



A NATIONAL ISLAND BIOSECURITY INITIATIVE: A PROPOSAL TO BUILD ECOSYSTEM HEALTH AND RESILIENCE ON AUSTRALIA'S ISLANDS THROUGH IMPROVED BIOSECURITY

A National Island Biosecurity Initiative is one component of the Island Rescue¹ plan being developed by a consortium of interested people and organisations concerned for the future of Australia's island environments and people.

Supporters of this initiative include:

WWF Australia

Reef Catchments NRM

Birds Australia

Invasive Species Council

We thank Dr Andrew Burbidge for providing assistance in the preparation of this proposal.

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EXECUTIVE SUMMARY

¹ For further information on the formation of the island Rescue Alliance see: <http://www.islandarks.com.au/>

Additional Commonwealth and State/Territory co-investment is urgently needed to maintain the extremely valuable resource that is Australia's islands. Worldwide, islands contain a disproportionate share of the world's terrestrial species, including many endemics. Many marine species that need land to reproduce—seabirds, turtles and seals—breed only or substantially on islands. Islands are particularly vulnerable to the impact of invasive species but such impacts can be prevented through quarantine or ameliorated through eradication or control. Island restoration after invasive organisms have been eliminated is possible. And history shows that successful actions on islands are among those with the greatest benefit to biodiversity conservation at the least cost.

Of the 8,300 offshore islands in Australia it is likely that the vast majority are directly relevant to one or more Matters of National Environmental Significance under the EPBC Act. The Commonwealth should therefore take a leadership role in developing a nationally consistent approach and standards for the prevention of invasion, early detection and rapid eradication of organisms that threaten island ecosystems through a National Island Biosecurity² Initiative.

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.

For an estimated cost of around \$1 million over 3 years, together with matching resources from States and Territories, a National Island Biosecurity Initiative could lay the foundations for an effective, nationally consistent approach to island biosecurity that would assist directly in the prevention of extinction of hundreds of threatened species and ecosystems and protection for globally significant populations of migratory species. Our proposal is complementary to the established need to control and where possible eradicate invasive organisms already established on islands.

² We define Biosecurity to mean the protection from the risks posed by organisms to the economy, environment and people's health, through exclusion, eradication and control.

THE BUSINESS CASE FOR A NATIONAL ISLAND BIOSECURITY INITIATIVE

The ecological significance of Australia's islands is immense and mitigating the impact of invasive species is the key to the future of many island ecosystems (see Appendix 2 for an overview). Invasive alien species are recognised as one of the major drivers of biodiversity loss worldwide.³ They also have significant, direct impacts upon many other sectors, including economic development, health, agriculture, tourism and trade.

Between 70 and 95% of the world's terrestrial species extinctions have occurred on islands⁴, and most of these (55–67%) were directly caused or facilitated by invasive alien species.^{5,6}

Island biodiversity is also under serious threat from another major driver of biodiversity loss—climate change—which will interact with biological invasions and other processes in complex ways.⁷ This effect has already been seen on Macquarie Island, where warmer winters were one of three contributing factors in the explosion of rabbit numbers.

There is strong evidence that healthy ecosystems are more resilient to the impacts of climate change, thereby helping to buffer resident communities from such impacts.⁸ Therefore, by fostering ecosystem health, invasive alien species management represents an effective form of Ecosystem-Based Adaptation (EBA) to climate change.

What is the problem?

- Island ecosystems are inherently vulnerable and island species are particularly prone to extinction – the leading cause of which is invasive species
- Invasive species on islands results in the degradation of natural assets (and associated impacts on livelihoods, biodiversity, tourism, culture)

³ Millennium Ecosystem Assessment 2005: Ecosystems and human well-being: Synthesis. Island Press.

⁴ Donlan, C.J.; Wilcox, C. 2008: Diversity, invasive species and extinctions in insular ecosystems. *Journal of Applied Ecology* 45: 1113–1123.

⁵ Island Conservation/Conservación de Islas (<http://islandconservation.org/why/#> and <http://islandconservation.org/slideshow/>).

⁶ IUCN 2009: IUCN Red List of Threatened Species (<http://www.iucnredlist.org>).

⁷ Secretariat of the Convention on Biological Diversity 2009: Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report of the 2nd Ad Hoc Technical Expert Group on Biodiversity and Climate Change. Technical Series No. 41.

⁸ World Bank 2009: Convenient solutions to an inconvenient truth: ecosystem-based approaches to climate change.

- The lack of a comprehensive national island conservation strategy means that there is no framework for strategic allocation of scarce conservation resources

What are the solutions?

A National Island Biosecurity Initiative would provide a framework and funding for the development of a consistent national approach and standards for island biosecurity. It should encompass the following components:

- **Quarantine:** Preventing invasions by potentially harmful organisms is the most cost-effective approach to protecting island biotas
- **Early Detection and Rapid Response:** Controlling invasive species before they become well established limits the damage to biodiversity and the cost of invasive species control
- **Eradication:** Successful eradication of invasive species on islands has been proven and is increasingly being practiced around the world – methