in Qld but proceeding in Wet Tropics (federal funding).
Koster's curse (*Clidemia hirta*)	2001	Qld	Accidental introduction, possibly as a contaminant of packaging material	Forms dense thickets that smother native vegetation.	Eradication program (national cost-sharing) in progress ('Four Tropical Weeds' program).
Limnocharis (*Limnocharis flava*)	2001	Qld	Unknown?	Serious weed of shallow water. Displaces native plants and animals. Restricts water flow and traps silt.	Eradication program (national cost-sharing) in progress ('Four Tropical Weeds' program).
Black slug (*Arion ater*)	2001, 2009	Vic, Tas	Accidental introduction	Omnivorous & large, could threaten native snails.	No action.
Miconia racemosa	2002	Qld	Unknown	Rainforest shrub that could compete with native plants.	Eradication program (national cost-sharing) in progress ('Four Tropical Weeds' program).
African big-headed ant (Lord Howe Island)	2003	Lord Howe Island	Accidental introduction – probably on building materials	Predation of many invertebrates, monopoly of food and displacement of native ants.	Under eradication. Control started in 2008.
Mexican feather grass (*Nassella tenuissima*)	2004, 2008	NSW, ACT	Illegal introductions – mistakenly sold (wrongly labelled), can be bought on	Potential to dominate woodlands and grasslands.	Removal from sale, tracing of sold plants, some populations eradicated.

			Ebay.		
Miconia nervosa	2004	Qld	Unknown	Rainforest shrub that could compete with native plants.	Eradication program (national cost-sharing) in progress ('Four Tropical Weeds' program).
Emerald furrow bee	2004	NSW	Presumed accidental – unknown	Competition for resources, disease spread, weed pollination, disruption of pollination of native plants.	Surveys in 2008 (funded by philanthropy).
Red-eared slider turtle	2004, 2005 2006, 2007	Qld, Vic, ACT, NSW	Illegal introductions – often smuggled into Australia, released by pet-keepers	Competition with native turtles and predation of native species.	Possibly eradicated in Qld, not attempted in NSW.
Argentine ant (Norfolk Island)	2005	Norfolk Island	Accidental introduction – presumably with cargo	Could threaten several rare birds.	Control undertaken, eradication commenced 2014.
Climbing perch	2005	Torres Strait	Uncertain – may be natural spread from PNG or illegal or accidental introduction.	Potentially major impacts on native fish if fish arrives on the mainland.	No action?
Electric ant	2006	Qld	Accidental introduction with cargo	Dominates areas, displaces native ants & kills small animals.	Eradication program (national cost-sharing) in progress.
Asian honey bee	2007	Qld	Accidental introduction on ship from New Guinea	Competition with native species for pollen & nectar & nesting cavities.	Eradication attempted (national cost sharing), then abandoned.
Candyleaf (*Stevia ovate*)	2007	Qld	Unknown	Competition with native plants.	Unknown.
Green shrimp plant (*Ruellia blechum*)	2008	Torres Strait islands	Unknown	Competition with native plants.	Unknown.
Hairy Croton (*Croton hirtus*)	2008?	Qld	Accidental – found at RAAF base at Weipa.	Competition with native plants	Unknown.
Myrtle rust	2010	NSW	Accidental introduction - unknown pathway	Infects hundreds of Myrtaceae species, including threatened species.	Eradication attempted (national cost sharing), then abandoned.
Hemileia wrightiae	2010	NT, Qld	Presumably accidental introduction	A fungus that infects plants in genus *Wrightia* (4 species in Australia, 2 known to be infected).	No action.
Pigeon	2011	Vic	Unknown but	Potentially infects a	Containment

paramyxovirus			suspected illegal introduction via a smuggled bird	wide range of native bird species with a high rate of mortality.	actions only
Smooth newt	2013	Vic	Illegal introduction – likely release by pet keeper	Predation of and competition with native frogs, fish and other species, could be toxic to predators.	No action apart from some surveys – national eradication proposal rejected.
European ant	2014	WA	Accidental introduction – via cargo?	Established near Perth airport?	Eradication underway?

Table 2. INCURSIONS (naturalised) of organisms permitted for keeping in part or all Australia, with high potential for environmental harm, detected since 2000

Organism	Years detected	Location	Likely pathway	Potential environmental impacts	Actions taken
Jewel cichlid	2000	NT, Qld	Released from aquaria	Unknown – possibly competition and introduction of diseases.	Eradicated from a creek near Darwin. Otherwise unknown.
Blue acara	2000	Vic	Released from aquarium	Unknown – possibly competition and introduction of diseases.	Unknown
Three-spot gourami	2000	Qld	Released from aquarium	Unknown – possibly competition and introduction of diseases.	Unknown
Hybrid cichlid (*Labeotropheus/Pseudotropheus*)	2001	Vic	Released from aquarium	Unknown – possibly competition and introduction of diseases.	Unknown
Speckled mosquito fish	2002	NSW	Released from aquarium	Likely to be harmful due to predation, competition, aggression and the introduction of parasites.	Eradicated by the NSW government.
White cloud mountain minnow	2002	NSW, Qld	Released from aquarium	Unknown – possibly competition	The release of native bass fingerlings

				and introduction of diseases.	for biological control didn't work. A 2007 eradication proposal was not funded.
Jack Dempsey cichlid	2004	NSW	Released from aquarium	Little known – this aggressive fish could displace native fish.	Unsuccessful eradication effort in 2004-05
Redclaw crayfish	2004, 2011	NSW	Unknown – possible escape from aquaculture or farm dam or release from aquarium	Native to northern Australia – could compete with native species.	None
Indian ringneck parrot	2005-2007	WA	Escapes or releases by pet-keepers.	Competition with native parrots.	Removed from the wild in WA. Many free-living birds in urban areas in eastern Australia.
Pearl cichlid	2008	NSW	Released from aquarium	Little known – this aggressive fish could displace native fish	None
Pearl eartheater	2009	NSW	Released from aquarium	Unknown	None?
Ferret	Multiple unconfirmed	Tas, Vic, WA	Escapes from pet-keepers.	Predation of native animals, with ground birds at particular risk. Biosecurity officers have not been able to confirm the presence of wild populations.	Attempts to confirm reports of populations.

Table 3. INCURSIONS (not known to be naturalised) – vertebrates detected in the wild 1999-2010 considered to be moderate to extreme or unknown risk of establishing (based on Henderson and Bomford 2011)

Species	Number incidents / number detected	Location
Asian black-spined toad	2 / 2	Vic, WA
Blackbuck	1 / 3	Qld
Rhesus macaque	1 / 1	Vic
Japanese macaque	1 / 2	Qld
Ferret	8 + / 9 + populations	NSW, Tas, Qld
Macaque (species not specified)	1 / 1	NSW
Chukar partridge	? / 1	Tas
Blue and gold macaw	1 / 1	SA
Canada goose	2 / 5	NSW
House crow	9 / ~17	NSW, WA
Indian ringneck parakeets	96 / ~161	NSW, WA
Lovebird (species not specified)	2+ / 2+	WA, NT
Mississippi alligator	1 / 1	NSW
Boa constrictor	3 / 4	Vic
Chinese box turtle	1 / 1	Qld
Corn snake	6 / 7	Qld, Vic
Alligator snapping turtle	1 / 1	NSW
Hermann's tortoise	3 / 3	SA, Qld
Asiatic painted frog	1 / 1	NSW
Newt (species not specified)	1 / 1	Vic
Frog (species not specified)	1 / 1	Vic
Lizard (species not specified)	1 / 1	Vic

Notes: This table differs from Table 1 in Henderson and Bomford (2011) in excluding species already definitely naturalised (such as feral deer species, Barbary doves, five-striped palm squirrels) and excluding species considered a low risk of establishment. There is a possibility that 3 of the species listed have established in the wild – Indian ringneck parakeet, ferret and Asian black-spined toad. Not listed are several species that escaped enclosures and were at large within a zoo. Animals stolen from zoos and subsequently detected alive in the wild are reported. Henderson and Bomford calculated establishment risk scores for birds and mammals from Bomford (2008) and for reptiles and amphibians from Bomford et al (2009), using instructions in Bomford (2008).

Table 4. Numbers of exotic vertebrates (excluding fish) detected in the wild, 1999-2010, not known to be naturalised (Henderson et al. 2011)

	Number of species detected	Species with moderate-serious risk of establishment	Number of incidents	Number of individuals detected
Mammals	9	4	17+	24+
Birds	7	5	165+	200+
Reptiles	9	6	18	20
Amphibians	4	2	5	5
Total	29	17	205+	249+

2.2 INTERCEPTIONS

Relevant to ToR (a)(iii): the extent of quarantine interceptions of exotic organisms with the potential to harm the natural environment, including numbers, locations, species and potential impacts

There is very limited public information about interceptions. In response to a question on notice in January 2013 – 'Does the department have an annual summary document detailing interceptions of exotic organisms, including numbers, species, locations and countries of transport origin; if so, can copies be provided for the past 3 years, from 2009 to 2012' – the agricultural minister said, 'No'.[23] The only information he provided was for 10 species on the DAFF list of Australia's 'most unwanted' (Table 5), not all of which are environmental threats, and most of which have not been selected as priorities for their environmental impacts. Only for half of them does DAFF's explanation of their 'risk to Australia' include any reference to the natural environment.

Table 5. Interceptions of Australia's 10 'most unwanted', 2009-2012

Species	Interceptions	DAFF website explanation of 'Risk to Australia'
Asian gypsy moth (*Lymantria dispar*)	23	The caterpillars feed on the leaves of more than 600 species of trees, such as oak, birch, aspen, eucalyptus, holly, rose, fruit trees and ornamental plants. The spread of Asian gypsy moth could have devastating effects to our agribusiness and horticultural industries.
Asian longhorn beetle (*Anoplophora glabripennis*)	1	A wood-boring pest that usually targets hardwood trees such as elm, willow, poplar, maple and a variety of fruit trees. Has the potential to devastate Australia's apple and pear plantations and destroy forests and native bush. Perfectly healthy trees can become quickly overcome by the beetle's attack and often die as a result. It can also cause serious damage to parkland trees and timber structures in houses.
Asian tiger mosquito (*Aedes albopictus*)	11	A major human and livestock health risk. Its bite can spread serious diseases such as dengue fever, yellow fever and several types of viral infections that can cause encephalitis.
Black spined toad (*Bufo melanostictus*)	25	Potentially more damaging than the cane toad and could become established in the cooler parts of Australia. Being a carnivore, the black spined toad could cause significant damage to Australia's natural environment. It competes with native frogs and toads for food and habitats, and is likely to carry exotic parasites or disease.
Burnt pine longicorn beetle (*Arhopalus ferus*)	58	Could have devastating effects on our forest and construction industries. The larvae damage pine timber, used for construction, by tunnelling in the wood and reducing the quality of the timber.
Formosan termite (*Coptotermes formosanus*)	8	Forms large colonies, which can quickly cause major structural damage to timber and timber components in housing and furniture. Has the potential to devastate Australia's forests and native bush as well as a major impact on timber-based industries.
Giant African snail (*Achatina fulica*)	94	Feed on more than 500 species of plants, including legume crops, ornamental plants, vegetables and the bark of large trees such as citrus and pawpaw. A serious risk to horticultural industries; their ferocious appetite is capable of destroying vegetable crops, fruit trees and Australia's native eucalypt forests.
Giant honey bee (*Apis dorsata*)	12	Carries a range of internal and external parasitic mites that could infest bees, resulting in a rapid reduction of domestic and commercial bee hives. This could cause serious damage to the Australian honeybee industry and related industries such as pollination providers.

[23] Minister for Agriculture, Fisheries and Forestry (2013).

Khapra beetle (*Trogoderma granarium*)	2	Feed on dried plant and animal products with a preference for grain and stored products. A risk to Australia's grain industries and could jeopardise our export grain markets.
Lesser auger beetle (*Heterobostrychus aequalis*)	152	Feeds on various hardwood timbers and bamboo. The damage is caused by larvae tunnelling in the wood which significantly reduces the quality of the timber. Could have devastating effects on Australia's furniture and timber industries and native forests.

Notes: It seems this list was developed in 2008 for a communication campaign for the cargo and shipping community. We are not aware of its status in biosecurity processes.

Henderson and Bomford (2011) compiled data for the Invasive Animals CRC from a variety of sources on intercepts of exotic vertebrates (but not fish), mostly from 1999-2010. Extracts from their data are shown in Tables 6-8.[24] They provided detection records for 137 identified species of exotic terrestrial vertebrates that are not currently established in Australia, plus 49 species that were not identified to species level but were in distinct genera or families not native to, or established in, Australia.[25] The majority of detections were reported as interceptions from illegal keeping, and the majority of species (about half) were reptiles.

Table 6 lists >60 examples of exotic vertebrates seized, surrendered or stolen from private keeping that were assessed as being at moderate to extreme risk of establishing in Australia. Most were being kept illegally as pets. They represent a biosecurity risk if they escape or are released into the wild either because of direct impacts on native species or the spread of disease. Smooth newts and red-eared sliders are examples of incursions likely to have been due to release by illegal keepers. The most commonly seized or surrendered reptiles were corn snakes and boa constrictors, both with a serious risk of establishment. Green iguanas, leopard geckos, veiled chameleons and Burmese pythons were seized in multiple incidents in more than one state.

Table 7 lists ~40 exotic vertebrate species detected in illegal import incidents and considered to be a moderate to extreme risk of establishing. Most of the information obtained by Henderson and Bomford (2011) came from Customs or AQIS or online media sources. The list is only a proportion of interceptions because the AQIS data was limited to intercepted animals that were selected for further processing. Other animals may have been destroyed without identification or reporting. AQIS information was only available back to 2003, and did not include details of the number of animals or whether the incident involved a smuggling or stowaway event. At least 155 snakes were detected in smuggling incidents, most in the mail. The most numerous were corn snakes, rainbow boas and Burmese pythons. At least 17 species of turtle were detected; 60 red-eared sliders were found in one passenger's luggage. More than 7000 fish were detected as illegal imports (16 incidents), mostly in air cargo and aquarium imports. Most fish were not identified to species level.

Table 8 lists >60 exotic vertebrates or vertebrate groups intercepted as stowaways from 2003–2010 assessed to be a moderate to extreme (or unknown) risk of establishment. The most numerous were reptiles, amphibians and birds. They included more than 79 Asian black-spined toads. About three-quarters of the interceptions recorded by AQIS involved stowaways from sea arrivals.

The exotic vertebrates listed in Tables 6-8 all represent potential future invasive species. There should be analysis of the patterns of interceptions and pathways to inform biosecurity risk assessments and allocation of resources. For example, frequently intercepted species with extreme or serious risks of establishment – smuggled species (corn snakes, eastern kingsnakes, Horsefield's tortoises, rainbow boas and red-eared sliders) and stowaway species (Asiatic painted frogs, black-spined toads, flat-tailed house geckos and Tokay geckos) – should be high priorities for surveillance and compliance efforts.[26] The interception patterns show that illegal and legal keeping and trading of exotic vertebrates in Australia are significant problems.[27]

[24] Henderson and Bomford (2011)
[25] Henderson et al. (2011)
[26] Henderson and Bomford (2011)
[27] Henderson et al. (2011).

Table 6. INTERCEPTIONS: exotic vertebrates seized, surrendered or stolen from private keeping (1999–2010) assessed to be a moderate to extreme risk of establishment (based on Henderson and Bomford 2011)

Species	Number of incidents / number of animals	Location
Cheetah	1 / 1	Qld
Blackbuck	1 / ?	SA
Common marmoset	1 / 4	NSW
Five-striped palm squirrel	3 / ~50	NSW, Vic
Crab-eating macaque	1 / 1	Vic
Japanese pig-tailed macaque	1 / 1	Vic
Ferret	1 / 1	Qld
Meerkat	1 / 1	SA
Baboon (species not specified)	1 / 2	Vic
Lemur (species not specified)	1 / 1	Qld
Monkey (species not specified)	1 / 3	Qld
Blue and gold macaw	3 / 4	NSW, Vic
Bobwhite quail	1 / 7	WA
Tricoloured nun	2 / ?	WA
Monk parrot	2 / ?	WA
Nanday conure	1 / ?	WA
Java sparrow	1 / 1	WA
Mississippi alligator	1 / 1	Vic
Puff adder	1 / 1	Vic
Gaboon viper	1 / 2	Vic
Boa constrictor	79+ / 153	NSW, Qld, Vic, WA
Dumereil's ground boa	1 / 3	Vic
Veiled chameleon	10 / 15	NSW, Vic
Common snapping turtle	1 / 1	Vic
Trinket snake	2 / 4	Vic
Chinese box turtle	1 / 1	Qld
Russell's viper	1 / 1	Vic
Baird's rat snake	1 / 2	NSW
Corn snake	51 / 158	NSW, Qld, SA, Vic, WA
Rat snake	4 / 11	NSW, Vic
Rainbow boa	3 / 15	NSW, Vic
Leopard gecko	10+ / 43+	NSW, Vic
Yellow anaconda	1 / 1	Vic
South American red-footed tortoise	1 / 3	NSW
Indian star tortoise	1 / 2	WA
African spurred tortoise	1 / 1+	NSW
Kenyan sand boa	3 / 10	NSW, Vic
Africa fat-tailed gecko	2 / 2	Vic
Western hognose snake	1 / 4	Vic
Green iguana	10 / 17	NSW, SA, Vic
Bell's hinged back turtle	1 / 1	WA
Grey banded kingsnake	3 / 5	NSW, Vic
Kingsnake	4 / 32	NSW, Vic
Milksnake	5 / 11	NSW, Vic
Rosy boa	1 / 2	Vic
Alligator snapping turtle	1 / 1	Vic

Monocled cobra	1 / 9	Vic
King cobra	2 / 6	NSW
Burmese python	11 / 14	NSW, Qld, Vic, WA
Ornate box turtle	1 / 1	NSW
Spur-thighed tortoise	1 / 1	WA
Red-eared slider	38+ / 115+	NSW, Qld, SA, Vic, WA, Tas
Chameleon (species not specified)	1 / 1	Vic
Rattle snake (species not specified)	3 / 9	Vic
Iguana (species not specified)	3 / 13	Qld, SA, Vic
Kingsnake (species not specified)	1 / 3	Vic
African house snake (species not specified)	1 / 1	Vic
Cape cobra (species not specified)	1 / 3	Vic
Bull snake (species not specified)	1 / 2	Vic
Garter snake (species not specified)	2 / 2	Vic
Pond slider (species not specified)	1 / 1	WA
Horned viper (species not specified)	1 / 2	Vic
Fire-bellied toad (species not specified)	1 / ?	NSW
European newt (species not specified)	1 / 5	Vic
Snakehead (species not specified)	1 / 1	NSW
Piranha	2+ / ?	SA
Freshwater shark	1 / ?	NSW

Table 7. INTERCEPTIONS: Exotic vertebrates intercepted as illegal imports at the border 1999–2010 considered to be a moderate to extreme risk of establishment (based on Henderson and Bomford 2011)

Species	Number of incidents / number of animals	Location
Chinchilla	1 / 4	Brisbane
Blue and gold macaw	2 / 11	Perth, Sydney
Lory	1 / 2	Perth
Fig parrot	1 / 3	Perth
Lorikeet	1 / 2	Perth
Lory	1 / 1	Sydney
Parrot	6 / 154	Brisbane, Melbourne, Perth
Pigeon	4 / 11	Melbourne
Poultry	5 / 107+	Melbourne, Sydney
Asian finch	1 / 2	Sydney
Bird	4 / 28	Melbourne, Sydney
Duermils boa	1 / 8	?
Boa constrictor	2 / 3	Adelaide
Painted turtle	1 / 1	Sydney
Malaysian box turtle	1 / 1	Fremantle
Bairid's rat snake	½	NSW
Corn snake	2 / 29	NSW
Stripe-tailed rat snake	1 / 1	Sydney
Rainbow boa	3 / 13	Adelaide, NSW
Leopard gecko	2 / 5	Sydney
South American red-footed tortoise	1 / 3	unknown
Indian star tortoise	1 / 2	Fremantle
East African sand boa	1 / 1	Sydney
Green Iguana	2 / 5	NSW
iNdian tent tortoise	1 / 1	NSW

Eastern mud tortoise	1 / 1	NSW
Kingsnake	3 / 6	NSW
Milk snake	1 / 2	unknown
Rosy boa	2 / 2	Sydney
Alligator snapping turtle	2 / 3	Melbourne, uknown
Burmese python	2 / 12	NSW, unknown
Reticulated python	1 / 1	Sydney
New Caledonian Guichenot's giant gecko	1 / 3	Sydney
Razon back musk turtle	1 / 1	Sydney
Common musk turtle	1 / 1	Sydney
Spur-thighed tortoise	1 / 1	WA
Hermann's tortoise	1 / 4	unknown
Horsefield's tortoise	3 / 7	Brisbane, unknown
Red-eared slider	5 / 67+	Brisbane, Fremantle, Sydney

Note: There were also 12 intercepts in which the species was not specified, so the risk of establishment could not be assessed.

Table 8. INTERCEPTIONS: Exotic vertebrates intercepted as stowaways entering Australia 2003–2010 assessed to be a moderate to extreme (or unknown) risk of establishment (based on Henderson and Bomford 2011)

Species	Number of incidents / number of animals	Location
Bat (species not specified)	9 / 9+	NSW, Vic, WA
Rodent (species not specified)	9 / 12+	NSW, NT, Qld, Vic, WA, Tas
Mammal	3 / 3+	Vic, WA
Crested myna	1 / 1	NSW
Common quail	1 / 1+	
Red junglefowl	1 / 1+	Qld
Various birds (species not specified)	158 / 159+	NSW, Qld, Vic, WA
Carolina anole	1 / 1+	Vic
Brown anole	1 / 1+	Vic
Changeable lizard	6 / 6+	NSW, Qld, Vic
Bibron's thick-toed gecko	1 / 1+	WA
Skin-shedding gecko	6 / 6+	NSW, NT, Qld, Vic
Tokay gecko	11 / 11+	Qld, Vic, WA
Giant gecko	1 / 1+	NSW
Spotted house gecko	4 / 4+	NSW
Yellow-bellied house gecko	1 / 1+	NSW
Flat-tailed house gecko	10 / 11+	NSW, NT, Qld, Vic
Turkish gecko	2 / 3+	Qld, Vic
Green iguana	1 / 1+	NT
Mourning gecko	6 / 6+	ACT, NSW, Qld
Wolf snake	1 / 1+	Vic
Chinese soft-shelled turtle	2 / 2+	NSW
Sinai agama	1 / 1+	NT
Burmese python	1 / 2+	Qld
Reticulated python	1 / 1+	Vic
Graham's crayfish snake	1 / 1+	Qld
Pond slider	3 / 3+	NSW, Qld
19 reptiles (species not specified)	288 / 303+	All states
Buergeria robusta	1 / 1	unknown

Black-spined toad	75 / 79+	NSW, Qld, Vic, WA
Ranger's toad	2 / 3+	Vic
Indus Valley toad	1 / 1	SA
European green toad	1 / 1	SA
foam-nest frog	1 / 1+	Qld
Chinese bullfrog	1 / 1+	NSW
Green tree frog	1 / 1+	Qld
Squirrel tree frog	1 / 1+	Qld
Grey tree frog	2 / 2+	NSW, SA
Western dwarf clawed frog	1 / 1+	NSW
Asiatic painted frog	18 / 20+	NSW, Qld, Vic, WA
Cuban tree frog	3 / 3+	Qld
Eastern spadefoot	1 / 1+	WA
Fiji tree frog	3 / 3+	NSW
Common tree frog	1 / 1+	NT
Hong Kong whipping frog	1 / 1+	Vic
African split-skin toad	1 / 1	WA
Various amphibians (species not specified)	9 / 48+	NSW, Qld, Vic, WA
Fish (species not specified)	4 / 4+	Vic, Qld

2.3 Adequacy of reporting

Relevant to ToR (b)(vii): the adequacy of reporting on incursions

For the inquiry to properly investigate the current state of environmental biosecurity (with respect to illegal and accidental introductions) it needs a comprehensive a list of recently detected incursions and interceptions with analysis of pathways, risks etc. The information required to do that is held by disparate sources or does not exist. To compile the data in Table 1 of recently detected naturalised incursions took considerable effort and is probably far from comprehensive because it is based only on information in the public domain. The only reasonably comprehensive compilation of data on recent incursions and interceptions that we are aware of is for exotic vertebrates in a report done for the Invasive Animals CRC.[28] It was compiled by requesting data from the federal, state and territory governments. Australia has reported some incursions to the International Plant Protection Convention but most reports are of organisms of agricultural concern.[29]

The lack of national data collection on environmentally relevant interceptions and incursions reveals a lack of national commitment to assessing risks and pathways and for tracking environmental biosecurity performance. This is essential information for understanding and improving environmental biosecurity. In their analysis of exotic vertebrate incursions and interceptions, Henderson et al. (2011) note that quantitative risk assessments for the establishment of exotic species are often hampered by a lack of data on incursions and interceptions at the initial stages of the invasion pathway. They say that 'a nationally coordinated framework for data collection and data sharing' in Australia 'is urgently required.' We consider it a very high priority for Australia to develop nationally agreed protocols for collecting data on interceptions and incursions (and the outcomes of any responses) and to establish a central publicly accessible repository for this data.

Henderson and Bomford (2011) noted that the quality of information provided by different state and territory agencies on exotic vertebrate interceptions and incursions varied considerably. Victoria and Western Australia had more extensive records than other states on incursions and compliance activities, detailing species, numbers, dates, locations and follow-up activities. Victoria had mapped all incursion/interception data. NSW's information on vertebrate pests detected at large was largely unrecorded in any official capacity.

[28] Henderson and Bomford (2011), also Henderson et al. (2011)
[29] International Plant Protection Convention (nd)

Even the data collected by the national biosecurity agency is seriously deficient. AQIS has a national incidents database for interceptions at the border, but the focus of this tends to be on plant pests and pathogens (presumably mostly of agricultural interest).[30] The data obtained by Henderson and Bomford on vertebrates was limited to intercepted animals selected for further processing (with other animals destroyed without identification or reporting). AQIS information also lacked details of numbers of animals per incident, and whether the incident involved a smuggling or stowaway event. For AQIS data on stowaways, only about half (47%) the incident reports identified the animal to species level. This undermines the capacity to analyse pathway risks and trends. The information on other groups of organisms is likely to be even less comprehensive than that for vertebrates.

RECOMMENDATIONS

1. For the purposes of this inquiry, compile lists of interceptions and incursions detected in Australia since 2000 by requesting information from relevant federal and state/territory agencies. Include information where available about the date and location of detections, likely origins and pathways, potential impacts and any actions taken.
2. Undertake an audit of current record-keeping practices and databases with records of interceptions and incursions.
3. Develop national protocols for collection of data on interceptions and incursions, and establish a national, publicly accessible database on interceptions, incursions and responses.
4. Obtain an agreement through COAG for all states and territories to supply specific information on interceptions and incursions to DAFF (or other agency). Require DAFF to publish annual reports on interceptions and incursions with sufficient information to allow for analysis of trends and biosecurity performance.

2.4 LEARNING FROM INTERCEPTIONS AND INCURSIONS – REVIEWS AND ANALYSES

Relevant to ToR (a) (iv) Any reviews or analyses of detected incursions or interceptions relevant to the environment and any changes in biosecurity processes resulting from those reviews or analyses.

One of the most important criteria for a robust biosecurity system is continuous learning from both failures and successes. As is clear from the lack of national data on interceptions and incursions, there has been little attempt to analyse current gaps in environmental biosecurity in Australia. It is being done to a large extent for agriculture but far from comprehensively for the environment, largely due to the lack of an environmental equivalent to the industry organisations, Plant Health Australia and Animal Health Australia, which monitor biosecurity performance on organisms of high priority for agriculture. Examples of reviews relevant to the environment are analyses by Henderson and Bomford (2011) on vertebrate incursions and interceptions, by Whittington and Chong (2007) on pathogens of imported fish, and by Corfield et al. (2008) on ornamental fish.

For the sake of continuous improvement, it is vital to review biosecurity responses to incursions. There have been regular reviews of ongoing eradication programs funded under national cost-sharing arrangements but they do not seem to be publicly available. There are also no publicly available reviews of failed eradication responses such as those for myrtle rust and Asian honey bees. We are aware there were two reviews, by Plant Health Australia and the NSW Department of Primary Industries, of the flawed emergency response to the myrtle rust incursion (see case study) but have been denied access to these reports. There has been a valuable review of tramp ant programs funded by Caring for our Country by Lach and Barker (2013), which exemplifies the sort of analysis needed to improve future programs.

There has also been almost no scrutiny of environmental biosecurity performance by the Australian parliament to date. We hope this inquiry is the start of a stronger parliamentary focus on environmental biosecurity. It is understandable that the biosecurity agency would focus more of its reform efforts in areas where scrutiny is

[30] Henderson and Bomford (2011)

most intense. Table 9 lists 17 senate inquiries since 2000 into specific biosecurity failures or perceived inadequacies initiated for industry reasons, of which one (on Asian honey bees) also had relevance to the natural environment. Several recent environmental incursions warrant their own senate inquiries – myrtle rust and tramp ants in particular.

In general there is much more analysis of the performance in agricultural biosecurity. For example, Plant Health Australia and Animal Health Australia publish annual biosecurity status reports reviewing biosecurity preparedness and performance relevant to the industries they represent.[31]

Table 9. Senate inquiries into aspects of agricultural biosecurity since 2000

Year of report	Inquiry focus
2000	An appropriate level of protection? The importation of salmon products
2001	The incidence of Ovine Johne's disease in the Australian sheep flock
2003	Management of the quarantine risks for the shipment of sheep aboard the MV Cormo Express and related matters
2004	The proposed importation of fresh apple fruit from New Zealand
2004	Biosecurity Australia's import risk analysis for pig meat
2005	Administration of Biosecurity Australia – Revised draft import risk analysis for bananas from the Philippines
2005	Administration of Biosecurity Australia – Revised draft import risk assessment for apples from New Zealand
2006	The administration by the Department of Agriculture, Fisheries and Forestry of the citrus canker outbreak
2007	Administration of the Department of Agriculture, Fisheries and Forestry, Biosecurity Australia and AQIS in relation to the final import risk analysis report for apples from New Zealand
2009	The import risk analysis for the importation of Cavendish bananas from the Philippines
2010	Biosecurity for Chinese apples and Australia â€“ US cherry trade
2010	Australian horse industry and an emergency animal disease response agreement
2011	Science underpinning the inability to eradicate the Asian honeybee
2014	The effect on Australian pineapple growers of importing fresh pineapple from Malaysia
2014	The effect on Australian ginger growers of importing fresh ginger from Fiji
2014	Proposed importation of potatoes from New Zealand
ongoing	The adequacy of the current biosecurity arrangements for imported and exported honey, apiary products, package bees and queen bees.

ISSUES FOR THE INQUIRY

- For the purposes of the inquiry, obtain any reviews conducted since 2000 of any incursion responses.
- How well does Australia learn from critical analysis of success and failure in environmental biosecurity?
- How well does Australia monitor progress in environmental biosecurity?
- Should there be public reviews into biosecurity responses triggered under NEBRA?

RECOMMENDATIONS

5. Undertake analysis of incursions and interceptions to identify high risk species and pathways for environmental biosecurity (this would be an appropriate function of the proposed Environment Health Australia).
6. Publish annual reviews of environmental biosecurity performance (as is done for the animal and plant industries) (again an appropriate function of the proposed Environment Health Australia).
7. Foster a learning culture in biosecurity by requiring public reviews of responses to incursions.

[31] Plant Health Australia (2014), Animal Health Australia (2013)

3. INCURSION CASE STUDIES

- The specific pathways of most recent incursions are not known. Of 36 incursions detected since 2000 of naturalised organisms, at least 14 have probably arrived accidentally with cargo or as stowaways, 4 have probably resulted from illegal smuggling or keeping, and 12 have probably been released or escaped from captivity.
- Case studies of 12 incursions, four categories of future risks and one of enforcement highlight multiple weaknesses along the biosecurity continuum that have facilitated the establishment of new harmful species and leave Australia open to many more new invaders.
- There is no evidence that governments have sought to learn through reviews and analyses of recent incursions

Relevant to ToR (a)(ii): the likely pathways of recently detected incursions and any weaknesses in biosecurity that have facilitated their entry and establishment

Relevant to ToR (a)(iv): any reviews or analyses of detected incursions or interceptions relevant to the environment and any changes in biosecurity processes resulting from those reviews or analyses

In the attached document 'Case studies' we have analysed 12 incursions detected since 2000 to explore the environmental consequences of these recent incursions and identify biosecurity weaknesses that have facilitated their entry and establishment. For each case study, we have listed issues for the inquiry. There are also four case studies of high risk organisms not yet established in Australia and one case study identifying weaknesses in biosecurity enforcement relating to the online trade of plants.

Pathways: Table 1 lists 24 recent incursions (terrestrial incursions detected since 2000) of species not permitted in Australia that have naturalised (including those since eradicated). As noted in section 4, there has been limited pathway analysis for organisms of environmental concern. The specific pathways in almost all cases are unknown (or there is no information in the public domain). We presume that 14 resulted from accidental introductions, most probably arriving with cargo via ships or as stowaways on ships: carder bee, red imported fire ant, yellow crazy ant, koster's curse, black slug, African big-headed ant (Lord Howe Island), emerald furrow bee, Argentine ant (Norfolk Island), electric ant, Asian honey bee, hairy croton, myrtle rust, Hemileia wrightiae, European ant. Four are most likely to have been due to illegal activity (smuggling or escape/release from illegal keeping or illegal trading): pigeon paramyxovirus, smooth newt, red-eared slider turtle, Mexican feathergrass. All 12 species listed in Table 2 (recent incursions, presumed naturalised, of vertebrate species that are permitted for keeping in at least some parts of Australia) have escaped or illegally been released from captivity (whether keeping was legal or illegal). Nine are aquarium fish.

Biosecurity weaknesses: The 12 case studies of incursions detected since 2000 (in the 'Case studies' document) show that weaknesses right along the biosecurity continuum have facilitated the entry and establishment of new species in Australia likely to cause environmental harm. The four case studies of future risks exemplify a lack of risk assessment and preparation for new invasive species. Table 10 identifies major types of flaws identified in the case studies. Box 2 summarises some of the biosecurity issues revealed by the case studies.

There are important lessons to be learnt from a detailed examination of these and other case studies. Each warrants specific recommendations to redress deficient responses. We recommend that an environmentally expert independent panel be appointed to investigate recent incursions to make recommendations specific to particular cases and on broader reforms to reduce the risks of future incursions.

TABLE 10. MAJOR CATEGORIES OF BIOSECURITY ISSUES RELEVANT TO CASE STUDIES

Organism	Risk assessment, pathway risk analysis	Contingency planning	Pre-border biosecurity	At border biosecurity	Surveillance	Responses to incursions	Enforcement
Red imported fire ants			■	■	■	■	
Yellow crazy ants	■	■	■	■	■	■	
Myrtle rust	■	■		■	■	■	
Smooth newts	■	■				■	■
Asian black-spined toads	■	■		■	■		
Mexican feathergrass				■	■		■
Asian honeybees	■	■			■	■	
Pigeon paramyxovirus	■	■			■	■	■
Argentine ants – Norfolk Island	■	■	■	■	■	■	
Red-eared slider turtles		■			■	■	■
Jack Dempsey cichlids	■	■	■		■	■	■
Emerald furrow bee	■	■			■	■	
Wattle, eucalypt pathogens	■	■	■	■	■		
Avian bornaviruses	■	■			■		■
Green iguanas	■	■					■
Internet sales	■						■

BOX 2. BRIEF OUTLINE OF BIOSECURITY ISSUES HIGHLIGHTED BY CASE STUDIES

See attached 'Case studies' document for details of each case.

12 case studies of incursions detected since 2000

Red imported fire ant: Of all the invasive species that should be kept out of Australia, red imported fire ants represent one of the most serious. They are also one of the most costly, and any flaws in quarantine that result in new incursions put at risk the >$300 million already spent trying to eradicate them. There have been four incursions detected since 2000. Despite being a high biosecurity priority, there have been two recent incursions in Gladstone, the latest detected this year. The incursions highlight inadequate surveillance: the 2014 incursion was not detected for probably 3 years after arrival. It exemplifies a failure to close arrival pathways and vulnerabilities in decision-making processes that permit a minority of states/territories to veto a national eradication. Failure on a >$300 million project looms unless sufficient continued funding is forthcoming.

Yellow crazy ant: Australia has failed both to prevent new incursions and to eradicate existing incursions. Since 2000, an average of >2 new outbreaks/year have been detected (>30 in Queensland). There may be many more outbreaks due to a lack of surveillance. YCA were intercepted in Australian ports at least 161 times from

1988-2011 (on average 7 times/year) and at least 40 times from 2008-2013 (on average 8 times/year).[32] YCA represent a failure over many years to fix quarantine holes that have led to multiple incursions into Queensland, a failure to accord this very high environmental threat the priority it warrants, a lacklustre and abandoned effort to eradicate them in Queensland, and limited implementation of a threat abatement plan. It is important to prevent further incursions as new genetic material (as a general principle) can greatly exacerbate invasive impacts by enhancing adaptive evolution of invasive species. Given their potentially devastating impacts on biodiversity, there should also be a thorough national assessment of the potential for eradication in the various outbreak sites. However, this requires that the gaps in quarantine allowing new incursions be identified and addressed.

Myrtle rust: Its establishment in Australia in 2010 represents a very serious failure of biosecurity for it had been recognised as a high risk for several years and response/contingency plans had been developed. [33] However, there was no surveillance program in place (as far as we are aware) and the emergency response to the incursion was seriously flawed, with a premature decision made not to eradicate (revised four months later to suppression with a goal of long-term eradication). By not proceeding rapidly with an eradication program (as was specified in the contingency plan) Australia may have missed a small window of opportunity (of about 6 months) to eradicate the rust before the weather became conducive to spread of the rust's spores. A very high priority biosecurity focus should be to prevent introductions of new variants of the rust, which could exacerbate its threat, as well as other pathogens that cause disease in Myrtaceae species.

Smooth newt: The potential environmental impacts of the smooth newt have not been taken seriously enough. Decision-making was exceedingly slow, with a decision by the National Management Group to not attempt eradication taken at least 22 months after detection, allowing the newt to spread and making eradication much more difficult (perhaps impossible) and costly. The precautionary principle was ignored and the decision-making lacked transparency and had limited input from independent experts on ecology and amphibians. This case particularly highlights the lack of precaution applied in decisions about whether to eradicate. Because the smooth newt has not established invasive populations in the southern hemisphere and there are no salamanders in Australia, there are high levels of uncertainty about the likely impact. This uncertainty should have resulted in a higher risk rating and more strongly favoured a decision to attempt eradication. By the time its impacts become apparent it will be far too late to eradicate the smooth newt.

Asian black-spined toad: This toad is widely accepted by governments as a high-risk target for interception and presumably a high priority for eradication if there is an incursion. The recent rate of interceptions (about 10 a year) and 3 detected incursions since 2000 suggest a high likelihood of establishment. It is unclear what plans have been developed to respond to incursions and whether they will be sufficient to prevent permanent establishment.

Mexican feathergrass: Multiple quarantine breaches show how easily a ban on importation of a plant can be rendered useless by importers labelling seeds with erroneous or out-of-date names. The demonstrated ease of buying this plant illegally from overseas through Ebay and other online traders exposes major enforcement weaknesses.

Asian honey bee: This incursion was subject to a failed eradication program, regarded by many as prematurely abandoned because some states did not want to provide financial support. A senate inquiry (by the Rural Affairs and Transport Reference Committee in 2011), triggered by concerns about the impacts on commercial beekeepers and farmers that depend on managed honey bees for pollination, concluded that the response to the Asian honey bee was flawed in several respects, including that the decision to abandon the eradication effort was not well justified and failed to apply the precautionary principle. The committee also criticised the risk assessment for Asian honey bees used to justify the initial eradication effort as having failed to assess their potential impacts on biodiversity.

Pigeon paramyxovirus: Despite the known potential of this pathogen to cause disease with high rates of mortality in many Australian bird species, and its spread around the world, there was no contingency plan for

[32] Dominiak et al. (2011), Minister for Agriculture, Fisheries and Forestry (2013).
[33] Glen et al. (2007), Plant Health Australia (2009)

the virus (whereas there is a plan for Newcastle virus). Despite its initial occurrence for several months just in loft pigeons, there was no attempt to eradicate the pathogen and it seems it was not ever properly assessed as a potential national eradication target. If this disease had been of concern to industry (as Newcastle disease is) the response would undoubtedly have been much more rigorous. The response was flawed in several respects and failed to prevent spread of the disease between pigeon lofts. There was a refusal to import a vaccine from overseas and trials of a chicken vaccine used for Newcastle disease were slow. The pathogen allegedly arrived with smuggled pigeons, highlighting the need for more focus on enforcement against wildlife smuggling.

Argentine ant, Norfolk Island: This incursion highlights the need for stringent quarantine on islands. The 5 years it took to identify the Argentine ant exemplifies the limited resources available for surveillance and response on islands. Substantial effort and resources have since been invested in surveillance and control of the ant on Norfolk Island, and there is good potential for eradication based on a 5 year strategy.But Australia could lose this potential unless sufficient funding is provided soon. Most ant eradication programs are threatened by insufficient or inconsistent funding.

Red-eared slider turtle: There is a high risk of continued illegal releases of this threatening invader into the wild. There have been varying degrees of action by state governments ranging from a concerted eradication effort by Queensland to very little action by NSW. To prevent it establishing and spreading, Australia needs a national strategy and a concerted education and compliance program to stop illegal keeping.

Jack Dempsey cichlid: This aggressive aquarium fish was illegally released into a pool in NSW. An attempt to eradicate it failed (or the cichlids were re-introduced). They are one of about 30 aquarium fish species that have established in Australian waterways.[34] They highlight the importance of preventing new incursions because it is extremely difficult or impossible to eradicate feral fish populations. More than 10 million fish are imported into Australia each year, and more than 450 species are permitted for import.

Emerald furrow bee: This bee was discovered by chance in the Hunter Valley in 2004. Apart from surveys in 2008-2010 funded by philanthropy, this new introduction has been ignored. Little is known about the bee's ecology, distribution and impacts. It exemplifies the catch 22 situation that applies with many environmental incursions – too little is known about potential impacts to motivate biosecurity authorities to take action yet by the time impacts become obvious it is too late for eradication or containment. It is important to prevent further introductions that could increase the species' environmental tolerance.

4 case studies of future incursion risks

Pathogens of wattles and eucalypts: Several pathogens that are jumping hosts to infect eucalypts and wattles in overseas plantations are serious risks to Australian native plants if they enter Australia. They exemplify the lack of preparation in Australia for new diseases and the lack of a preventative focus in environmental biosecurity. Australia should be working with forest managers overseas to identify risks and adopt practices to minimise the transfer of pathogens from native forests to plantations and crops of Australian species.

Fish pathogens and parasites: Live ornamental fish are a high risk group for introducing aquatic animal diseases into Australia, because they are vectors of numerous diseases, are widely traded widely around the world, are imported in large numbers into Australia (>10 million a year) and are frequently released into waterways by aquarium owners. Current quarantine practices are acknowledged by biosecurity authorities to be ineffective in stopping the entry of diseased fish into Australia. Very little is known about specific disease risks of the hundreds of species permitted entry into Australia.

Bornaviruses of parrots: This disease infecting captive parrots could threaten a wide range of parrots and other bird species if it spills over into wild populations. But the risks have been neglected.
The disease is not notifiable, there has been no risk assessment or contingency planning, and there is no surveillance or monitoring. The case would be very different if this was a commercial threat. It highlights the critical need to provide Wildlife Health Australia with resources to focus on wildlife disease risks in addition to the diseases that are a focus because they are also a commercial or human health risk. It also highlights the

[34] Corfield et al. (2008)

need for an environmentally focused biosecurity body such as the proposed Environmental Health Australia.

Green iguana: Regular interceptions and an incursion highlight the risks of illegal importing and keeping of green iguanas. It raises questions about the priority accorded to enforcement against wildlife crimes and highlights a lack of contingency planning.

1 case study of biosecurity enforcement

Online sales of prohibited plants: The Invasive Species Council tested the policies of online traders using Ebay to purchase three sets of seeds of prohibited plants. In all three cases the seeds arrived within about two weeks. Complaints were lodged with Ebay with no effect. It exemplifies the lack of compliance focus on illegal internet trade of prohibited species.

The Invasive Species Council is not aware of any process of review and improvement triggered by the issues raised in these case studies.

Issues for the inquiry

- What can be learnt from analysis of the case studies presented here that will be of value in recommending reforms to environmental biosecurity?
- What should be done to ensure that future decisions and processes incorporate the lessons that can be learnt from analysis of recent decisions and actions?

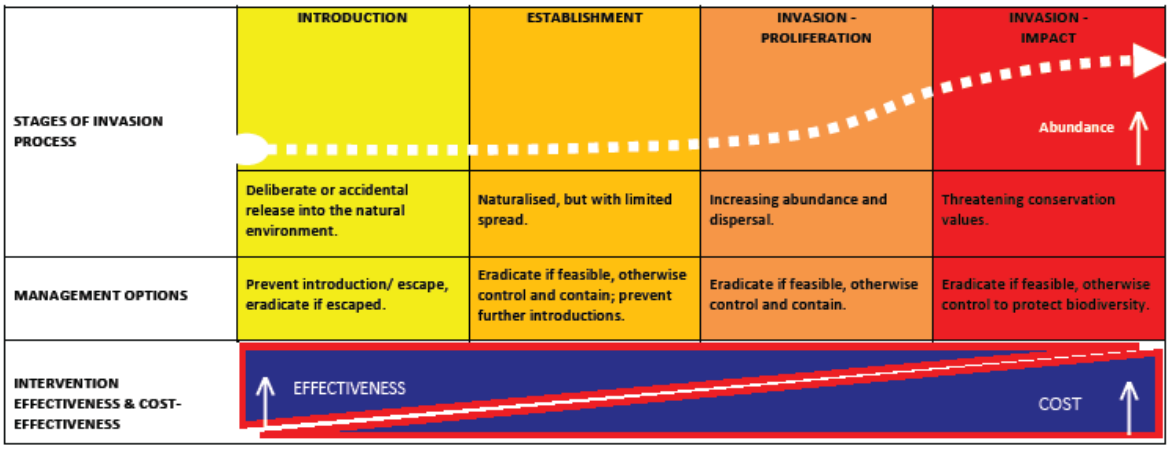
Recommendations

8. Establish an independent environmental expert panel to review recent incursions (including those provided as case studies for this submission) to recommend ongoing responses to those incursions and reforms to reduce the risks of future incursions. An immediate priority should be to review whether smooth newts are eradicable.

4. RISK ASSESSMENT & PRIORITISATION

- The identification and prioritisation of biosecurity threats has been done systematically for most of Australia's primary industries, but not for the natural environment.
- The establishment of the environmental equivalent to Plant Health Australia and Animal Health Australia is essential to undertake the work of identifying priority environmental threats and pathways.
- Horizon scanning involving experts from relevant disciplines is a sound process for developing a priority list of environmental risks.
- Prevention requires systematic identification of future risks such as pathogens developing in overseas plantations of Australian eucalypts and wattles.
- Australia has a good system for assessing new proposed imports but the risk assessment processes used under biosecurity and environmental laws vary considerably in their rigour, transparency, whether the precautionary principle is applied and public consultation.
- The public would have much greater confidence in risk assessment processes if they were transparent and undertaken by an independent biosecurity authority, as recommended by the Beale review.
- Many currently permitted imports have not undergone risk assessment because they were being imported prior to the introduction of mandatory risk assessment. There should be mandatory public reviews of import conditions when there is evidence they are failing to keep out potentially invasive species.

By the time a species has become 'invasive', it is usually too late to eradicate it and it becomes costly and difficult (sometimes impossible) to control it to protect biodiversity. Prevention of new invaders should be an extremely high priority, the first in a hierarchy of responses. Essential to prevention is the identification of high priority biosecurity risks.



4.1 IDENTIFYING ENVIRONMENTAL RISKS AND PRIORITIES

Relevant to ToR (b)(i): the extent to which high priority risks for the environment have been identified in terms of both organisms and pathways, and accorded priority in relation to other biosecurity priorities

Australia is clearly at risk to the threat posed by thousands of known or potential exotic environmental pests. Identifying priority potential threats to the environment is widely acknowledged as a critical first step in the development of biosecurity strategies and processes to minimise the risk of pest incursion and establishment. Risk assessment is important also to inform response decisions and facilitate rapid responses to potentially harmful species. Not all exotic species newly detected in the wild can be or should be eradicated or controlled

but there should at least be a consistent and transparent process based on risk assessment to determine whether or not a response to is desirable. There has been no risk assessment in response to many recent incursions (see case studies).

This identification and prioritisation of threats has been done systematically for most of Australia's primary industries but not for the natural environment. Most environmental threats accorded biosecurity priority also pose a direct threat to the economy, human health or social amenity. Lack of knowledge of biosecurity risks to biodiversity is a major impediment. As one example of the relative neglect of risks to biodiversity, Whittington and Chong (2007) note that from 2000-2006 there were 16 times more scientific publications on diseases in farmed fish than those in aquarium fish and 470-fold more papers on disease in cattle.

In response to a senate question on notice in January 2013 – 'Does AQIS have a list of exotic species that are regarded as high priority threats to the environment to target for interception; if so, can a copy be provided' – the-then Minister for Agriculture, Fisheries and Forestry replied as follows:[35]

> 'The department has the list, Australia's most unwanted, which targets ten species that are considered high priority threats to Australia's biosecurity: the Asian gypsy moth, Asian longhorned beetle, Asian tiger mosquito, black spined toad, burnt pine longicorn beetle, formosan termite, giant African snail, giant honeybee, khapra beetle and the lesser auger beetle. With the exception of the Asian tiger mosquito and khapra beetle, the rest could be considered threats to Australia's environment.'

While some of these are certainly environmental risks, the list does not include many of the highest priority environmental threats. A list of just 10 species is clearly inadequate and we assume/hope there is a more extensive environmental priority list informing biosecurity focus in Australia. (Plant Health Australia has identified 350 high priority pests for plant industries.)[36]

Even with specific imports, there is little evidence that priority environmental risks have been comprehensively identified and assessed. For example, with timber imports the DAFF website makes no mention of environmental priorities such as yellow crazy ants: [37]

> Some of the more damaging pests that threaten our biosecurity include Asian longhorn beetle, burnt pine longicorn beetle, Japanese pine sawyer beetle, Asian gypsy moth, termites, auger beetle, powder post beetles and wood wasps.

Again, while some of these are likely to have environmental impacts, they have been designated priorities because of their potential impacts on the forestry or horticultural industries.

There has been some identification and priority ranking of environmental risks in some aspects of biosecurity – for example for exotic vertebrates (by the Invasive Animals CRC) and marine invaders at a national level.[38] In contrast, the priority biosecurity threats for plant and animal industries have been comprehensively identified through the work of Animal Health Australia and Plant Health Australia, which are industry-government bodies majority-funded by governments (Table 11). The establishment of an equivalent body to undertake the work of identifying priority environmental threats and pathways (and much else) is essential (see section 12). This prioritisation work is fundamental to biosecurity and should be funded by governments. While we wait, ISC is trying to source its own funding through private philanthropy to fill some of the gaps. One gap of great concern exemplified by the recent establishment of myrtle rust in Australia (see case study 3) is of plant diseases establishing in overseas plantations of eucalypts and wattles (and crops of Australian native plants) that could invade Australia (see Box 3 and case study 13). An additional three case studies highlight examples of other risks – a serious parrot disease in captive parrots, pathogens and parasites of aquarium fish and green iguanas (case studies 14-16).

[35] Minister for Agriculture, Fisheries and Forestry (2013).
[36] Roy et al. (2014), Plant Health Australia (2014), Table 35.
[37] http://www.daff.gov.au/biosecurity/import/timber
[38] Massam et al. (2010), Hayes et al. (2005)

Table 11. Risk and prioritisation assessments for environmental and economic biosecurity threats

Focus	Risk assessments & prioritisation
Environmental risks	
Terrestrial vertebrates	The Vertebrate Pest Committee has assessed and categorised threats posed by 651 exotic vertebrate mammals, birds, amphibians and reptiles held in Australia: 6 mammals, 110 birds, 40 reptiles and 3 amphibians have an 'extreme threat' status. Also some more recent establishment risk assessments.[39]
Terrestrial invertebrates	?
Terrestrial pathogens	?
Plants	No priority list we are aware of. There is a National Environmental Alert List (2000) that lists 28 species in the early stages of establishment with the potential to become a significant threat to biodiversity. The highest weed risks are due to legal rather than accidental or illegal imports.
Environmental & economic risks	
Marine organisms	23 medium & high priority species (2005)[40] 35 species on CCIMPE Trigger List[41] (under revision)
Economic risks	
Animal industry pests	The Emergency Animal Disease Response Agreement lists 65 animal diseases.
Plant industry pests	Plant Health Australia has identified 348 high priority pests.[42] The Emergency Plant Pest Response Deed lists 80 plant diseases.

A recent horizon scanning project for Great Britain outlined a good process for systematically identifying potential threats and opportunities, leading to prioritisation of future invasive threats to biodiversity.[43] Their process involved two phases: (1) preliminary consultation with experts within five groups (plants, terrestrial invertebrates, freshwater invertebrates, vertebrates and marine species) to derive ranked lists of potential invasive species and (2) consensus-building across expert groups to compile and rank the entire list of potential invasive species. We endorse this as a sound process for developing a priority list relevant to the Australian environment.

The 2009 Hawke review of the EPBC Act identified the need to focus on future threats and recommended the establishment of a foresighting unit to identify potential and future threats and set in place preventative strategies.[44] We strongly support this recommendation. Its work would be broader than that proposed here.

BOX 3. OVERSEAS INCUBATORS OF PATHOGENS OF AUSTRALIAN PLANTS[45]

New plant diseases that could one day blight Australian ecosystems are incubating in overseas plantations and crops of Australian plants.

Biosecurity holes can be blamed for the recent arrival in Australia of myrtle rust but it was initiated when Australia started exporting its eucalypts all around the world, including to South America, there to be exposed to pathogens native to South American Myrtaceae. The rust was recorded jumping host to eucalypts in Brazil

[39] Vertebrate Pests Committee (2007), Bomford (2008), Massam et al. (2010)
[40] Hayes et al. (2005)
[41] http://www.marinepests.gov.au/national-system/how-it-works/Emergency_management/Trigger%20list/Pages/default.aspx
[42] Plant Health Australia (2014)
[43] Roy et al. (2014)
[44] Recommendations 23 (2) and (3) in Hawke (2010).
[45] The references for this box are in Booth (2011).

in 1912 and first caused a serious disease outbreak in a eucalyptus plantation in 1973.

By exporting eucalypts and wattles for large-scale cultivation in plantations, Australia has set up the conditions for new pathogens to shift and adapt to these native plants. An estimated 18 million hectares in 80 countries are planted with eucalypts, and wattles are grown in Africa and South East Asia. The same risk applies to other Australian plants grown as crops – native floral species such as Geraldton wax cultivated for the cut flower trade, for example – or that become dominant weeds. High-density monocultures are favourable habitats for new pathogens to invade, and can support far greater pathogen densities than are typically found in natural situations. Global trade and travel then provide the means for pathogens adapted to Australian species overseas to eventually make it into Australia, where many more hosts await them in natural ecosystems or in cultivation. Plants newly exposed to pathogens can be devastated by disease.

Myrtle rust is just the first of several pathogens that could follow this path. There is very little awareness of these threats and no serious biosecurity preparations. South African fungal researcher Michael Wingfield is one to have highlighted the risks associated with plantations:

> … native pathogens, previously thought to be relatively host specific and non-threatening, are adapting to infect exotic plantation trees. Other than the damage that these pathogens are causing to exotics, they now pose a serious threat to the same or related tree species in their areas of origin. This tremendous threat is only just being recognised and it is little understood.

Wingfield notes that plantation forestry in the tropics and southern hemisphere has occurred for more than a century, but that this is a short time for pest and pathogen development. New diseases are rapidly emerging in plantations, and some of the most serious are due to pathogens jumping host to the plantation species.

Host jumping is when a pathogen acquires a new host. New diseases often emerge when a pathogen adapts, usually due to selection among existing genetic variants or novel mutations. Pathogenic fungi such as eucalyptus rust are particularly adaptable because infection on one plant can yield billions of spores, which can maintain infection even if adaptation is low and thus foster mutations.

The risks of host jumping are likely to be higher if (a) the new host is related to existing hosts – as is the case with Australian eucalypts grown in South America, which has many native Myrtaceae; (b) the new host grows in close association with existing hosts such as when eucalypt plantations are established close to native forests; and (c) the new potential host is grown in high densities, as occurs with plantations.

See case study 13 on pathogens of wattles and eucalypts for examples of pathogens that are of potential risk for Australia. One example is fungi from the genus *Chrysoporthe*, two species of which have jumped hosts to cause serious stem canker diseases in plantation eucalypts. A related fungus *Cryphonectria parasitica* causes chestnut blight, which has virtually eliminated American chestnuts from the US and is under eradication in Australia after infecting chestnuts in Victoria. An African fungus *Ceratocystis albifundus* has recently jumped to plantations of *Acacia mearnsii* and causes rapid wilting, dieback and death. At least four other recently discovered *Ceratocystis* species may also have the potential to infect Acacia species in Africa.

Issues for the inquiry

- What processes have there been, if any, to identify priority threats to environmental biosecurity? Who has been involved in such processes?
- Apart from the 10 priority threats identified by DAFF as Australia's most unwanted, are there any others designated as quarantine priorities? How has priority designation influenced quarantine processes?

Recommendations

9. As a high priority, through a transparent, scientific process, identify and rank Australia's priority environmental biosecurity threats. Undertake pathway analysis of these high priority threats to identify

where biosecurity should be focused. These tasks should be undertaken in an ongoing way (with regular reviews of priorities) by a body such as the proposed Environment Health Australia.

10. Undertake a horizon scanning process to identify and rank future biosecurity threats to the environment. This should be done in two steps through a transparent process involving all relevant experts: (1) development of a comprehensive preliminary list of potential threats, including plants, terrestrial invertebrates, freshwater invertebrates, vertebrates, marine species and pathogens and (2) prioritisation to derive ranked lists of potential invasive species through a consensus-building process. Ideally, this task would be undertaken by a body such as the proposed Environment Health Australia.
11. Establish a foresighting unit within the environment department as recommended by the 2009 Hawke review of the EPBC Act.

4.2 Product-specific risk assessments

Relevant to ToR (b)(i), (ii): the extent to which high priority risks for the environment have been identified and the process for determining priorities for import risk analyses and the process for prioritising the preparation of these analyses.

One of the best aspects of Australia's biosecurity system is that it requires risk assessment of goods newly proposed for import (those not already permitted imports) and only those assessed as meeting Australia's 'appropriate level of protection' (ALOP) are then added to the permitted import list. Australia's ALOP is aimed at 'reducing risk to a very low level, but not to zero'. However, many of the permitted imports have not undergone risk assessment – because they were being imported prior to the introduction of mandatory risk assessment in 1997 – and many do not meet Australia's ALOP. The risks of permitted live imports themselves establishing and becoming invasive in Australia are not the main focus of this inquiry – they warrant a separate inquiry[46] – but the potential for these imports to be pathways for accidental introductions is an inquiry focus. A vast number of invasive species, particularly invertebrates, have arrived as 'hitchhikers' or 'stowaways' with imported goods.

There are various types of risk assessment under legislation regulating live imports as outlined in Table 12. They involve different processes and varying levels of rigour and precaution.

Table 12. Types of biosecurity risk assessment for imports, positives and negatives

Legislation	Focus	Positives	Negatives
EPBC Act, Part 13A	Live organisms (except for plants[47])	Comprehensive risk assessment. Open process with consultation. Precautionary principle applies. Some 3rd legal party rights to challenge decisions.	Risk assessment undertaken by proponents. Decision by minister rather than independent expert body.
Quarantine Act, import risk analyses (IRAs)	Mostly goods proposed for import where risk management processes not established or not adequate – selected by the secretary of the department of agriculture.	Risk assessment process is transparent with consultation. Risk analysis by department.	Process for selecting products for IRA lacks transparency. Precautionary principle does not apply. Environmental impacts often poorly or not considered, particularly if impacts are uncertain. No 3rd party legal rights to challenge process or merits. Import decision by secretary of

[46] In particular, the majority of weeds in Australia, including newly establishing weeds, are legal imports.
[47] The Department of Agriculture administers the import of new species of live plants under provisions of the EPBC Act.

			department rather than independent expert body.
Quarantine Act, risk assessments	Other goods proposed for import not on permitted import list.	Risk assessment protocol is reasonably precautionary.	Risk assessment is not transparent. Risk assessments are not published. No 3rd party legal rights to challenge process or merits. Import decision by secretary of department rather than independent expert body.

Of the three processes, the assessments conducted under the EPBC Act are generally more rigorous from an environmental perspective than those under the Quarantine Act, and the decision-maker under the EPBC Act is required to apply the precautionary principle. One drawback is that the risk assessment is conducted by the proponent rather than by an independent expert.[48] In 2009 the federal government considered whether to integrate the provisions under the EPBC Act into the new proposed Biosecurity Act. However, the agricultural minister did not agree to the conditions for this (such as applying the precautionary principle), which were as advised by the reviewer of the EPBC Act, Allan Hawke.[49]

The import risk analysis process is also detailed and transparent with public consultation but the process for selecting products for IRAs is lacking in transparency and generally does not focus on environmental priorities. There is no requirement to apply the precautionary principle (see section 7) and the uncertainty about environmental risks often receives little consideration in import decisions. DAFF has said, for example: 'The potential susceptibility of Australian native flora to exotic pests and diseases is largely untested although some serious exotic pests and diseases have been shown experimentally to be suited to native plants as hosts.'[50] In a report for the federal environment department, Corfield et al. (2008) note that risk assessments for the importation of aquarium fish are based on overseas information, which 'can be of limited value in predicting the likelihood of environmental impacts in Australian waters'.

To ensure that risk analysis is directed to the highest priorities, including environmental, economic and health priorities, there should be a transparent prioritisation process for import risk analyses based on degree of risk.

The standard risk assessment process for imports is much less rigorous. It is also secretive, so there is no way for the public to assess the rigour and adequacy of risk assessments. The government cannot expect the public to have confidence in a process so lacking in transparency.

Import risk analyses are currently mostly conducted only for new proposed imports (goods or classes of goods) when 'relevant risk management measures have not been established' or when relevant measures for similar goods are not considered adequate. Import risk analyses have also occasionally been conducted for already approved imports – for example for horse imports, on the advice of the independent inquiry into the outbreak of equine influenza in Australia.[51]

We strongly recommend there should be a process for triggering import risk analyses of existing permitted imports when there is evidence that import conditions are not meeting Australia's ALOP, such as when there is a pattern of repeated interceptions or incursions associated with the import of certain goods. For example, timber imports appear to be a high risk pathway for yellow crazy ants, of which there have been repeated interceptions and incursions (see case study). High risk pathways for yellow crazy ants and other tramp ants warrant the rigorous transparent analysis of an import risk analysis. Import risk analysis is also warranted in

[48] This was regarded as a problem by most participants in an Invasive Animals CRC workshop on biosecurity risks relevant to exotic vertebrates (Henderson 2009).
[49] Hawke (2010)
[50] Australian Government (2008).
[51] Biosecurity Australia (2010).

response to serious new incursions such as that of myrtle rust (see case study) for goods that are identified as pathways for future incursions that could considerably exacerbate the invasive impacts.

Issues for the inquiry

- Are current risk assessment processes consistently comprehensive, rigorous and precautionary enough to minimise the risks of accidental introductions (and achieve Australia's ALOP)?

Recommendations

12. Ensure that all import decisions are based on independent, transparent and scientifically credible risk assessments. Adopt the Beale-recommended model of an independent authority and expert commission. Otherwise, establish a Risk Assessment Authority to undertake risk assessments and import risk analyses.
13. Require all biosecurity risk assessments to be open for consultation and published.
14. Develop triggers to conduct an import risk analysis of existing permitted imports for which there is evidence (such as a high rate of interceptions or incursions) that are not meeting Australia's ALOP.
15. Ensure that import risk analysis is directed to the highest priorities, including environmental, economic and health priorities, by establishing a transparent prioritisation process based on degree of risk.
16. Require the precautionary principle to be applied to all biosecurity risk assessments, as required under the Biodiversity Convention.

5. BIOSECURITY PLANNING

- There has been very little contingency and other planning for environmental biosecurity. No body currently exists to take the lead on essential planning for priority environmental threats.
- In contrast, through Plant Health Australia and Animal Health Australia, the federal and state/territory governments have invested millions of dollars each year in developing, in partnership with industry, plans and strategies to improve industry biosecurity.

Relevant to ToR (b)(iii): the current approach to contingency planning for high priority environmental risks and the process by which they were developed

Contingency and other planning is essential for effective biosecurity. Table 13 shows the range of strategies and plans that have been undertaken for Australia's plant industries – including a biosecurity strategy, a diagnostic strategy, a surveillance strategy, industry biosecurity plans, contingency plans, diagnostic protocols, and biosecurity manuals. There has been little such equivalent planning in environmental biosecurity. We are aware of contingency plans for a few species (electric ants, red imported fire ants and eucalyptus/myrtle rust) and there are probably some at a state level.

Contingency planning for high priority risks includes identifying pathways, measures to reduce risks, surveillance protocols and diagnostic methods, and defining responses to incursions and the roles and responsibilities of various parties. As the environment department says (referring to tramp ants), 'Contingency plans build preparedness and help fast-track responses to new … incursions by outlining in advance arrangements for responding to new incursions. They reduce potentially larger impacts by aiding coordinated action.'[52]

Through Plant Health Australia and Animal Health Australia, the federal and state/territory governments have invested many millions of dollars in developing, in partnership with industry, plans and strategies to improve industry biosecurity (as shown in Table 13 for plant biosecurity). Environmental biosecurity needs a similar level of investment and collaboration within the environmental sector to improve preparedness for priority environmental threats. It also needs an environmental body – the proposed Environment Health Australia – to take the lead on this essential planning (see section 12).

[52] DSEWPaC (2012)

Table 13. Plant biosecurity strategies, plans, protocols, manuals[53]

Plant industries	Natural environment
National Plant Biosecurity Strategy (2010)	No equivalent
National Plant Biosecurity Diagnostic Strategy (2012) -	No equivalent
National Plant Biosecurity Surveillance Strategy (2013)	No equivalent
Plant Biosecurity Research, Development and Extension Strategy (2013)	A strategy for environmental research, development and extension is in draft form
Identification of 348 high priority industry pests (December 2013)[54]	No equivalent
27 Industry Biosecurity Plans covering 34 plant industries	No equivalent
127 national diagnostic protocols developed	No equivalent, but 1 protocol (for myrtle rust) is relevant
17 industry-specific biosecurity manuals	No equivalent
Contingency plans for high priority pests – >90 industry plans	Plans for electric ants, red imported fire ants, eucalyptus/myrtle rust.

ISSUES FOR THE INQUIRY

- What institutions and resources are needed to bring planning for the natural environment up to the level of that achieved for plant and animal industries?

RECOMMENDATIONS

17. Develop a timetable for bringing environmental biosecurity planning up to the level achieved for plant and animal industries. Within 3 years develop contingency plans for 30 high priority environmental pests.
18. Within two years develop an environmental biosecurity strategy.

[53] Plant Health Australia (2014)
[54] Plant Health Australia (2014), Table 35.

6. SURVEILLANCE AND MONITORING

- Apart from routine surveillance at ports and airports, there is limited surveillance for high priority threats to the environment.
- Under the regional Northern Australian Quarantine Strategy program there is monitoring in northern Australia for targeted pests, weeds and diseases. It is an excellent model and has identified a number of new incursions but recent budget cuts and economic priorities will undermine its capacity to detect environmental threats.
- Lack of government diagnostic capacity to identify exotic species hinders surveillance and monitoring ability.
- In an analysis of plant biosecurity surveillance programs, Plant Health Australia found that just 8% of 140 national and state/territory programs in 2012 and 12% in 2013 were focused on amenity or environmental target hosts (some others were focused on multiple targets, so some may have included environmental targets).
- The community plays an important role in surveillance and could play a much greater role with more support.

Relevant to ToR (b)(iv): the adequacy of current protocols and surveillance and their implementation for high-priority environmental risks

At a Commonwealth level, apart from in northern Australia, there is limited surveillance for high priority threats to the environment outside that routinely conducted for designated pest species at ports and airports. The available information shows that most incursions identified in Tables 1 and 2 have been detected by members of the public rather than by dedicated surveillance programs. The threat abatement plan for tramp ants notes that 'shortfalls in current surveillance mechanisms for tramp ants are illustrated by chance discoveries of incursions, such as by members of the public'.[55]

In response to a question on notice on 13 January 2013 – 'What particular, if any, surveillance operations does AQIS have in place for exotic species that are regarded as high priority threats to the environment' – the minister for agriculture provided the following information.[56]

> 'The department conducts seasonal and ongoing surveillance of targeted exotic pest species that pose a high priority threat to Australia's biosecurity. Seasonal surveillance operations conducted by the department include:
> - Asian gypsy moth targeted flight season; which targets vessels arriving from ports in the far east of Asia.
> - Burnt pine longicorn beetle targeted flight season; which targets vessels arriving from ports in New Zealand.'

However, these pests are primarily regarded as economic threats and the motivations for these two surveillance programs are undoubtedly economic (the only threats highlighted on the departmental website are economic).[57]

[55] Commonwealth of Australia (2006)
[56] Minister for Agriculture, Fisheries and Forestry (2013).
[57] DAFF explains on its website on these two species that (1) 'The spread of Asian gypsy moth could have devastating effects to our agribusiness and horticultural industries' and (2) 'If introduced into Australia the burnt pine longicorn beetle will have devastating effects on our forest and construction industries. The larvae cause damage to pine timber, used for construction, by tunnelling in the wood and reducing the quality of the timber.'

Also in response to the question on notice, the minister highlighted the regional Northern Australian Quarantine Strategy program. Environment NGOs consider this program an exemplary model for detection of new incursions and community education. It monitors the northern region of Australia from Broome to Cairns for targeted pests, weeds and diseases. The main biosecurity risks for northern Australia are in neighbouring countries: Indonesia, Timor-Leste and Papua New Guinea. The program has identified a number of new incursions, including several new weeds.

However, we understand that what was a very lean operation has suffered recent budget cuts involving the loss of 20% of its staff over the past two years, ending a permanent presence in many remote communities such as in the Torres Strait islands, where quarantine officers have been stationed for the last 20 years. We question whether the program has sufficient funding to achieve its purposes, particularly since the recent budget cuts. There are several environmental weeds on the NAQS target list. However, the majority of other targets are economic threats.[58] We also question whether there is sufficient environmental focus in the program and whether appropriate responses are taken when new threats are detected. We recommend the inquiry seek to determine the proportion of detections that trigger eradication or control on the basis of assessed risk.

Several case studies exemplify the lack of dedicated surveillance programs for high priority environmental threats. For example, there is no systematic surveillance for most tramp ant species and despite recommendations in two contingency plans there was no (or little) dedicated surveillance for myrtle rust. The threat abatement plan for tramp ants notes the lack of surveillance for ants:

> 'National post-border monitoring programs exist for identified target pests, such as the Asian gypsy moth (*Lymantria dispar*) and fruitflies (eg *Bactrocera papaya*). However, shortfalls in current surveillance mechanisms for tramp ants are illustrated by chance discoveries of incursions, such as by members of the public. Since the development of the RIFA National Eradication Program, surveillance has been conducted by state and territory governments in high-risk areas (eg freight terminals, nurseries) where RIFA-contaminated materials could arrive from south-eastern Queensland. Otherwise, no routine monitoring or surveillance for tramp ants appears to be undertaken in other areas of high-risk or value (eg conservation areas).' [Underlining added.]

We assume there is dedicated surveillance for red imported fire ants in addition to that which is included generally for ants as 'contaminants' in imported goods. However, the 2006 detection of red imported fire ants in Gladstone (now eradicated) has been recently been followed by another detection linked by the Queensland Government to importation of goods associated with LNG infrastructure development. It is thought to have been present for three years before being detected earlier this year (see case study).

Diagnostic capacity

One impediment to surveillance and monitoring is the lack of diagnostic capacity within governments (to identify exotic species). This issue is highlighted in the case study on yellow crazy ants.

The 2006 threat abatement plan highlighted the limited diagnostic capacity for tramp ants – only 25% of recorded an interceptions were recorded to species level in the Pest and Disease Information System database (1986–2003).[59] The 2012 review of the tramp ant plan found that diagnostic capacity had declined since then:[60]

> 'There has been a decrease at national and state levels in diagnostic services for pest species particularly in regard to servicing public reporting. The Australian Museum advises it is the only officially acknowledged free public service of its kind remaining in Australia. There are some other avenues, but they are few and only tend to be found through word of mouth. For instance, ant identifications or assistance is freely provided by the CSIRO Darwin laboratory. There is a fee for

[58] See http://www.daff.gov.au/biosecurity/quarantine/naqs/naqs-target-lists.
[59] Commonwealth of Australia (2006)
[60] DSEWPaC (2012)

service provided by the Australian National Insect Collection at the CSIRO in Canberra. Some state primary industry departments may assist where a specimen may be an ant of high risk concern.'

In contrast, there has been considerable work to develop diagnostic services for industry. Plant Health Australia has developed >100 diagnostic protocols for specific pests or pest groups with detailed information on diagnostic procedures and data on the pest, its hosts, taxonomic information, detection and identification.[61]

Industry vs environmental surveillance

There are many more surveillance programs in Australia for high priority threats to industry and human health (human pathogens) than there are for the environment. In an analysis of plant biosecurity surveillance programs, Plant Health Australia found that just 8% of 140 national and state/territory programs in 2012 and 12% in 2013 were focused on amenity or environmental target hosts (some others were focused on multiple targets, so some may have included environmental targets) (Table 14).[62] The six programs run by the Commonwealth government in 2012 are shown in Table 15.

Table 14. Plant biosecurity surveillance programs, 2012, 2013[63]

Target host	% of surveillance programs 2012	% of surveillance programs 2013
Amenity / environment	8	12
Broadacre – grains, sugarcane, other	14	15
Forestry	5	8
Honey bees	5	6
Horticulture – fruit, vegetables, viticulture, other	47	49
Multiple	21	6

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Table 15. Commonwealth plant biosecurity surveillance programs, 2012

Name	Target hosts	Target pests
Australian Plague Locust Commission surveillance and control program	Open grasslands	Australian plague locust, spur-throated locust, migratory locust
National Asian gypsy moth trapping program	Forestry, fruit, vines	Asian gypsy moth
National exotic fruit fly trapping program	Horticulture	Fruit flies
NAQS exotic fruit fly trapping program – Torres Strait	Horticulture	Exotic fruit flies
NAQS pest and disease surveys	Broad range of tropical horticultural and agricultural species grown in home gardens and communities in northern Australia	126 high priority exotic pests
Multiple pest surveillance program	Amenity, forestry, horticulture, stored grains	Targets & activities vary by state and territory

Community surveillance

As highlighted by the fact that the majority of incursions listed in Table 1 were detected by members of the public, the community plays an important role in surveillance and could play a much greater role if there was more support. To maximise its benefits it should be focused on high priorities, with protocols to ensure the information collected is relevant and that it is acted on. Fostered by an extensive education program, the

[61] Plant Health Australia (2013), Plant Health Australia (2014)
[62] Plant Health Australia (2013), Plant Health Australia (2014).
[63] Plant Health Australia (2013)

community has played an important role in assisting the red imported fire ant eradication program with landholder reports of ants in urban areas. In rural or bushland areas where large areas are infrequently visited, sightings by landholders cannot be relied upon. On public land, community volunteers could be harnessed to undertake both coordinated and ad-hoc surveillance. This could be extended to private land with landholder consent.

The level of support needed may be significant, so caution should be used if the use of community volunteers is seen to be a method of saving money. One successful model in Victoria is the Weed Spotters program where registered volunteers are trained to identify and report a set list of priority weeds. There are exceptions to the need for a coordinating role for government, such as the successful Indian Myna eradication program in Canberra. In this case, volunteers self-organised around their own priorities. Careful thought must be given to volunteer motivations and dynamics if high reliance is to be placed on this solution for priority surveillance programs.

Issues for inquiry

- What surveillance programs target priority threats for the environment?
- What has been the success of these programs?
- How many incursions of environmental invaders detected since 2000 have been detected by surveillance programs compared to those detected by members of the public or people with no responsibility for surveillance?
- Have any biosecurity assessments of surveillance priorities for environmental pests been conducted?
- Are funding levels for the Northern Australian Quarantine Strategy (NAQS) program sufficient for it to achieve its purposes. How comprehensive is its focus on environmental threats?
- How many incursions have been detected by the NAQS program? How many count as environmental threats? How many detections of species of likely risk for the environment elicited a response to eradicate or control?

Recommendations

19. Conduct an audit of surveillance programs Australia-wide that target priority environmental threats. Identify major gaps in surveillance, including those for tramp ants.
20. Develop dedicated surveillance programs for high priority environmental threats based on pathway risk analysis.
21. Conduct an audit of diagnostic capacity within Australia for priority environmental threat categories such as invasive ants. Develop a strategy to fill gaps in diagnostic capacity. Develop diagnostic protocols for priority environmental threats.
22. Develop a community mobilisation program to assist with surveillance efforts.

7. NATIONAL EMERGENCY PREPAREDNESS AND RESPONSE ARRANGEMENTS (TERRESTRIAL ONLY)

- The formal intergovernmental biosecurity framework deals poorly with environmental biosecurity, in particular due to its lack of an environmental entity equivalent to Plant Health Australia and Animal Health Australia, its lack of engagement of the environmental and community sectors, and the often limited involvement of ecological experts
- Flaws in the emergency response agreements include a requirement for consensus approval of all eradications and funding arrangements, which allows one state (or even an industry partner when an environmental incursion is covered by an industry agreement) to veto action and tends to result in short-term and insufficient funding.
- Without a requirement to apply the precautionary principle, decision-makers are likely to proceed with eradication only if there is a high degree of certainty about its technical feasibility even though there may be very good reasons from a public interest perspective to proceed with an eradication despite uncertainty.
- There is often limited involvement of technical experts in decision-making on eradications, and no requirement for feasibility and significance assessments to be subject to peer review. There is often limited involvement of environment departments. Community or environmental groups have no involvement at all.
- Decision-making by the National Management Group and consultative committees lacks transparency.
- To facilitate rapid action, a national fund is needed for initial responses up to a certain cost.
- The precautionary principle is standard in environmental law and policy and the guiding principle for Article 8(h) of the Biodiversity Convention specifies that the precautionary principle should be applied comprehensively to decisions relevant to preventing, eradicating, containing and controlling invasive species.
- Application of the precautionary principle should be required in biosecurity decision-making.

The main frameworks for preparing for and responding to new terrestrial incursions in Australia have been the animal disease and plant pest response agreements. These provide for:[64]

- *Funding sources identified and costs shared*: potential liabilities are known and funding mechanisms are agreed in advance
- *Participation of industry*: industry is directly involved in decision making about mounting and managing an emergency response from the outset
- *Coordinated incursion responses*: a consistent and agreed national approach for managing incursions
- *Shared risk minimisation*: commitment to risk mitigation by all parties through the development and implementation of biosecurity strategies and programs including surveillance, risk reduction, education, preparedness and early action.
- *Training and expertise*: motivation and rationale to maintain a reserve of trained personnel and technical expertise
- *Transparency*: provision of accountability and transparency to all signatory parties.

Animal Health Australia and Plant Health Australia are charged with overseeing the implementation of these deeds on behalf of government and participating industries. These two agreements are excellent models of preparing for and responding to biosecurity incidents.

Recent changes

The Beale review in 2008 recommended a more integrated and risk-based approach to biosecurity. An intergovernmental approach was formalised through an Intergovernmental Agreement on Biosecurity (IGAB),

[64] Modified from text by Plant Health Australia and Animal Health Australia

brought into force in 2012. Tasmania declined to be part of this agreement due to concerns that their interests were not covered.

One major output of the IGAB was an agreement about responses to environmental incursions between the federal, state and territory governments. This National Environmental Biosecurity Response Agreement (NEBRA), agreed in 2012, was modelled on the industry-based schemes to deal with threats not covered by these existing schemes

In the development of the IGAB and NEBRA there was no consultation with the environmental sector or non-government land managers despite their expertise and interest in the outcome and the important role they play in implementing biosecurity at the local level.

Formal biosecurity decision-making frameworks	
2002	Emergency Animal Disease Response Agreement (EADRA)
2007	Emergency Plant Pest Response Deed (EPPRD)
2012	Intergovernmental Agreement on Biosecurity (IGAB)
2012	National Environmental Biosecurity Response Agreement (NEBRA)

Table 16 shows the incursions considered or managed under the three terrestrial agreements in 2013.

TABLE 16. EMERGENCY RESPONSES UNDER NATIONAL COST-SHARING AGREEMENTS ACTIVE IN 2013[65]

Plant deed (EPPRD)	Outcomes	Public contribution $	Animal agreement (EADRA)	Outcomes	Public contribution $	Environment (NEBRA or pre-NEBRA responses)	Outcomes	Public contribution $
Green snail	Not an EPP	NA	Poultry avian influenza HPAI H7N2, NSW	Birds destroyed on 2 properties, virus contained	<$1M	Red imported fire ants in Qld	Eradication in progress	$15M 2012-13 $18M[66] 2013-14
Cocoa pod borer	Successful eradication	No funding requested				Smooth newt in Victoria	Rejected as an eradication target	NA
Chestnut blight	In proof of freedom stage	$0.5M 2012-13 $0.3M 2013-14				Four tropical weeds	Eradication in progress	$1.5M 2012-13 $1.5M 2013-14
Fursarium wilt	Under consideration by the CCEPP	No allocation as yet				Electric ant in Qld	Eradication in progress	$1.2M 2012-13 $1.2M 2013-14
Pepper chat fruit viroid	Under consideration by the CCEPP	No allocation as yet				Siam weed	Eradication not technically feasible	$0.5M 2012-13
Banana freckle	Eradication ongoing	<$1.2M 2013-14				Asian honeybee	Eradication not feasible, transition to management	$2M 2011-13
Potato spindle tuber viroid	Eradication implemented, under surveillance							
Strawberry angular leaf spot	Proposal for declaring eradicated in	No allocation yet						

[65] Standing Council on Primary Industries ministerial council resolutions 3 May 2013, 6 Dec 2013. Includes transitions from eradication to management.
[66] Qld contribution of $3M is additional to cost sharing agreements.

	preparation.			
Mango malformation disease	CCEPP considering technical feasibility	No allocation yet		
Branch broomrape	Transition to management	$1.7M 2012-14		
Myrtle rust	Transition to management	$1.5M 2011-13		
Red witchweed	Interim response developed	No allocation yet		

7.1 Flaws in the incursion response framework

Relevant to ToR (b)(v): current systems for responses to newly detected incursions, the timeliness and adequacy, and the role of ecological expertise

The formal intergovernmental and industry partnership biosecurity framework deals poorly with environmental biosecurity, in particular due to its lack of an environmental entity equivalent to Plant Health Australia and Animal Health Australia, its lack of engagement of the environmental and community sectors, and the often limited involvement of ecological experts.

IGAB includes provisions to establish the necessary elements of a good biosecurity system including pre-border and border assessment, verification and inspection processes, post-border measures, comprehensive national surveillance and diagnostic system, national emergency preparedness and response agreements.[67] Plant Health Australia and Animal Health Australia coordinate preparedness and response mechanisms for biosecurity threats that impact primary industries. This work is only being carried out to a limited extent for environmental threats despite the IGAB requirement that preparedness (and response agreements) must 'comprehensively cover industries, the environment and community under pre-arranged governance and cost-sharing agreements.' The NEBRA covers responses, but does not address the issue of preparedness.

Flaws in the emergency response agreements
The case studies on myrtle rust, red imported fire ants, smooth newts, pigeon paramyxovirus and Asian honeybees are particularly useful in exemplifying issues with emergency response agreements.

Hierarchy of deeds and agreements: Formal responses to incursions threatening the environmental rely on a hierarchy of deeds and agreements. Firstly, the government/industry plant and animal agreements are checked to see if they are triggered. If so, responses occur under these plans that were developed primarily for the purposes of industry (by Plant Health Australia or Animal Health Australia). Decision-making involves the relevant industry representative body and government representatives (usually only the agricultural departments) and there is no involvement of community representatives. If an incursion does not trigger industry agreements, responses fall under the NEBRA agreement.

We are concerned that this hierarchy means that decision-making for incursions with impacts on both industry and the environment is likely to dominated by industry perspectives. Many of the 80 listed plant diseases and 65 animal diseases in the plant and animal agreements impact on native plants and animals. It means that an industry party to the agreement could veto a response to an environmental incursion that also impacts on industry.

[67] IGAB 2012, Section 5.2: 'Through this Agreement, the Parties commit to a strengthened national biosecurity system based on the following components:
...
- Pre-border and border assessment, verification and inspection processes that establish which goods posing a biosecurity risk can enter Australia, their vectors, conditions of entry, and inspection and compliance arrangements.
- Post border measures to prevent the establishment of potentially serious pests and diseases that enter Australia or arise internally.
- A comprehensive national surveillance and diagnostic system that provides for early detection and accurate and timely diagnosis of pests and diseases.
- National emergency preparedness and response arrangements that:
  - comprehensively cover industries, the environment and community under pre-arranged governance and cost-sharing agreements; and
  - maintain an effective level of preparedness and response arrangements across jurisdictions to adequately respond to biosecurity incidents and emergencies across the biosecurity continuum.'

Decision-making model: A major flaw in all the deeds/agreements is the need to have consensus of all states/territories and any industry partners before it is agreed to attempt or continue an eradication.[68] This allows any one government or industry participant to effectively veto an eradication. A similar flaw is that unanimous support is required from all governments and any industry funder for cost-sharing arrangements for any eradication attempt. The requirements for consensus agreement skew decisions towards no or limited action and short-term and limited funding (ie. lowest common denominator decisions). Decisions of the consultative committee must also be made by the consensus of its members

By contrast, a risk-management approach to a new incursion should favour strong action on eradication over no action and the allocation of optimal funds to achieve eradication. Lessons learnt from past eradications are that eradication responses are improved by long-term planning and the retention of skilled staff, which requires the allocation of sufficient, long-term funds rather than short term funds as is typical. A new decision-making model is needed that draws more heavily on expert opinion about the significance and feasibility of eradications rather than on the case-by-case inclination of particular governments or industry participants. See 'Funding' below for an alternative model. The red imported fire ant program is currently hampered by unwillingness from Western Australia to allocate more than one year's funding, despite an offer of $3 million of additional funds from Queensland.[69] This may threaten the success of the eradication program and potentially subject all of Australia to massive environmental, social and economic costs.

Treatment of uncertainty: An additional flaw is the level of certainty required to act. NEBRA states that initiating a response to an incursion requires that 'the technical feasibility analysis of the outbreak indicates that the eradication is possible and likely.'[70] There is no definition of the terms 'possible and likely' in the NEBRA, and the degree of feasibility required is not specified. Without a requirement to apply the precautionary principle, coupled with the requirement for consensus, decision-makers are likely to proceed with eradication only if there is a high degree of certainty about its technical feasibility. From a risk management perspective, where the potential impacts of a new incursion are high, but the feasibility of eradication is uncertain, there may be very good reasons from a public interest perspective to proceed with an eradication despite uncertainty. This is particularly so for environmental incursions because of the difficulties and costs of managing invasive species once they are entrenched and the often great uncertainty about their impacts and the potential for eradication. From a risk management point of view, the high benefit:cost ratio common for eradications of new incursions should lower the threshold for certainty for proceeding with an eradication. Eradication programs such as that for the red imported fire ants show that often much is learnt during the process that greatly increase the feasibility. Sound environmental decision-making requires the application of the precautionary principle (see section 7.2).

Involvement of experts: There is often limited involvement of technical experts in decision-making. There is no requirement for the National Management Group to seek and have regard to technical advice – the NEBRA only says it 'may' do so[71] – and no requirement for feasibility and significance assessments to be subject to peer review by experts.

Involvement of environment departments: Most decisions about eradications are made by agricultural agencies with often limited involvement of environment departments. With the primary mission and expertise of these departments being in the agricultural sector, environmental incursions often don't receive the attention they warrant (see section 3). The expertise and focus of people appointed to decision-making roles in biosecurity agencies is predominantly of agricultural pests and diseases. For example, the role of the Australian Chief Plant Protection Office was described in 2013 as being to 'work closely with the Biosecurity Plant Division to enhance and drive opportunities for the Australian economy and Australia's plant-dependent industries through improved market access; to promote a shared vision for plant health in Australia to protect our valuable plant resources; and to represent the Australian Government on plant health issues of

[68] For example, NEBRA 6.7(e) states: 'To avoid any doubt, the NBMG must decide, on the basis of advice from the NBMCC, that a national biosecurity incident response will not commence if:
(v) the NBMG has not reached a consensus that a national biosecurity incident response should commence.
[69] Standing Council on Primary Industries ministerial council resolutions 3 May 2013.
[70] NEBRA 6.7 (b)(i)
[71] NEBRA 6.7 (d)(i)

international and national interest.' ABARES is often relied on for advising on technical issues but their expertise is in primary industries rather than the natural environment.[72]

Environmental sector involvement: Plant Health Australia and Animal Health Australia re closely involved in decision-making on responses (as a member of a consultative committee and as observers to national management groups). Affected industry groups also have a similar level of involvement. Community or environmental groups have no involvement at all.[73]

Transparency: The activities of the national management group and consultative committees are mostly secret. In a document provided by the Department of Agriculture, the department states that information on an incursion is subject to 'careful management' so as to (i) avoid inappropriate action by the public, (ii) protect trade and market access, (iii) protect 'confidential' information and (iv) limit potential compensation claims.[74] We are not convinced there are sound reasons for the current extent of secrecy and consider there are ways to protect confidential information and limit problems identified. These reasons are not balanced with public interest concerns and the need to explain decision-making to build confidence in responses to eradications that impact on the environment, human health and social amenity. For some high-profile incursions, public communiqués are issued but they reveal limited information about decision-making.

An attempt by the Invasive Species Council to use FOI laws in 2013 to request access to minutes of the National Management group for the two-year period July 2011-June 2013 only resulted in the provision of 9 pages of meeting agendas 9 months later at a cost of $97.50. Attempts to obtain agendas over a longer period, obtain minutes of the meetings, or to narrow down our request were refused because it was deemed to 'substantially and unreasonably divert resources of the agency'.

Although industry representatives are party to relevant decisions under EADRA and EPPRD, industry bodies have also criticised the secrecy of the National Management Group, as highlighted in the senate inquiry into the citrus canker outbreak in Queensland.[75] For example, Growcom said: 'The processes and decisions of the NMG were confidential therefore adding to the confusion. It is strongly suggested that future NMG processes and decisions be visually accountable and that the decisions are conveyed to the relevant stakeholders and the general public in a prompt manner.' And the Queensland Citrus Growers said: 'Confidentiality of CCEPP and NMG meetings has made it difficult for QCG and other industry representatives to communicate decisions and outcomes back to the industry bodies, and to the growers they represent.'

The abolition of the Standing Committee of Primary Industries Minister under COAG in December 2013 will further diminish transparency. Minutes of SCoPI that included reports on progress on nationally funded eradications and summaries of the work of the inter-government National Biosecurity Committee were made publicly available and it is unclear whether this arrangement will now continue.

Funding: An effective response to new incursions usually requires rapid action to limit spread. Activating the current agreements to obtain national funding is often time consuming, and obtaining consensus agreement is difficult. We strongly recommend that a national fund be established to provide funds for initial responses up to a certain cost so as to facilitate effective action. Decisions should be made on the basis of expert advice about significance and feasibility rather than on the basis of political willingness to provide funds. Signing up to a national response agreement should commit all governments to the allocation of funds for future eradications according to an agreed formula, without the need to gain the approval of all governments for each action. This would facilitate rapid decision-making and a more precautionary approach.

[72] Incoming Government Brief FOI 2013/14-22, 20 March 2014. The DAFF website says that ABARES provides research, analysis and advice 'on significant issues affecting Australia's agriculture, fisheries and forestry industries'.
[73] ISC was informed in 2011 that DAFF was considering whether ENGO representatives would be invited to participate as observers under NEBRA. One comment from within the agricultural department was that ENGOs might expect too much from the process.
[74] Department of Agriculture (2014)
[75] The Senate Rural and Regional Affairs and Transport Legislation Committee (2006)

ISSUES FOR THE INQUIRY

- How can current arrangements for responding to new incursions specified under the three agreements (NEBRA, EADRA, EPPRD) be improved to optimise decision-making for the public interest?
- Decision-making processes: Is consensus decision-making the best model? Should environment departments be involved in or lead decision-making as members of the national management group? Should the environment sector have at least an observer role on the national management group and consultative committee?
- Expertise: Should there be a requirement to seek and have regard to expert advice for decisions about eradications? Should significance and feasibility assessments be subject to peer review?
- Funding: Should there be a new funding model to improve the national capacity to respond quickly and effectively to new incursions of high environmental priority?

RECOMMENDATIONS

23. Develop a new model of decision-making in response to incursions to maximise the potential for decision-making in the public interest. This should include (i) majority rather than consensus decision-making, (ii) involvement of the community sector (at least as an observer to the national management group and consultative committees), (iii) much greater transparency about decision-making including publication of reasons for all decisions, (iv) peer review of significance and eradication feasibility assessments, (v) early establishment of scientific panels, and (vi) application of the precautionary principle.
24. Establish an emergency response fund that can be used to fund immediate and ongoing emergency responses up to a certain level for identified high priority, nationally significant incursions as assessed by an expert panel.

7.2 PRECAUTIONARY PRINCIPLE

Relevant to ToR (b)(v): current systems for responses to newly detected incursions, the timeliness and adequacy, and the role of ecological expertise

There is often considerable uncertainty about whether introduced species will become invasive and their likely impacts. Uncertainty,[76] whether due to inconclusive or insufficient evidence, is particularly prevalent and high with respect to impacts in the natural environment because of the complexity of biological interactions, the diversity of ecosystems and the unpredictability of environmental changes over time, particularly under climate change.

The precautionary principle is fundamental to effective biosecurity, particularly for the natural environment. The first Guiding Principle for Article 8(h) of the Biodiversity Convention requires a precautionary approach (Box 4).[77] The precautionary principle is standard in environmental law and policy (although often poorly enacted): a weak version of the principle was endorsed in the 1992 Intergovernmental Agreement on the Environment and is in the EPBC Act.

The approach to uncertainty is a vexed and contentious issue within biosecurity – because of what is regarded by many commentators as a conflict between obligations under global trade law and those under the Biodiversity Convention. There are undoubtedly tensions between the two regimes – with the ideals of free trade promoting the global flow of goods except when there is evidence of harm and those of conservation emphasising the need for protection in the face of scientific uncertainty, in effect giving the environment the benefit of doubt – but some commentators consider that application of the precautionary principle is

[76] Riley (2012): "uncertainty may be considered as a level of knowledge that is insufficient to conclude with confidence whether a species will become invasive, whether a pathway is likely to introduce IAS, and the nature of the relationship of IAS with co-stressors to biodiversity."
[77] Article 8(h) of the Biodiversity Convention requires the signatory countries to as far as possible and as appropriate: 'Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species'.

compatible with trade laws (and, as noted, the EPBC Act requires the application of precaution for decisions on live animal imports).[78,79] Where there is legal incompatibility between Australia's obligations under the Biodiversity Convention and under trade laws, Australia should as an urgent priority seek to reform trade laws.

Many decisions within biosecurity are precautionary – for example, the approach of refusing entry to new organisms unless they pass a risk assessment, and elements of the risk assessment process, such as requiring a certain threshold of information about risks before determining whether a particular import will be approved.

But as highlighted in the case studies many decisions relevant to the environment are not precautionary. When there is uncertainty about the impacts of an organism or the feasibility of eradication, the usual approach of the National Management Group (or its consultative committee) has been to not proceed with eradication. This was particularly evident in the responses to the following incursions, as outlined in the case studies for myrtle rust, the smooth newt and the Asian honey bee.

In 2011 the Senate Rural Affairs and Transport References Committee recommended that the Consultative Committee on Emergency Plant Pests reconsider whether the Asian honey bee was eradicable and that it 'should specifically apply the precautionary principle to areas of scientific uncertainty in its reconsideration'.[80]

As the guiding principle for Article 8(h) of the Biodiversity Convention specifies, the precautionary principle should be applied comprehensively to decisions relevant to preventing, eradicating, containing and controlling invasive species.

BOX 4. GUIDING PRINCIPLE 1, ARTICLE 8(H), BIODIVERSITY CONVENTION

Guiding principle 1 requires that 'efforts to identify and prevent unintentional introductions as well as decisions concerning intentional introductions should be based on the precautionary approach, in particular with reference to risk analysis… The precautionary approach should also be applied when considering eradication, containment and control measures in relation to alien species that have become established. Lack of scientific certainty about the various implications of an invasion should not be used as a reason for postponing or failing to take appropriate eradication, containment and control measures.' [81]

[78] This issue is discussed in more detail in Invasive Species Council (2012a).

[79] Riley (2012) argues that regulators should meet the objectives of both regimes and suggests one approach based on the concept of plausibility: "In the midst of competing views, regulators should take uncertainty into account in a wider context that incorporates the objectives of each regime. Instead of the problem of IAS [invasive alien species] being viewed as a trade *or* environmental problem, it should be viewed as a trade *and* environmental problem. Since WTO processes are based on reducing uncertainty, while the CBD Guiding Principles favour reducing the effects of uncertainty, taking a relational approach means that regulators need to concede that 'solutions do not exclusively consist of eliminating or reducing uncertainty.'

"Yet, either way, regulators still need to rely on scientific evidence to determine when to implement measures and what type of measures to initiate. A suggested method lies in identifying patterns that indicate a causal link between stressors to biodiversity and resultant threats or harm to biodiversity – a concept expressed as a 'plausible hypothesis'.

"The concept of 'plausibility' describes a proposition that remains persuasive until an alternative is shown to be more credible. This formulation draws on the work of the ancient philosopher Carneades, who stated that: plausibility commences with the proposition that, what appears to be true is tentatively true if it is contextually consistent with 'other things that appear to be true'. As a means of dealing with uncertainty, 'plausibility' affords the following guidelines: that regulators may invoke notions of plausibility where it is not possible to determine the actual state of affairs with certainty; that a statement is not plausible if it contradicts a known state of affairs; and, that in the absence of a known state of affairs, two contradictory statements may still be plausible." [Citations not included.]

[80] The Senate Rural Affairs and Transport References Committee (2011)

[81] See http://www.cbd.int/decision/cop/?id=7197. Underlining added.

RECOMMENDATION

- Require application of the precautionary principle in all environmental biosecurity decision-making, as required under the Biodiversity Convention. This includes for decision-making under the various agreements and deeds for emergency responses (NEBRA, EADRA, EPPRD) to incursions with potential impacts on the natural environment.

8. ENFORCEMENT

- Several recent incursions have been the result of species illegally brought to Australia, illegally kept or illegally released into the wild.
- Environmental crimes do not get the focus they warrant due to the low level of resources, the placement of biosecurity within agricultural agencies, the lack of a coordinated intelligence network, and a lack of methods used to investigate other types of crimes. Courts tend to impose low penalties.
- There is said to be a thriving illegal trade in wildlife, both into and out of Australia, and extensive illegal keeping. ISC demonstrated it is easy to make online purchases of prohibited, high-risk plants.

Relevant to ToR (b) (vi): the extent to which compliance monitoring and enforcement activities are focused on high priority environmental risks

Several recently detected incursions have been of species illegally brought to Australia or released into the wild, raising questions for this inquiry about the effectiveness of biosecurity compliance programs. Relevant case studies are:

- Pigeon paramyxovirus – alleged to have arrived via smuggled pigeons
- Smooth newt – suspected to have been released by someone illegally keeping them as pets
- Mexican feathergrass – sold illegally online and grown in gardens
- Red-eared slider – suspected to have been released by people illegally keeping them as pets
- Jack Dempsey cichlid – assumed to have been illegally released by a pet keeper
- Ebay internet purchases – the demonstrated ease of buying prohibited products through Ebay

There is little information available publicly about the priorities and effectiveness of biosecurity compliance. However, there has recently been some revealing commentary in the media from officers involved or recently involved in biosecurity compliance, and ISC has spoken to two people with good knowledge of compliance (on condition of anonymity).

The main point made by compliance officers is that enforcing laws with relevance for environmental biosecurity (either biosecurity laws or wildlife laws) generally has low priority within government. With finite resources for compliance, the priorities for biosecurity compliance are determined by politics and agency interests. One officer described it as 'like being a fireman', reacting to political pressure rather than risk-based priorities. Resources for biosecurity compliance have declined, and while there is more focus on allocating resources according to risk, the overall low level of resources means that compliance cannot be done properly and wildlife crimes are neglected. One officer noted that the placement of biosecurity within agricultural agencies contributes to environmental crimes not getting the focus they warrant.

Wildlife smuggling: A recent ABC Background Briefing program on bird smuggling cited internal documents from the Department of Environment in Victoria, which said, 'There is ample evidence that there is a thriving illegal trade in wildlife, both into and out of Australia, and that Victoria is significant in that trade.'[82] The document was based on intelligence gathered between 2005 and 2009: 'There are 50 to 500 eggs entering Australia per month, a significant increase in smuggling activity over the last several years.'

Background Briefing interviewed the former National Manger of Investigations with Customs, Richard Janeczko. Here are some relevant extracts:

> *Hagar Cohen (the reporter)*: Two sweeping wildlife investigations were launched in the past decade. They revealed sophisticated networks of criminals trading eggs of native parrots with eggs of exotic

[82] Background Briefing (2012). More of the transcript of this ABC report is included in the case study on pigeon paramyxovirus.

> parrots from South Africa, Singapore and the Philippines. But as we'll hear, these two investigations were dropped at the last minute. None of the key players identified were prosecuted.
> *Richard Janeczko*: I believe with a bit more resources, effort, and equipment those people could be successfully prosecuted, so I'm concerned about that. …
> *Hagar Cohen*: So you're saying there's no one out there to police wildlife crime in Australia?
> *Richard Janeczko*: What I'm saying is that it's not got the focus it deserves. I do think it's gone too far down the pecking order.
>
> *Richard Janeczko*: You make a detection at the airport, you've got two options. You either just record it, take the goods away, tell the guy he's a naughty boy or a naughty girl… to actually then pursue that to court takes a lot of effort and you know that it's going to take a lot of effort. And if you want to get the organisers, you've got to do more than that. If I get you at the airport with your birds in your vest—you've smashed them up—you've got to get DNA testing, you've got to identify the birds, you then have to work out where you were going to take the birds, because you might be only a mule, so we've got to work out who paid you, who the real organiser is. So the success rate in prosecutions, I think, or the lack of success—which is the better way to describe it—I think is down to the fact that there just isn't enough resources and priority to this sort of crime.
>
> *Hagar Cohen*: Is it simply an issue of not enough resources?
> *Richard Janeczko*: Well, I think firstly it's the recognition that it's a problem. And I think that's what's missing at the moment; there's not a recognition that the problem is as important as it is. So I think that's the key issue. If you accept that this is a danger to the future existence of Australia's vibrant ecology, you'd find the money.

There is reportedly widespread illegal smuggling, breeding and trading of banned species of aquarium fish in Australia.[83] One analysis in 2002 was that prohibited species account for up to 10% of the fish imported into Australia.[84]

Wildlife crime investigations: A 2011 report by a NSW environmental compliance officer, Steven James (cited in the Background Briefing program), says the Special Investigations Unit in the NSW Office of Environment and Heritage, which conducts investigations into wildlife crime, is also involved in administering >50 pieces of legislation, and 'does not have the capacity to provide full time resources to effectively tackle wildlife crime and gather any real intelligence on the subject'. This lack of capacity is similar to other jurisdictions in Australia.[85]

James cites the Partnership for Action against Wildlife Crime in Scotland as an excellent example of government agencies, NGOs and the community working together to combat wildlife crime. He says the model of wildlife crime law enforcement in the US is a good model with a network of federal and state agencies working cooperatively with resources identical to many police forces. While Australian wildlife crime investigators have a 'good working relationship through the Australasian Environmental Law Enforcement and Regulators Network (ALERT)' they 'lack a coordinated intelligence network, something mainstream policing has enjoyed for some time.'

James says Australia lacks essential methods to investigate wildlife crime: 'The clear difference between wildlife crime investigations in Australia and some agencies overseas is the use of overt and covert methodologies, intelligence management, digital evidence recovery and forensic science more like mainstream criminal investigation. Wildlife crime is discussed openly with the community who are considered part of the solutions as much as they are part of the problem.'

James recommends establishing a national network of dedicated wildlife crime investigators and crime intelligence analysts, establishing a database for wildlife crime intelligence, promoting wildlife crime as

[83] McNee (2002), West et al. (2007), citing others.
[84] McNee (2002)
[85] James (2011)

significant and mainstream, establishing a national reporting system, and providing funding for forensic analysis of DNA. We endorse all these recommendations.

Illegal online selling: It is easy to purchase prohibited imports online. After making complaints to Ebay about illegal products available to purchasers in Australia and receiving no response, ISC tested the system by successfully making purchases from the United States, China and Hong Kong of seeds of three prohibited plants, each banned from sale in Australia and regarded as a high-risk weed: Mexican feathergrass (*Nassella tenuissima*), stipa sleepygrass (*Stipa robusta*) and Kochia (*Bassia scoparia*).

Illegal keeping: Smooth newts and red-eared sliders have established probably due to releases by people illegally keeping them (see case studies 4 and 10). Illegal keeping is a major issue particularly for birds, reptiles and fish in Australia. Many collectors are attracted to the unusual and rare. They want animals that other keepers don't have. Initially, a new exotic species will be costly to buy and rare. But when keepers start breeding them their price drops and they become more readily available and often openly advertised. Animals are quite often found in the wild after being discarded by keepers.

The Background Briefing program on bird smuggling cited examples of birds not permitted to be kept in Australia being openly advertised for sale:[86]

> *Hagar Cohen*: Daniel Gowland's research shows large numbers of new exotic species are being openly advertised.
> *Daniel Gowland*: We're just trying to demonstrate that there are species, not individuals that are potentially smuggled in, but entire species that are in and this is what they're now being advertised as. The prices are coming down as the numbers come up. They're not on the list of species to be here…
> *Hagar Cohen*: So give me some examples of the ads. What have you got there?
> *Daniel Gowland*: This is a Rose-crowned Conure, a nicely DNA sexed unrelated pair: 'Preferably contact over the phone. Will freight to all buyers' expenses.' Here's another ad: 'One young Brown-throated Conure. Male. Call me.' Some of them are advertised in two of the major bird magazines and some of them are advertised on websites.
> *Hagar Cohen*: OK, so you've got 11 or 12 ads, what has been the government response to that?
> *Daniel Gowland*: Nothing, nothing. They're advertised in magazines, they're advertised on bird sale websites. You can ring and buy them. We could possibly go and do it now. Now, my question is, where are the government standing with any form of sustainability here? Where are they standing on their disease risk approach for birds in captivity, for birds in aviculture?
> *Hagar Cohen: Background Briefing* rang a breeder from Queensland who advertises Rose-crowned Conures for sale. This bird isn't on the inventory of exotic species, so theoretically it should be seized by the government. The breeder was asking $500 per bird and said he'd sold quite a few. He didn't have papers for the birds, but he reckoned nobody in Australia would have papers for the Rose-crowned Conures, because, as he said, they all came 'from somewhere they weren't supposed to.' He told me the government knows people are breeding and advertising the birds and as far as he knows, nobody's had their birds seized.

There is some lack of clarity in Australia about who is primarily responsible for enforcing laws relevant to illegal keeping, with various state/territory and federal environmental and biosecurity laws potentially applying. There is a lack of coordination between the various responsible departments.

Other biosecurity laws: There is also reason to suspect limited enforcement of other aspects of biosecurity laws. For example, in 2013 the Auditor General of WA found there is 'limited monitoring and almost no enforcement of landowner responsibilities to control established pests' with a 99% fall in the number of compliance notices issued. It was noted that, 'Monitoring and enforcement is a key element of a regulatory framework and there is a risk that some landholders will not control pests if there is no prospect of enforcement.'[87]

[86] Background Briefing (2012)
[87] Office of the Auditor General (2013)

Public education: There is little focus on educating the public on their compliance obligations. One officer ISC talked to stressed the importance of doing publicity when there are seizures. However, politicians often avoid or suppress publicity, he said, because it highlights weaknesses in their system and embarrasses them.

Penalties: One officer said the courts don't take crimes involving wildlife seriously enough. They usually give very low penalties and/or non-custodial sentences because they do not understand the potential environmental consequences of offences, such as demonstrated by the case studies.[88] How a judge views an offence often reflects general public perceptions about the relative seriousness of smuggling drugs vs pornography vs wildlife. Maximum penalties are often 5 times the value of the product. With penalties this low, smugglers simply factor this cost into the business of illegal imports.

ISSUES FOR THE INQUIRY

- What are the impediments to enforcing laws relevant to environmental biosecurity (under environmental and biosecurity laws)?
- Have there been any assessments of enforcement adequacy and the likely extent of wildlife crime relevant to biosecurity? With recent budget cuts, has enforcement capacity declined?
- How are enforcement priorities determined?
- How much coordination between governments (state and federal) is there in enforcing laws relevant to environmental biosecurity?

RECOMMENDATIONS

25. Establish a national network of wildlife crime investigators and crime intelligence analysts supported by a wildlife crime intelligence database.
26. Conduct public education about wildlife crime, including through publicising arrests and seizures. Establish and promote a national reporting system for wildlife crime.
27. Develop a strategy for environmental biosecurity compliance that identifies priorities.
28. Provide funding for forensic analysis of DNA for wildlife crime investigations.
29. Conduct a risk analysis of illegal smuggling and keeping of wildlife and develop a compliance strategy to target these crimes.
30. Conduct an audit of internet sales of organisms not permitted in Australia and develop a compliance strategy to stop illegal internet sales.
31. Investigate the adequacy of penalties available and applied for crimes relevant to environmental biosecurity. Educate the judiciary on the serious biosecurity consequences of wildlife crimes.
32. Develop a program similar to that of the Scottish Partnership for Action against Wildlife Crime which involves government agencies, NGOs and the community working together to combat wildlife crime.

[88] A recent example (reported on 1 September 2014) is a man fined just $770 for illegal keeping of an African pygmy hedgehog in captivity without a licence.

9. COMMUNITY ENGAGEMENT

- Meaningful community partnerships and engagement is essential for transparent, participatory and accountable biosecurity governance but Involvement of the environmental sector in the biosecurity system is extremely limited. The Biosecurity Advisory Council characterised community biosecurity engagement strategies as 'fragmented, under resourced and uncoordinated'.
- In contrast, industry bodies are closely involved in multiple advisory and consultative committees, and in processes such as contingency planning, policy setting and decisions on incursions.
- The Government's greatest ally in achieving stronger environmental biosecurity will be the environmental community sector with potential benefits from greater engagement including higher quality policies and decisions, improved biosecurity practices and stronger community and political support for biosecurity.
- A body such as the proposed Environment Health Australia is the most practicable way of engendering partnerships with community to address high priority biosecurity issues.

Relevant to ToR (b)(vii): the adequacy of … engagement of the community.

Community 'engagement' and 'partnership' are prominent buzzwords in biosecurity. As recognised by the Nairn and Beale reviews of biosecurity, they are also essential for transparent, participatory and accountable biosecurity governance. Engagement is challenging, and if done poorly – eg. consultation for the sake of process box-ticking rather than improved outcomes – it is a waste of government (public) and community resources, both of which are anathema to the community sector.

The environmental NGO sector has a major stake in biosecurity and warrants a strong role in policy-setting and decision-making by virtue of at least the following:

- a healthy natural environment is both a community right and responsibility
- the community bears the costs of ineffective biosecurity in suffering the effects of and paying for and conducting control of invasive species
- many biosecurity services are provided voluntarily by the community sector
- there are many types of biosecurity expertise within the sector
- environmental biosecurity lags behind industry biosecurity in part because there is limited community involvement within biosecurity policy-setting and decision-making.

Biosecurity is far from just technical decision-making. It requires prioritising, balancing, planning, innovating and foresighting, all of which require or benefit from the advocated community engagement and partnerships. That is why ISC has proposed the establishment of Environment Health Australia as a 'relationship and brains infrastructure' for grappling with priority environmental biosecurity challenges.

Involvement of the environmental sector in the biosecurity system is extremely limited. ISC has been the main ENGO engaged in federal biosecurity processes – as the sole environmental representative in a government working group on new biosecurity laws and on the National Biosecurity Committee Stakeholder Engagement Consultative Group. There has been no engagement on very important environmental issues such as the National Environmental Biosecurity Response Agreement. It appears that community 'partners' are regarded as more biosecurity brawn than brain, to comply with policies and decisions that are largely shielded from their views and expertise and to focus on controlling invasive species once they are out in the environment.

The Biosecurity Advisory Council (2011) has characterised community biosecurity engagement strategies as 'fragmented, under resourced and uncoordinated'.

Environmental compared to industry engagement
The lack of involvement of the environmental community sector is in stark contrast to the close involvement of industry bodies in biosecurity processes – in advisory and consultative committees, contingency planning, policy setting and decisions on incursions. Of about 20 federal biosecurity consultative forums noted by the

2008 Beale review – 14 AQIS Industry Consultative Committees, Animal Health Australia, Plant Health Australia, Aquatic Animal Health Committee, Australian Wildlife Health Network and Quarantine and Exports Advisory Council (replaced by the Biosecurity Advisory Council), only the latter two have had environmental representation or experts (as far as we are aware). Industry biosecurity benefits in particular from the work of Plant Health Australia and Animal Health Australia on contingency planning and other projects, for which there is no environmental equivalent.

A similar lack of engagement of the environmental community sector exists at a state level. Typically, advisory committees have one environmental representative and several industry representatives.

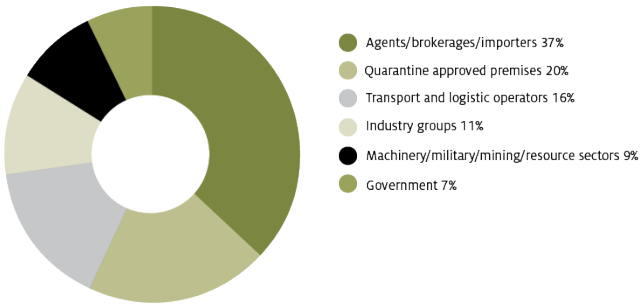
DAFF funded a three-year 'Engaging in Biosecurity' project to develop a biosecurity engagement framework. Most of the resulting reports discuss community engagement in general terms but focus almost entirely on agriculture. The reference group for the project did not have any environment NGO representation. The Biosecurity Engagement Guidelines list 12 'key stakeholders in biosecurity' that do not include environment NGOs. Community groups are listed but are described as groups like Lions and Neighbourhood Watch. Numerous industry-based groups are acknowledged.

TABLE 17. COMPARISON OF PARTICIPATION BY ENGO AND INDUSTRY REPRESENTATIVES IN FEDERAL BIOSECURITY PROCESSES (2008)

Biosecurity process	Industry involvement	ENGO involvement
Biosecurity Advisory Council	5 members with agricultural expertise or industry involvement.	0 members from the ENGO sector, 1 member with primary ecological expertise.
Contingency planning for incursions	Industry membership in Plant Health Australia and Animal Health Australia.	No equivalent body for environmental threats.
Responding to incursions	Represented through the involvement of Plant Health Australia and Animal Health Australia and as industry signatories to EADRA and EPPRD agreements.	No involvement in decisions. No role under NEBRA.
Consultative committees	14 industry-specific consultative committees; industry representation on animal health, plant health and national biosecurity committees.	Generally no representation.

Note: These committees may have changed in recent times. The lack of ENGO involvement has not changed.

The DAFF 2012-13 Annual Report summarises the breadth of biosecurity stakeholder consultation with industry during that year.[89]



DAFF BIOSECURITY STAKEHOLDER MEETINGS IN 2012-13

[89] DAFF Annual Report 2012-13 Figure 8 Biosecurity stakeholder meetings in 2012–13. From http://www.daff.gov.au/about/annualreport/2012-13/part-3/program-2.1

The one committee with environmental NGO representation – the Stakeholder Engagement Consultative Group – was formed in 2012. The aim of the group was to develop a strategy for improved consultation with all sectors, including the environment sector, but when it was abolished in mid-2013 a strategy for environmental sector consultation had not be developed. Steps have been taken to start a new group to liaise between the Department of Agriculture and the environmental sector.

Engagement and partnerships
Effective engagement requires ensuring community access to information, participation, and justice to empower groups and individuals to have a meaningful voice in decisions relevant to their health, wellbeing, communities and environment.

'Partnership' is a more demanding concept, implying shared power and responsibility.[90] The Beale review concluded that it is fundamental to effective biosecurity, as reflected in the title of the report 'One biosecurity: a working partnership'.[91] A new approach was needed, it said, and engagement with the business and community sectors 'must occur consistently and continually at several levels, from policy setting through co-regulatory alternatives to actions by individuals and companies, before, at and after the border'.

A partnership is not appropriate for all biosecurity processes. Governments are entrusted with biosecurity responsibilities, such as quarantine, on behalf of the community and should engage the community without divesting responsibility.

We advocate a partnership approach for functions proposed for Environment Health Australia. A partnership approach may also be appropriate for the development of biosecurity strategies and plans and the implementation of eradication and control programs on public and private conservation land.

Environment NGOs are a distinct and recognised category of community stakeholder with a clear stake in biosecurity, including:

- as advocates for and contributors to more effective environmental policies and programs (the majority of environmental gains in Australia have been catalysed by advocacy by environmental NGOs),
- as active participants in biosecurity, particularly in eradication and control programs for biodiversity conservation, on public and private lands, and
- as educators and information providers to a much wider range of stakeholders than government agencies can hope to reach.

Effective biosecurity is just as vital to conservation as it is to primary industries. The lack of direct financial benefit (apart from some avoidance of additional costs in community control programs) does not make its stakeholders any less legitimate or less important than those from industry sectors. The advocated access to information and participation in decision-making and policy-setting should be community entitlements but, more importantly, are practical vehicles for achieving effective biosecurity. There are many characteristics of environmental biosecurity that render engagement more essential and more challenging than for industry biosecurity.

Benefits
The Government's greatest ally in achieving stronger environmental biosecurity will be the environmental community sector. The potential benefits from greater engagement include the following.

Higher quality policies and decisions
- Ensuring community access to information and participation in decision-making increases the transparency and integrity of decision-making and the legitimacy of decisions.

[90] A relevant definition is 'a relationship characterised by mutual cooperation and responsibility for the achievement of a specified goal.'
[91] Beale et al (2008)

- Involving the community sector avails decision-makers of information vital for sound decision-making. The sector includes experts and practitioners in many fields.
- The meaningful participation of the community sector delivers different perspectives, expertise and ideas to increase innovation in biosecurity policy.

Improved biosecurity practices

- Ensuring that community sectors have a strong stake in effective biosecurity will motivate influential groups and individuals to work to improve biosecurity awareness and practices in the community.
- Involving environmental practitioners in policy and planning will increase the prospects of implementation.

Stronger community and political support for biosecurity

- Engaging the environmental community sector will result in stronger biosecurity advocacy for public and private support for and investment in biosecurity.

Challenges and costs

Effective engagement requires much more than including an environmental representative on relevant committees and inviting community submissions on some decisions. It requires commitment, resources and effort by both government and the community sector. Challenges of engagement for environmental biosecurity include the following:

- There are a multitude of legitimate stakeholders, with multiple and sometimes conflicting agendas.
- There are capacity deficiencies in the community sector, particularly lack of resources and time. The previous lack of involvement in biosecurity policy also means there is lack of intimate knowledge of processes. Biosecurity is an information-dense issue, demanding much of community representatives.
- Within the environmental community sector, biosecurity does not receive the attention and priority it warrants (for reasons of complexity, culture, history). The focus has traditionally been on controlling the most damaging invaders rather than on the continuum.
- Engagement is essential but not a panacea for resolving contentious policy issues. There will inevitably be tensions between different parties, including where economic and environmental interests are in conflict. There are cultural differences and lack of mutual understanding between many in the biosecurity sector and the environmental community sector.

Issues for the inquiry

- What arrangements will best facilitate effective partnerships with non-government bodies to improve environmental biosecurity?
- What constitutes best practice engagement for environmental biosecurity?

Recommendations

33. Establish Environment Health Australia, or similar body, as the most practicable way to engender partnerships with community to address priority environmental biosecurity issues (see detail in section 12).
34. Establish a consultative committee for environmental biosecurity, involving representatives from the range of environmental community stakeholders, to engage with DSEWPaC and DAFF on priority environmental biosecurity issues.
35. On all consultative and advisory committees relevant to environmental biosecurity, ensure there is representation from the environmental community sector adequate to represent the diversity of views and expertise of the sector and proportionate to the environmental relevance of the committee. Where the issues are equally relevant to industry and the environment, ensure there is equivalent representation from both sectors. The membership of the Biosecurity Advisory Council should have equal representation of expertise in agriculture and the environment.
36. Establish an 'environmental engagement' position within the biosecurity agency to work with the sector to facilitate access to information and participation within biosecurity processes.

37. Develop a memorandum of understanding between DAFF and representative organisations within the environmental community sector and best practice engagement guidelines for the sector as a project undertaken in partnership with the sector. This project would include assessment of the capacity needs of the sector to fully engage in biosecurity processes at all levels.
38. Publish extensive information about biosecurity on the internet, providing open access to information to allow the community sector to better understand and evaluate biosecurity decisions and performance.

10. REPORTING AND TRANSPARENCY

- Biosecurity in Australia, particularly environmental biosecurity, is largely opaque, with limited flow of information about most aspects of biosecurity including new incursions, organisms detected, import applications and approvals, most risk assessments, enforcement actions, and the status of introduced species.
- The 2012 Biosecurity Bill made no provisions to improve information flow and transparency.
- Information collection and publication is vital for biosecurity functions such as establishing a baseline against which to assess progress to biosecurity targets, evaluating progress, auditing biosecurity performance, identifying emerging biosecurity risks and sharing information about risks with biosecurity participants.
- The proposed Environment Health Australia would be the appropriate body to undertake many of the environmentally relevant reporting functions.

Relevant to ToR (b)(vii) the adequacy of reporting on incursions and transparency in decision-making

Biosecurity in Australia is largely opaque, with limited flow of information about most aspects of biosecurity performance (Box 5), including about new incursions, organisms intercepted or detected, inspection rates, applications for imports, applications approved and rejected, individual risk assessments, enforcement actions, and the status of introduced species.

Information essential to environmental biosecurity is particularly lacking. There is no reporting such as is done by Plant Health Australia and Animal Health Australia for primary industries.[92] There is no baseline against which to assess Australia's progress towards its 2015 invasive species target in the Biodiversity Conservation Strategy 2010-2030. State of the environment reports typically evaluate responses to invasive species by listing 'plans, strategies and inputs to management, but rarely report on the effectiveness of processes or on outputs and outcomes.'[93]

BOX 5. INFORMATION FLOW IN BIOSECURITY, EXTRACTED FROM COOK (2010)[94]

In reality, the flow of information between and within national biosecurity systems appears limited. Interception records associated with traded commodities are rarely published, and when available are of limited use in quantitative risk assessments as the total number of inspections (i.e., including negative finds, where no organisms are found) are either not recorded, or haphazardly classified. Data are not made readily available to parties outside government agencies who could benefit from it, such as research institutions or other biosecurity agencies, possibly facing similar threats. Moreover, estimates of the probability of an incursion, establishment, spread, and impact are seldom validated if and when a target IAS is detected.

The flow of biosecurity-related information between trading partners is also limited, giving rise to the tendency for governments to overlook net social and economic gains from trade due to unknown IAS risks.

Apart from reporting by the Inspector-General of Biosecurity, there were no provisions in the Biosecurity Bill 2012 to improve information flow and transparency. It was inadequate in the following ways:

- Very limited access to information, with no requirements in the Bill for publication of information other than for Biosecurity Import Risk Analyses and reports by the Inspector-General.

[92] Eg. Plant Health Australia (2014).
[93] State of the Environment 2011 Committee (2011)
[94] Cook et al. (2010)

- Very limited rights to make representations and limited consultation requirements, restricted to Biosecurity Import Risk Analyses and some Inspector-General functions.
- Limited involvement for the community in policy setting, with no requirements for advisory committees or consultative committees to have any representation from the community sector (or to have any particular environmental expertise).
- Rights to obtain reasons for decisions or appeal decisions to apply only to import applicants, not the community.

Information collection and publication is vital for the following biosecurity functions:

- establishing a baseline against which to assess progress to biosecurity goals and targets
- evaluating progress towards achieving biosecurity targets and goals
- auditing performance of biosecurity functions, including risk assessments, surveillance, inspections interceptions, eradications, containment, and control
- identifying emerging biosecurity risks to enable the development of preventative policy
- sharing information about risks with biosecurity participants, including internationally.

Environment NGOs advocate the following mandated reporting requirements:

- outlook reports on emerging biosecurity risks and policy options, and
- state of biosecurity reports including progress in achieving biosecurity goals and targets in the proposed Environmental Biosecurity Strategy, performance of biosecurity functions and programs and data such as species interceptions and spread.

The proposed Environment Health Australia would be the appropriate body to undertake many of the environmentally relevant reporting functions.

ISSUES FOR THE INQUIRY

- What sort of biosecurity information should be made publicly available and in what formats?

RECOMMENDATIONS

39. Mandate the following reporting requirements:
    - Environmental biosecurity outlook reports (every two years)
    - State of environmental biosecurity reports (annual), including on progress to achieve targets in the proposed Environmental Biosecurity Strategy.

11. BIOSECURITY INSTITUTIONS AND CULTURE

- The environment is treated largely as an add-on to existing biosecurity approaches rather than driving new ecologically informed approaches.
- As is widely acknowledged, environmental biosecurity has not received the same priority and resources as biosecurity for industry and lags behind.
- The environment is not given priority in biosecurity for reasons including that it is primarily the responsibility of agricultural agencies, who have no specific commitment to environmental targets such as those in the national biodiversity strategy, a lack of environmental expertise in decision-making echelons, the lack of methods for responding to high uncertainties in ecological systems and for costing environmental impacts.
- New institutional arrangements are needed to ensure sufficient priority is given to the environment, including the proposed Environment Health Australia and the creation of an independent biosecurity authority advised by an expert biosecurity commission.

Relevant to ToR (b)(viii): institutional arrangements for environmental biosecurity and potential improvements

On the webpage providing an overview of 'Biosecurity in Australia', the Department of Agriculture states:

> For well over a century, quarantine has played a critical role in reducing the risk and shaping our nation to become one of the few countries in the world to remain free from the world's most severe pests and diseases.[95]

As outlined in section 1, the converse is true for the environment, which is suffering the impacts of many of the world's most severe pests and diseases, and is one of the nations most severely affected by invasive species.

Australia's biosecurity system was established primarily to protect agriculture and is managed primarily by agricultural agencies. The dominant culture and concepts in biosecurity have been born from agriculture. Environment is now formally and legislatively a biosecurity focus but in many respects the environment is treated as an add-on to existing biosecurity approaches rather than driving new ecologically informed approaches.

There is widespread acknowledgement that environmental biosecurity has not received the same priority as biosecurity for industry and lags behind. The 2008 Beale review of biosecurity noted the inequity:[96]

> '…Australia has a relatively poor knowledge of the biosecurity threats to its natural environment. This is largely a function of the absence of commercial incentives to research and monitor environmental pests and diseases. As a result, the principal responsibility for biosecurity research as it relates to the natural environment lies with governments and the community. These activities have not received a high priority for funding. Unlike incursions that impact on primary production, where active engagement by business is motivated by self-protection, the effort required to respond to an incursion affecting the environment must be provided primarily by governments.

The 2009 Hawke review of the EPBC Act also noted the inequity and identified a problem of 'culture'.[97] In his advice on whether biosecurity functions in the EPBC Act (assessing live animal imports) should be transferred to the biosecurity agency, Allan Hawke said there were potential benefits with 'an opportunity to embed

[95] http://www.daff.gov.au/biosecurity/quarantine
[96] Beale et al. (2008)
[97] Hawke (2010) Appendix 6.

environmental considerations as equal to those of human health and primary production in all stages of Australia's approach to managing biosecurity'. However, the risk was that 'environmental outcomes could be compromised if the primary focus remains on trade and primary production – a problem of "culture"'.

There are several reasons that the environment is given insufficient priority in biosecurity, including the following.

Institutional arrangements: Both federally and in state/territory governments, biosecurity is primarily the responsibility of agricultural agencies and there is often limited engagement of environmental agencies in biosecurity policy-setting and decision-making (such as decisions under NEBRA and other agreements on whether to undertake eradications). The agricultural agency has no manifest commitment to important environmental targets such as set out in Australia's national biodiversity strategy. One of the problems with biosecurity being primarily the responsibility of agricultural agencies is that it is thus not a sufficiently high priority for either the environmental or agricultural agency.

Organisational culture: This is manifested in many different ways; for example, see section 9 on engagement. The minister and senior executives within agricultural agencies are selected primarily for their interest and expertise in agriculture.

Lack of environmental expertise: There is limited environmental expertise within the decision-making echelons of biosecurity agencies.

Ecological complexity: There are many differences between agricultural and environmental systems (section 1) that are not fully understood or well accounted for in biosecurity decision-making. For example, despite the often great uncertainty of environmental impacts, there is no requirement to apply the precautionary principle in biosecurity decision-making.

Lack of costing methodology: The impacts of invasive species on agriculture can be costed but there are no accepted methods for 'costing' environmental impacts or comparing them with other types of impacts, which in combination with the great uncertainty often associated with environmental impacts can lead to them being disregarded.

Many of the issues that we identify in this submission arise because the natural environment is not given sufficient priority. It is hard to mandate priority – Allan Hawke thought it necessary to legislatively require that the environment be given equal consideration alongside human health and economy and social considerations[98] – but we think it needs new institutional arrangements. Only a dedicated body such as the proposed Environment Health Australia will deliver the required focus on biosecurity preparedness. Decision-making needs much greater involvement of environment departments and the non-government environmental sector. The role of biosecurity should be separated from trade promotion – there is a serious conflict of interest in the dual roles of the Department of Agriculture (and the departmental secretary) to promote agricultural trade and implement biosecurity. The best institutional arrangement to resolve the current problems is to implement the recommendation of the Beale review of biosecurity to create an independent biosecurity authority advised by an expert biosecurity commission.[99]

ISSUES FOR THE INQUIRY

- What institutional and cultural impediments are there to achieving stronger environmental biosecurity?
- How can the disparities in resources to environmental and agricultural priorities be addressed?
- What is the level of environmental expertise within biosecurity agencies, including in senior executive roles?
- How can institutional arrangements be improved for environmental biosecurity?

[98] Hawke (2010)
[99] Beale et al. (2008)

RECOMMENDATIONS

40. Implement the structure proposed by the Beale review of a statutory Biosecurity Authority, an expert Biosecurity Commission and an independent Director of Biosecurity.
41. Specify that at least one-third of Biosecurity Commissioners must have primary expertise in disciplines relevant to environmental biosecurity, including ecology and conservation biology, and be appointed by the Environment Minister, as recommended by the Hawke review of the EPBC Act.
42. Create a Biosecurity Minister to oversee biosecurity legislation. Alternatively, provide the Environment Minister with statutory decision-making roles relating to important environmental biosecurity issues.
43. Elevate environmental biosecurity as a priority in biosecurity legislation and in the administration of biosecurity.

12. PROPOSAL FOR ENVIRONMENT HEALTH AUSTRALIA

- Given the extreme existing threats to biodiversity by invasive species and the continued high rate of incursions, Australia needs a stronger focus on environmental biodiversity that is ecologically informed, well-coordinated and collaborative.
- Environment NGOs propose the establishment of a national body – called Environment Health Australia or similar – as a very high priority to improve Australia's biosecurity preparedness, responses, capacity, and collaboration.
- Bolting environmental functions onto existing structures Plant Health Australia and Animal Health Australia will not work since existing industry-focused bodies are unlikely to give environmental threats the priority and focus warranted and to effectively involve the community sector.
- Over the past 5 years, the federal government has contributed >$20 million to -Plant Health Australia and Animal Health Australia. Given how far environmental biosecurity lags behind agricultural biosecurity, there is good reason for the federal government to invest even more in an equivalent environmental body.

Relevant to ToR (b) (viii): institutional arrangements for environmental biosecurity and potential improvements

Given the extreme existing threats to biodiversity by invasive species and the continued high rate of new invasive species arriving and establishing, Australia clearly needs a more concerted focus on environmental biosecurity that is ecologically informed, well-coordinated and collaborative.

Environment NGOs propose the establishment of a national body – called here Environment Health Australia (EHA) – to bring together major participants in environmental biosecurity, effectively involve the community sector, and facilitate cross-jurisdictional, cross-sectoral collaboration.

EHA is proposed as the environmental equivalent of (and to collaborate with) AHA and PHA, which appear to be an excellent model for engendering industry-government partnerships. One of the reasons that agricultural biosecurity is considerably more advanced than environmental biosecurity is the existence of PHA and AHA. The 2008 biosecurity review noted they 'have been integral to Australia's biosecurity success'.[100] Plant Health Australia recognised the advantages of establishing a similar independent body 'to create the framework and coordination for partnerships to operate' for environmental purposes.[101]

Environment NGOs consider that a similar collaborative approach with similar levels of publish resources (see Tables 18 and 19), focused on environmental biosecurity priorities and with meaningful involvement of the community sector, would greatly strengthen Australia's capacity for environmental biosecurity.

We consider this one of the highest priority reforms, and an essential basis for many of the other reforms needed. The proposal is outlined in detail in the attached document 'Keeping Nature Safe'.[102]

Proposed functions and membership of EHA

The functions of the proposed EHA could include the following:

- Improve Australia's biosecurity preparedness, eg. develop contingency plans and surveillance protocols, and conduct foresighting
- Strengthen the foundations of environmental biosecurity by promoting more ecologically informed approaches to biosecurity

[100] Beale et al. (2008)
[101] Plant Health Australia (2008)
[102] Invasive Species Council (2012b)

- Promote effective responses to environmental invasions, eg. develop emergency response plans and facilitate training
- Enhance community awareness, vigilance and action in biosecurity
- Improve environmental biosecurity capacity, eg. identify and prioritise research and capacity needs and act as a clearing house for information
- Improve coordination and collaboration between jurisdictions, agencies and sectors.
- Monitor and report on progress in environmental biosecurity.

Potential members of EHA include:

- Federal, state and territory government environment and biosecurity agencies
- Environmental NGOs
- Indigenous land management organisations
- Natural resource management and conservation land management organisations
- Research institutions focused on biosecurity and ecology
- Professional bodies for people involved in environmental biosecurity (eg. weed societies, Ecological Society of Australia, Australasian Plant Pathology Society)
- Environmental and allied primary production industry bodies (eg. in ecotourism, environmental restoration, zoo and wildlife industry, botanic gardens).

Not an industry body

In recognition of the need to improve environmental biosecurity and the benefits brought by PHA and AHA, there have been proposals to expand their functions to include a focus on environmental issues.[103] However, for the following reasons we consider that bolting on environmental functions to the existing structures will not work to achieve the ecological, collaborative and coordinated approach needed for environmental biosecurity.

PHA and AHA are not-for-profit companies to coordinate government-industry partnerships to protect plant and animal industries. The industry membership of these bodies is understandably unlikely to accord environmental threats the priority and specific focus they require. It is difficult to see how the wide variety of stakeholders in the community sector could assume an effective partnership role in these organisations, and there has been no consultation with the community sector about this.

The 'one biosecurity' approach to biosecurity advocated by the 2008 biosecurity review requires recognising differences as well as similarities to biosecurity for industry and environmental purposes. Although many invasive species affect both business and environmental assets and warrant a joint approach, protecting nature differs in many ways from protecting industry assets, including in the ways outlined in section 0. A dedicated focus by an environmental body is needed rather than a bolt-on to existing bodies.

Funding

The major impediment to the proposal for EHA seems to be financial due to budgetary constraints as governments reduce spending, including on biosecurity and conservation. This is false economy given the high costs of failure to prevent new incursions.

The community relies on governments to invest resources on their behalf to protect the environment for the public good. The 2008 biosecurity review recognised that biosecurity research for the natural environment had 'not received a high priority for funding'.[104]

Given that improving environmental biosecurity is so critical to conservation and that environmental biosecurity lags that for industry in large part because of government investment in the work of PHA and AHA, there is a strong rationale for governments to also invest in a body focused on environmental priorities. Other potential sources of funding include development offsets, industry levies under the 'polluter pays' principle, philanthropic funding and memberships and in-kind support.

[103] Eg. Beale et al. (2008)
[104] Beale et al. (2008)

Many groups in the community sector have limited capacity to contribute financially but EHA could potentially leverage considerable in-kind contributions.[105] The community sector already contributes substantially to management of invasive species threats. Respondents to a national survey of organisations managing invasive species threats included 485 community organisations providing $61 million of effort per year. By extrapolation, the annual value of the community effort was conservatively estimated to be in the order of $600 million and likely to be much higher.[106]

Over the 5 years to 2012-13, the federal government provided $22.6 million funding to AHA and PHA, an average $4.5 million/year (Tables 18 and 19). This includes membership subscription funding of $10.2 million and project funding of $12.4 million. State and territory governments in combination provided an equivalent level of membership funding, ie. $10.2 million over the 5 years to 2012-13. (They presumably also provide some project funding.) Industry paid a third of total membership funding ($10.2 million over 5 years).

Given how far environmental biosecurity lags agricultural biosecurity and the huge investment by taxpayers in agricultural biosecurity through AHA and PHA (as well as other ways), there is good reason for the federal government to invest at least a similar level in the proposed Environment Health Australia, that is, $20 million over the next 5 years. A higher level of funding would be justified given how much work needs to be done to achieve the same level of preparedness as the industry sector.

TABLE 18. COMMONWEALTH FUNDING FOR ANIMAL HEALTH AUSTRALIA, 2008-09 TO 2012-13[107]

Financial Year	Membership funding ($ million, exc GST)	Project funding ($ million, exc GST)
2012-13	1.30	0.88
2011-12	1.30	0.99
2010-11	1.24	1.14
2009-10	1.27	2.08
2008-09	1.27	1.09
5 year total	**6.38**	**6.18**

TABLE 19. COMMONWEALTH FUNDING FOR PLANT HEALTH AUSTRALIA, 2008-09 TO 2012-13[108]

Financial Year	Membership funding ($ million exc GST)	Project funding ($ million exc GST)
2012-13	0.78	1.96
2011-12	0.75	3.76
2010-11	0.75	0.23
2009-10	0.75	0.12
2008-09	0.75	0.22
5 year total	**3.78**	**6.29**

[105] Many industry groups also contribute very little funding to the industry groups, with some bodies paying just $1500 annually for membership of Plant Health Australia.
[106] Invasive Species Council (2013a)
[107] Minister for Agriculture, Fisheries and Forestry. 2013. Government Funding: Animal Health Australia and Plant Health Australia. Question No. 2668 (asked on 14 January 2013)
[108] Minister for Agriculture, Fisheries and Forestry. 2013. Government Funding: Animal Health Australia and Plant Health Australia. Question No. 2668 (asked on 14 January 2013)

RECOMMENDATIONS

44. Establish a new national body – called Environment Health Australia (or similar) – to bring together major participants in environmental biosecurity, effectively involve the community sector, and facilitate cross-jurisdictional, cross-sectoral collaboration on priority tasks. The functions would include:

    - Improve Australia's biosecurity preparedness, eg. develop contingency plans and surveillance protocols, and conduct foresighting
    - Strengthen the foundations of environmental biosecurity by promoting more ecologically informed approaches to biosecurity
    - Promote effective responses to environmental invasions, eg. develop emergency response plans and facilitate training
    - Enhance community awareness, vigilance and action in biosecurity
    - Improve environmental biosecurity capacity, eg. identify and prioritise research and capacity needs and act as a clearing house for information
    - Improve coordination and collaboration between jurisdictions, agencies and sectors.
    - Monitor and report on progress in environmental biosecurity.

45. Invest a minimum of $20 million over the next 5 years in the proposed Environment Health Australia. Encourage state and territory governments to contribute at least $10 million over the next 5 years.

13. THE IMPORTANCE OF ISLAND BIOSECURITY

- Islands are important environmental assets that are highly vulnerable to invasive species yet offer sanctuary to species threatened by invasive species on the mainland and opportunities for eradicating invaders.
- Rigorous biosecurity for islands should be a high environmental priority, but Australia lacks a national, comprehensive plan of action for island biosecurity, and island biosecurity is often neglected.
- Environmental NGOs have proposed a National Island Biosecurity Initiative to establish biosecurity priorities for all islands based on their ecological values and risk assessment and develop biosecurity management systems.
- Essential biosecurity functions could be facilitated by the declaration of 'conservation biosecurity zones' as was proposed by environmental NGOs for the Biosecurity Bill 2012.

Relevant to ToR (c): any other related matter

Islands are very important environmental assets in Australia. They harbour many endemic species and subspecies, and provide breeding and roosting grounds for seabirds, marine mammals and reptiles. Most of Australia's breeding seabirds nest only on islands.[109] Many islands also function as refugia for species threatened by invasive species on the mainland.

Numerous islands are either within a World Heritage Property (eg. Great Barrier Reef islands), a Commonwealth Territory (eg. Heard Island and McDonald Islands), or contain a Commonwealth-managed protected area over the whole or part of the island (eg. Christmas Island, Norfolk Island). Many are also important to matters covered by the EPBC Act including nationally threatened species and ecological communities, migratory species and marine species, threat abatement plans and recovery plans. A strategic approach to island biosecurity would complement and assist in the implementation of these plans (such as abatement plans for rodents on offshore islands, tramp ants and cane toads). Many islands contain critical habitats for one or more species listed under various international agreements to which Australia is a signatory, including the Convention on Migratory Species (marine turtle nesting-sites and many seabird nesting sites), Agreement on the Conservation of Albatrosses and Petrels (ACAP) and various Migratory Bird Agreements (JAMBA/CAMBA/KORAMBA).

However, islands also seem to be disproportionately impacted by invasive species, and have suffered many native species extinctions.[110] The three most recent probable extinctions in Australia have been on islands (Christmas Island pipistrelle, Christmas Island skink, Norfolk Island white-eye, all affected by invasive species). But islands also offer the advantage that eradications of invasive species are often far more feasible than they are on the mainland. Far more eradications have been achieved on islands – >120 on Australian islands.[111]

Therefore, rigorous biosecurity for islands should be a high environmental priority. But as Nias et al. (2010) note, Australia lacks 'a national, comprehensive plan of action for island biosecurity', and island biosecurity is often neglected. There are probably many unrecorded recent incursions on islands because there is very little surveillance on most of Australia's >8000 islands.

There has been a recent incursion of Argentine ants on Norfolk Island (see case study). This ant is one of the world's most economically and environmentally damaging invasive species. How they arrived on Norfolk Island is unknown. They probably arrived around 2000 but were identified only in 2005 and spread rapidly after 2007, probably via the distribution of garden mulch from a waste management centre. Substantial effort and resources have been invested in surveillance and control of the ant and it is considered eradicable but unless

[109] Nias et al. (2010)
[110] Simberloff (1995)
[111] Eradications have been tallied in Invasive Species Council (2013b).

additional resources are provided soon, it may move beyond the point of successful eradication.[112] The case study demonstrates both the need for improved biosecurity at point of entry as well as the environmental, financial and economic benefit of early detection and eradication.

Proposal for a National Island Biosecurity Initiative

WWF and Reef Catchments, supported by several other NGOs, have proposed a National Island Biosecurity Initiative (Box 6). Many of the essential quarantine and surveillance measures could be facilitated by the declaration of 'conservation biosecurity zones', which NGOs have proposed be established under the forthcoming Biosecurity Act (Box 7).

Chapter 6 of the Biosecurity Bill 2012 provided the Director of Biosecurity with discretion to declare various types of biosecurity zone. In response, environment groups proposed that the provisions be used to protect high value conservation areas subject to high biosecurity risks, which is the case for many islands.[113] Unless biosecurity protection of such areas is a designated federal government goal and there is a designated zone type, systematic protection is unlikely to occur. Therefore ENGOs proposed a special category of biosecurity zone – 'conservation biosecurity zones' – to implement biosecurity measures and plans and conduct monitoring in areas with high conservation values and special biosecurity needs such as islands.[114] Environment NGOs recommended that the Secretary of the Environment Department have power under the Biosecurity Act to make conservation biosecurity zone declarations on the advice of an independent expert body such as the Threatened Species Scientific Committee.

Box 6. National Island Biosecurity Initiative[115]

Elements of a National Island Biosecurity Initiative should include:

- Establishing biosecurity priorities for all islands based on their ecological values and risk assessment.
- Development of biosecurity management systems for all islands. High priority and high risk islands (e.g., those with development or people living on them) should have an individual biosecurity management system; those with a lower risk can be managed via regional management systems.
- Biosecurity management systems that include both the prevention of incursions through quarantine approaches and establishment of systems to control importation of species for domestic and agricultural purposes. Biosecurity management systems should cover both terrestrial and marine organisms.
- Regular surveillance of high and medium priority islands, e.g. those with populations of threatened species that would be threatened by an invasive species such as cats or rats, and occasional surveillance of lower priority islands.
- Best practice approaches developed and/or modified from existing resources and appropriate training for island managers.
- Establishment of ready response capability including the ready availability of equipment.
- A range of tailored education programs targeted at island dwellers and visitors.

Box 7. Examples of how biosecurity zones could help protect high value conservation areas

Protecting islands from re-invasion by eradicated species: Australia has recently been investing substantial resources in eradicating invasive species from islands – for example, cats, rabbits and rats from Macquarie Island; and goats, pigs, cats, rats and mice from Lord Howe Island. Biosecurity zones could be established to provide the basis for implementing regulations and protocols to limit the risks of re-invasion or new incursions.

[112] Lach and Barker (2013)
[113] Invasive Species Council (2012a)
[114] Invasive Species Council (2012a)
[115] WWF, Reef Catchments. (2010)

Protecting seabird nesting islands: Many islands important for seabirds are at great risk of accidental (or sometimes deliberate) release of invasive predators, such as rats, mice, tramp ants or weeds. Biosecurity zones could be declared to provide a nationally consistent basis for regulating activities that pose biosecurity risk such as visitation by fishing boats or yachts.

Buffering high value areas from biosecurity risk: Although managers (whether government or private) of high value conservation areas have the lawful capacity to manage invasive species on their land, they are usually powerless to manage activities or monitor pests or diseases in adjacent areas that threaten their land. Conservation biosecurity zones could be used as the basis for managing or monitoring buffer areas to provide protection for high value areas at risk.

ISSUES FOR THE INQUIRY

- How adequate are current biosecurity measures for islands with high biodiversity values?
- What surveillance programs are there for islands?
- What the main gaps in biosecurity for islands with high biodiversity values?

RECOMMENDATIONS

46. Develop a National Island Biosecurity Initiative, which includes:
    a. establishing biosecurity priorities for all islands based on their ecological values and risk assessment,
    b. developing biosecurity management systems for all islands, with individual biosecurity management systems for high priority and high risk islands,
    c. conducting regular surveillance of high and medium priority islands,
    d. developing best practice biosecurity approaches for island managers,
    e. establishing ready response capability for islands
    f. building community support for improved island biosecurity.
47. Under the Biosecurity Bill, establish a category of biosecurity zone for high value conservation areas with high biosecurity risks known as 'conservation biosecurity zones', as the basis for implementing biosecurity measures, plans and monitoring for islands (and other high-value sites). The zones should be declared by the Secretary of the Environment Department on advice by a scientific committee (e.g. Threatened Species Scientific Committee), and biosecurity arrangements negotiated in bilateral agreements with state and territory governments.

14. MARINE BIOSECURITY

48. Vessels are the main vector for the dispersal of exotic marine species – attached to the hull or equipment as biofouling or carried in ballast water. Marine invasion risks rise as shipping volumes escalate.
49. Environment NGOs endorse the proposal for national regulation of ballast water in the Biosecurity Bill 2012, and recommended that standards be clearly defined in regulations.
50. There should also be a national regulatory regime for biofouling, a high risk pathway for marine invasions, responsible for probably more than two-thirds of marine introductions globally.

Relevant to ToR (c): any other related matter

Invasive species are major threats to Australia's marine biodiversity. Australian waters already have an estimated 250 introduced species, another 230 cryptogenic species (whose origins are uncertain but are considered likely to be exotic) and 6 native species dispersed beyond their native range.[116] It is estimated that an additional average 3 to 4 species establish in Australian waters each year.

As vessels are the dominant vector for the dispersal of non-indigenous marine species – attached to the hull or equipment as biofouling or carried in ballast water – an adequate biosecurity regime must address these pathways. About 15,000 vessels arrive from overseas each year, and the numbers are growing. For example, 4000 ships cross the Great Barrier Reef every year, and this is projected to increase to about 7000 by 2020. Marine invasion risks rise as shipping numbers escalate.

Environment NGOs endorsed the proposal for national regulation of ballast water discharge in Chapter 5 of the Biosecurity Bill 2012, while reserving judgement about the adequacy of the regime as details were to be outlined in regulations or by decision of the Director of Biosecurity. We recommended that standards be clearly defined in regulations. Given the projected increases in the discharge of ballast water concurrent with projected growth in ship based exports of mineral resources like coal, additional safeguards are essential to reduce the risk of invasive species introductions via ballast water. The use of on board ballast water treatment systems should be required for ships coming to Australia.

However, the Biosecurity Bill did not propose a regulatory regime for biofouling. This is a major gap in biosecurity and environmental law. We understand that the government has been considering whether to proceed with a regulatory or voluntary regime (subsequent to consultation on a Regulatory Impact Statement analysing the costs and benefits of the regulatory and voluntary options).

Environment NGOs strongly recommend a national regulatory regime with a scope similar to that for ballast water, covering international and domestic vessels and marine infrastructure (such as oil rigs), for all Australian waters, including external territories. This is justified on environmental and economic grounds due to the high likelihood of invasions by this pathway and the serious to catastrophic consequences that can result. A voluntary regime will not be sufficient to address the risk. The Regulatory Impact Statement noted there was 'limited evidence of widespread uptake' of voluntary biofouling guidelines. A consistent national approach (which also takes into account regional environmental differences) will be of benefit to business in reducing complexity arising from different state standards.

Although there is as yet no international convention covering biofouling,[117] as there is for ballast water, a national approach can be justified constitutionally on the basis of the Biodiversity Convention and the United Nations Convention of the 'Law of the Sea', article 196 of which states that 'States shall take all measures necessary to prevent, reduce and control …. 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.'

[116] Department of Agriculture, Fisheries and Forestry (2011)

[117] The International Maritime Organisation has endorsed the Guidelines for the Control and Management of Ships' biofouling to minimise the transfer of invasive aquatic species.

Current federal, state and territory approaches to biofouling are deficient (mostly non-existent) and inconsistent. The approach to biofouling management in Australia (and globally) is in its infancy, akin to the situation for terrestrial introductions several decades ago. As the Regulatory Impact Statement noted, for 'most jurisdictions, the detection and identification of NIMS is by chance or through other compliance mechanisms, rather than by undertaking a targeted risk management approach specific to biofouling risks.' Western Australia has the most stringent requirements, and any national approach should exceed those standards and apply them comprehensively to all vessel types, depending on individual and cumulative risks.

The environmental justification for regulation of biofouling is substantial, as biofouling is likely to be the dominant cause of marine invasions, potentially responsible for more than two-thirds of marine introductions world-wide.[118] Currently, fewer than 1% of arriving vessels are inspected for biofouling. A substantial proportion of inspected vessels (about one in four) have high priority pest species present in biofouling. As the number of ships visiting Australia increases, the risks of biofouling introductions also increase. Although slow-moving vessels such as yachts and oil rigs tend to accumulate considerably more biofouling than fast-moving commercial ships, the cumulative risks due to commercial traffic could represent the greater risk simply due to their dominance (about 90% of vessels arriving in Australia) as well as the diversity of ports they visit.

BOX 8. BIOFOULING AS A HIGH-RISK PATHWAY FOR MARINE INTRODUCTIONS

Recent studies have demonstrated that vessels frequently convey organisms around the world in biofouling, for example:

1. Coutts and Dodgshun (2007) found about 150 species in sea-chests of 42 vessels visiting or operating in New Zealand between May 2000 and November 2004. 40% were indigenous to New Zealand, 15 % introduced, 10 % non-indigenous, and 35 % of unknown origin.
2. Farrapeira et al. (2007) recorded 23 species from 7 cargo vessels at a Brazilian port.
3. Mineur et al. (2007) recorded 31 algal taxa from 22 commercial cargo vessels, in the Mediterranean.
4. Sylvester and MacIsaac (2009) found 57 species on 20 commercial vessels (16 bulk carriers and 4 chemical tankers) in North American ports.
5. Otani et al. (2007) found 22 barnacle species on two bulk carriers in a Japanese port, the majority not recorded in that port.

All vessels should be required by law to undertake the risk-minimising measures specified in the biofouling guidelines specific to different types of vessels[119] rather than leave it to voluntary compliance. There should be enforcement regimes and penalties sufficiently robust to motivate compliance, and the potential for the government to recover all costs of responding to a marine pest incursion from the person or organisation responsible for the introduction (but it will be impossible to trace back in most cases).

As noted in section 2, there is little information about recent marine incursions due to a lack of marine surveillance and monitoring. Given the risks associated with shipping, there should be mandatory port marine pest surveys every five years.

RECOMMENDATIONS

48. Accede to the IMO Ballast Water Convention and pass national legislation to implement the convention. Adopt a national regulatory approach to ballast water, covering international and domestic traffic, for all Australian waters, as proposed in the Biosecurity Bill, with standards specified in regulations.

[118] 55–69 % of the ~1780 introduced marine species detected in ports and harbours globally have life-history characteristics that are consistent with attachment to and survival on vessel hulls (Hewitt and Campbell 2008).

[119] http://www.marinepests.gov.au/.

49. Legislate mandatory adoption of IMO Guidelines on bio-fouling. Adopt a national regulatory approach to biofouling, covering international and domestic traffic, for all Australian waters.
50. Require ships coming to Australia to have ship-board ballast water treatment systems.
51. Undertake mandatory port marine pest surveys at least every five years. Ensure public reporting and disclosure of marine pest surveys.

15. BIOSECURITY RESEARCH

- Australia has poor knowledge of invasive species threats to biodiversity, and there is considerably more investment in research for agricultural biosecurity.
- The demise of the Weeds CRC and the loss of research staff in government agencies and CSIRO have substantially reduced research capacity.
- One recent advance is the development of a draft National Environment and Community Biosecurity Research, Development and Extension Strategy 2014-2017.

Relevant to ToR (c): any other related matter

The 2008 review of biosecurity found that 'Australia has a relatively poor knowledge of the biosecurity threats to its natural environment', largely due to 'the absence of commercial incentives' and low priority for government funding.[120] Much more is known about cultivated species and the invasive threats to them than about biodiversity and invasive species threats.[121]

There has been considerably more investment, including by governments, in research for agricultural biosecurity. For example, of more than 650 research, development and extension plant biosecurity projects identified by Plant Health Australia in 2013, just 6% were focused on the natural environment. [122]Some additional projects identified as having multiple foci (22% of all projects) would also have environmental outcomes. The research situation for environmental priorities has worsened since the demise of the Weeds CRC.

Declining research capacity is a major barrier to better management of invasive species. Of 29 biological control projects reviewed in 2006, 14 were judged successful and the total investment in weed biocontrol yielded a benefit of $23 for every research dollar invested.[123] Despite this success, recent government decisions have seen the total number of scientists working on biological control in Australia decrease from >30 in the 1980s-90s to 7-8 now, with further declines anticipated.[124] This hamstrings the national capacity to limit impacts from new invasive species that cannot be eradicated.

Current research, development and extension for environmental biosecurity is poorly coordinated. One important recent advance is the development of a draft National Environment and Community Biosecurity Research, Development and Extension Strategy 2014-2017 by CSIRO. We look forward to its finalisation and implementation.

RECOMMENDATIONS

52. Increase funding for research into biological control agents for environment weeds and pests.
53. Finalise the National Environment and Community Biosecurity Research, Development and Extension Strategy this year, and provide funding for identified high priorities.
54. Re-establish a research organisation similar to the former Weeds CRC.

[120] Beale et al. (2008)
[121] Burgman et al. (2009)
[122] Plant Health Australia (2014)
[123] Page and Lacey (2006)
[124] Palmer et. al. (2014)

16. LIST OF RECOMMENDATIONS

1. For the purposes of this inquiry, compile lists of interceptions and incursions detected in Australia since 2000 by requesting information from relevant federal and state/territory agencies. Include information where available about the date and location of detections, likely origins and pathways, potential impacts and any actions taken.
2. Undertake an audit of current record-keeping practices and databases with records of interceptions and incursions.
3. Develop national protocols for collection of data on interceptions and incursions, and establish a national, publicly accessible database on interceptions, incursions and responses.
4. Obtain an agreement through COAG for all states and territories to supply specific information on interceptions and incursions to DAFF (or other agency). Require DAFF to publish annual reports on interceptions and incursions with sufficient information to allow for analysis of trends and biosecurity performance.
5. Undertake analysis of incursions and interceptions to identify high risk species and pathways for environmental biosecurity (this would be an appropriate function of the proposed Environment Health Australia).
6. Publish annual reviews of environmental biosecurity performance (as is done for the animal and plant industries) (again an appropriate function of the proposed Environment Health Australia).
7. Foster a learning culture in biosecurity by requiring public reviews of responses to incursions.
8. Establish an independent expert panel to review recent incursions (including those provided as case studies for this submission) to recommend ongoing responses to those incursions and reforms to reduce the risks of future incursions. An immediate priority should be to review whether smooth newts are eradicable.
9. As a high priority, through a transparent, scientific process, identify and rank Australia's priority environmental biosecurity threats. Undertake pathway analysis of these high priority threats to identify where biosecurity should be focused. These tasks should be undertaken in an ongoing way (with regular reviews of priorities) by a body such as the proposed Environment Health Australia.
10. Undertake a horizon scanning process to identify and rank future biosecurity threats to the environment. This should be done in two steps through a transparent process involving all relevant experts: (1) development of a comprehensive preliminary list of potential threats, including plants, terrestrial invertebrates, freshwater invertebrates, vertebrates, marine species and pathogens and (2) prioritisation to derive ranked lists of potential invasive species through a consensus-building process. Ideally, this task would be undertaken by a body such as the proposed Environment Health Australia.
11. Establish a foresighting unit within the environment department as recommended by the 2009 Hawke review of the EPBC Act.
12. Ensure that all import decisions are based on independent, transparent and scientifically credible risk assessments. Adopt the Beale-recommended model of an independent authority and expert commission. Otherwise, establish a Risk Assessment Authority to undertake risk assessments and import risk analyses.
13. Require all biosecurity risk assessments to be open for consultation and published.
14. Develop triggers to conduct an import risk analysis of existing permitted imports for which there is evidence (such as a high rate of interceptions or incursions) that are not meeting Australia's ALOP.
15. Ensure that import risk analysis is directed to the highest priorities, including environmental, economic and health priorities, by establishing a transparent prioritisation process based on degree of risk.
16. Require the precautionary principle to be applied to all biosecurity risk assessments, as required under the Biodiversity Convention.
17. Develop a timetable for bringing environmental biosecurity planning up to the level achieved for plant and animal industries. Within 3 years develop contingency plans for 30 high priority environmental pests.
18. Within two years develop an environmental biosecurity strategy.
19. Conduct an audit of surveillance programs Australia-wide that target priority environmental threats. Identify major gaps in surveillance, including those for tramp ants.
20. Develop dedicated surveillance programs for high priority environmental threats based on pathway risk analysis.

21. Conduct an audit of diagnostic capacity within Australia for priority environmental threat categories such as invasive ants. Develop a strategy to fill gaps in diagnostic capacity. Develop diagnostic protocols for priority environmental threats.
22. Develop a community mobilisation program to assist with surveillance efforts.
23. Develop a new model of decision-making in response to incursions to maximise the potential for decision-making in the public interest. This should include (i) majority rather than consensus decision-making, (ii) involvement of the community sector (at least as an observer to the national management group and consultative committees), (iii) much greater transparency about decision-making including publication of reasons for all decisions, (iv) peer review of significance and eradication feasibility assessments, (v) early establishment of scientific panels, and (vi) application of the precautionary principle.
24. Establish an emergency response fund that can be used to fund immediate and ongoing emergency responses up to a certain level for identified high priority, nationally significant incursions as assessed by an expert panel.
25. Establish a national network of wildlife crime investigators and crime intelligence analysts supported by a wildlife crime intelligence database.
26. Conduct public education about wildlife crime, including through publicising arrests and seizures. Establish and promote a national reporting system for wildlife crime.
27. Develop a strategy for environmental biosecurity compliance that identifies priorities.
28. Provide funding for forensic analysis of DNA for wildlife crime investigations.
29. Conduct a risk analysis of illegal smuggling and keeping of wildlife and develop a compliance strategy to target these crimes.
30. Conduct an audit of internet sales of organisms not permitted in Australia and develop a compliance strategy to stop illegal internet sales.
31. Investigate the adequacy of penalties available and applied for crimes relevant to environmental biosecurity. Educate the judiciary on the serious biosecurity consequences of wildlife crimes.
32. Develop a program similar to that of the Scottish Partnership for Action against Wildlife Crime which involves government agencies, NGOs and the community working together to combat wildlife crime.
33. Establish Environment Health Australia, or similar body, as the most practicable way to engender partnerships with community to address priority environmental biosecurity issues (see detail in section 12).
34. Establish a consultative committee for environmental biosecurity, involving representatives from the range of environmental community stakeholders, to engage with DSEWPaC and DAFF on priority environmental biosecurity issues.
35. On all consultative and advisory committees relevant to environmental biosecurity, ensure there is representation from the environmental community sector adequate to represent the diversity of views and expertise of the sector and proportionate to the environmental relevance of the committee. Where the issues are equally relevant to industry and the environment, ensure there is equivalent representation from both sectors. The membership of the Biosecurity Advisory Council should have equal representation of expertise in agriculture and the environment.
36. Establish an 'environmental engagement' position within the biosecurity agency to work with the sector to facilitate access to information and participation within biosecurity processes.
37. Develop a memorandum of understanding between DAFF and representative organisations within the environmental community sector and best practice engagement guidelines for the sector as a project undertaken in partnership with the sector. This project would include assessment of the capacity needs of the sector to fully engage in biosecurity processes at all levels.
38. Publish extensive information about biosecurity on the internet, providing open access to information to allow the community sector to better understand and evaluate biosecurity decisions and performance.
39. Mandate the following reporting requirements:
    - Environmental biosecurity outlook reports (every two years)
    - State of environmental biosecurity reports (annual), including on progress to achieve targets in the proposed Environmental Biosecurity Strategy.
40. Implement the structure proposed by the Beale review of a statutory Biosecurity Authority, an expert Biosecurity Commission and an independent Director of Biosecurity.
41. Specify that at least one-third of Biosecurity Commissioners must have primary expertise in disciplines relevant to environmental biosecurity, including ecology and conservation biology, and be appointed by the Environment Minister, as recommended by the Hawke review of the EPBC Act.

42. Create a Biosecurity Minister to oversee biosecurity legislation. Alternatively, provide the Environment Minister with statutory decision-making roles relating to important environmental biosecurity issues.
43. Elevate environmental biosecurity as a priority in biosecurity legislation and in the administration of biosecurity.
44. Establish a new national body – called Environment Health Australia (or similar) – to bring together major participants in environmental biosecurity, effectively involve the community sector, and facilitate cross-jurisdictional, cross-sectoral collaboration on priority tasks. The functions would include:
    - Improve Australia's biosecurity preparedness, eg. develop contingency plans and surveillance protocols, and conduct foresighting
    - Strengthen the foundations of environmental biosecurity by promoting more ecologically informed approaches to biosecurity
    - Promote effective responses to environmental invasions, eg. develop emergency response plans and facilitate training
    - Enhance community awareness, vigilance and action in biosecurity
    - Improve environmental biosecurity capacity, eg. identify and prioritise research and capacity needs and act as a clearing house for information
    - Improve coordination and collaboration between jurisdictions, agencies and sectors.
    - Monitor and report on progress in environmental biosecurity.
45. Invest a minimum of $20 million over the next 5 years in the proposed Environment Health Australia. Encourage state and territory governments to contribute at least $10 million over the next 5 years.
46. Develop a National Island Biosecurity Initiative, which includes:
    a. establishing biosecurity priorities for all islands based on their ecological values and risk assessment,
    b. developing biosecurity management systems for all islands, with individual biosecurity management systems for high priority and high risk islands,
    c. conducting regular surveillance of high and medium priority islands,
    d. developing best practice biosecurity approaches for island managers,
    e. establishing ready response capability for islands
    f. building community support for improved island biosecurity.
47. Under the Biosecurity Bill, establish a category of biosecurity zone for high value conservation areas with high biosecurity risks known as 'conservation biosecurity zones', as the basis for implementing biosecurity measures, plans and monitoring for islands (and other high-value sites). The zones should be declared by the Secretary of the Environment Department on advice by a scientific committee (e.g. Threatened Species Scientific Committee), and biosecurity arrangements negotiated in bilateral agreements with state and territory governments.
48. Accede to the IMO Ballast Water Convention and pass national legislation to implement the convention. Adopt a national regulatory approach to ballast water, covering international and domestic traffic, for all Australian waters, as proposed in the Biosecurity Bill, with standards specified in regulations.
49. Legislate mandatory adoption of IMO Guidelines on bio-fouling. Adopt a national regulatory approach to biofouling, covering international and domestic traffic, for all Australian waters.
50. Require ships coming to Australia to have ship-board ballast water treatment systems.
51. Undertake mandatory port marine pest surveys at least every five years. Ensure public reporting and disclosure of marine pest surveys.
52. Increase funding for research into biological control agents for environment weeds and pests.
53. Finalise the National Environment and Community Biosecurity Research, Development and Extension Strategy this year, and provide funding for identified high priorities.
54. Re-establish a research organisation similar to the former Weeds CR

17. REFERENCES

Animal Health Australia. 2014. *Animal Health in Australia 2013.* Animal Health Australia, Canberra.

Australian Government. 2008. *Australia – Measures affecting the importation of apples from New Zealand (DS367) First Written Submission of Australia*. Geneva, 18 July 2008.

Background Briefing. 2012. *The parrot smugglers.* Transcript . ABC Radio National. (http://www.abc.net.au/radionational/programs/backgroundbriefing/2012-11-18/4370820#transcript)

Beale R, Fairbrother J, Inglis A, Trebeck D. 2008. O*ne Biosecurity – a working partnership*, Independent review of Australia's Quarantine and Biosecurity Arrangements, Report to the Australian Government

Biosecurity Advisory Council. 2011. 'Biosecurity Advisory Council's detailed response', Advice provided to the Minister for Agriculture, Fisheries and Forestry, February 2011.

Biosecurity Australia. 2010. *Import risk analysis report for horses from approved countries: final report*. Biosecurity Australia, Canberra.

Bomford M. 2008. *Risk assessment models for establishment of exotic vertebrates in Australia and New Zealand*. Invasive Animals Cooperative Research Centre.

Booth C. 2011. Overseas incubators. *Feral Herald* 27. Invasive Species Council.

Burgman M, Walshe T, Godden L, Martin, P. 2009. Designing regulation for conservation and biosecurity. *Australasian Journal of Natural Resources Law and Policy* 13: 93-112.

Commonwealth of Australia. 2006. *Background document for the threat abatement plan to reduce the impacts of tramp ants on biodiversity in Australia and its territories.* Department of the Environment and Heritage, Canberra.

Cook D, Liu S, Murphy B, Lonsdale W. 2010. Adaptive approaches for biosecurity governance. *Risk Analysis* 30(9): 1303-1314.

Corfield J, Diggles B, Jubb C, McDowall R, Moore A, Richards A, Rowe D. 2008. Review of the impacts of introduced ornamental fish species that have established wild populations in Australia. Prepared for the Australian Government Department of the Environment, Water, Heritage and the Arts.

Coutts A, Dodgshun T. 2007. The nature and extent of organisms in vessel sea-chests: A protected mechanism for marine bioinvasions. *Marine Pollution Bulletin* 54: 876-886

Department of Agriculture. 2014. Overview of Emergency Management Process. Undated briefing to Invasive Species Council 14 Feb 2014.

Department of Agriculture, Fisheries and Forestry. 2011. *Proposed Australian Biofouling Management Requirements*. Consultation Regulation Impact Statement. Australian Government.

Department of Sustainability, Environment, Water, Population and Communities. 2012. *Review of the Threat Abatement Plan to reduce the impacts of tramp ants on biodiversity in Australia and its territories 2006–2011*. Australian government.

Evans M, Watson J, Fuller R, Venter O, Bennett S, Marsack P, Possingham H. 2011. The spatial distribution of threats to species in Australia. *BioScience* 61: 281-289.

Farrapeira C, Melo A, Barbosa D, Silva K. 2007. Ship hull fouling in the port of Recife, Pernambuco. *Brazilian Journal of Oceanography* 55(3): 207-221.

Fitzsimons J, Legge S, Traill B, Woinarski J. 2010. *Into Oblivion? The Disappearing Native Mammals of Northern Australia*. The Nature Conservancy: Melbourne.

Garnett S, Crowley G. 2000. *The Action Plan for Australian Birds*. Environment Australia. Canberra.

Groves R, Hosking J, Batianoff G, et al. 2003. *Weed categories for natural and agricultural ecosystem management*. Bureau of Rural Sciences, Canberra.

Hawke, A. 2010. *The Australian Biodiversity Act. Report of the Independent review of the Environmental Protection and Biodiversity Conservation Act 2009*. Department of Environment, Water, Heritage and Arts. Australian Government.

Hayes K, Sliwa C, Migus S, McEnnulty F, Dunstan P. 2005. *National priority pests: Part II Ranking of Australian marine pests*. An independent report undertaken for the Department of Environment and Heritage by CSIRO Marine Research.

Henderson W, Bomford M. 2011. *Detecting and preventing new incursions of exotic animals in Australia*. Invasive Animals Cooperative Research Centre, Canberra.

Henderson W, Bomford M, Cassey P. 2011. Managing the risk of exotic vertebrate incursions in Australia. *Wildlife Research* 38, 501-508.

Hewitt C, Campbell M. 2008. Assessment of relative contribution of vectors to the introduction and translocation of marine invasive species. Report for the Department of Agriculture, Fisheries and Forestry. National Centre for Marine Conservation and Resource Sustainability Australian Maritime College.

International Plant Protection Convention. nd. Australia: Official Pest Report (Art. VIII.1a) (63) (https://www.ippc.int/countries/australia#officialreports)

Invasive Species Council. 2008. I*nvasive Species: One of the top three threats to Australian biodiversity. Backgrounder*. See fact sheets at invasives.org.au

Invasive Species Council. 2012a. Exposure draft of the Biosecurity Bill 2012. A submission from Environment NGOs. 24 October 2012. (Endorsed by 17 ENGOs)

Invasive Species Council 2012b. *Keeping nature safe: a proposal for Environment Health Australia.*

Invasive Species Council. 2013a. *Research, analysis and extension project: additional analysis report*. Unpublished report.

Invasive Species Council. 2013b. *Tallying eradications in Australia.* Feral Herald Blog. (http://invasives.org.au/feral-animal-control/tallying-eradications-in-australia-please-help-us-make-a-comprehensive-list/)

James S. 2011. Report by Steven Christopher James 2011 Churchill Fellow. *To study emerging methodologies, intelligence tools and forensic science to investigate wildlife crime.*

Lach L, Barker G. 2013. *Assessing the Effectiveness of Tramp ant Projects to Reduce Impacts on Biodiversity, The University of Western Australia and G M Barker and Research Associates*. A report prepared for the Australian Government Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Lintermans M. 2004. Human-assisted dispersal of alien freshwater fish in Australia. *New Zealand Journal of Marine and Freshwater Research* 38: 481–501.

Low T. 1999. *Feral Future*. Penguin Books Australia, Ringwood, Victoria.

McNee A. 2002. *A national approach to the management of exotic fish species in the aquarium trade: an inventory of exotic freshwater species*. Report for Fisheries Resources Research Fund, Commonwealth of Australia.

Mineur F, Johnson M, Maggs C, Stegenga H. 2007. Hull fouling on commercial ships as a vector of macroalgal introduction. Marine Biology 151: 1299–1307

Minister for Agriculture, Fisheries and Forestry. 2013. Senate question No 2671. Question upon notice 14 January 2013.

Natural Resource Management Ministerial Council. 2006. *A Strategic Approach to the Management of Ornamental Fish in Australia*. Bureau of Rural Sciences, Canberra, Australia.
.
Nias R, Burbidge A, Ball D, Pressey R. 2010. Island arks: the need for an Australian national island biosecurity initiative. *Ecological Management and Restoration* 11(3): 166-67.

Office of the Auditor General. 2013. *Managing the impact of plant and animal pests: a state-wide challenge.* Western Australia Auditor General's Report. Report 18 December.

Otani M, Oumi T, Uwai S, et al. 2007. Occurrence and diversity of barnacles on international ships visiting Osaka Bay, Japan, and the risk of their introduction. *Biofouling* 23: 277-286.

Page A, Lacey K. 2006. *Economic impact assessment of Australian weed biological control*. CRC for Australian Weed Management, Adelaide

Palmer W, McLaren D, Sheppard A. 2014. Australia's present scientific capacity to progress the biological control of weeds. *Proceedings of the XIV International Symposium on Biological Control of Weeds*, *Krugur National Park, South Africa, March 2-7*.

Plant Health Australia. 2008. *Submission to quarantine & biosecurity review*.

Plant Health Australia 2013. *National Plant Status Biosecurity Report 2012*.

Plant Health Australia 2014. *National Plant Status Biosecurity Report 2013*.

Richardson D, Rejmánek M. 2011. Trees and shrubs as invasive alien species – a global review. *Diversity and Distributions* 17: 788-809.

Riley S. 2012. Heads I win, tails you lose: Uncertainty and the protection of biodiversity from invasive alien species. *Asia Pacific Journal of Environmental Law* 14 (1-2): 139-168.

Roy H, Peyton J, Aldridge D, et al. 2014. Horizon scanning for invasive alien species with the potential to threaten biodiversity in Great Britain. *Global Change Biology* doi: 10.1111/gcb.12603.

Simberloff D. 1995. Why do introduced species appear to devastate islands more than mainland areas? *Pacific Science* 49(1): 87-97.

Simberloff D, Souza L, Nunez M, Barrios N, Bunn W. 2012. The natives are restless, but not often and mostly when disturbed. *Ecology* 93: 598-607.

State of the Environment 2011 Committee. 2011. *Australia State of the Environment 2011. Independent report to the Australian Government Minister for Sustainability, Environment, Water, Population and Communities*.

Stohlgren T, Pysek P, Kartesz J, et al. 2011. Widespread plant species: natives versus aliens in our changing world. *Biological Invasions* 13:1931–1944.

Sylvester F, MacIsaac H, 2009. Is vessel hull fouling an invasion threat to the Great Lakes? *Diversity and Distributions* 16: 132-143.

The Senate Rural Affairs and Transport References Committee. 2011. *Science underpinning the inability to eradicate the Asian honey bee*. Commonwealth of Australia.

The Senate Rural and Regional Affairs and Transport Legislation Committee. 2006. *The administration by the Department of Agriculture, Fisheries and Forestry of the citrus canker outbreak*. Commonwealth of Australia.

Vertebrate Pests Committee. 2007. *List of Exotic Vertebrate Animals in Australia*.

Vitousek P, D'Antonio C, Loope L, Rejmanek M, Westbrooks R. 1997. Introduced Species: A significant component of human-caused global change. *New Zealand Journal of Ecology* (21) 1-16.

West P, Brown A, Hall K. 2007. *Review of alien fish monitoring techniques, indicators and protocols: Implications for national monitoring of Australia's inland river system*s. Invasive Animals Cooperative Research Centre, Canberra.

Whittington R, Chong R. 2007. Global trade in ornamental fish from an Australian perspective: The case for revised import risk analysis and management strategies. *Preventive Veterinary Medicine* 81: 92-116.

Woinarski J, Burbidge A, Harrison P. 2014. *The Action Plan for Australian Mammals.* CSIRO Publishing.

WWF, Reef Catchments. 2010. *A national island biosecurity initiative: A proposal to build ecosystem health and resilience on Australia's islands through improved biosecurity*.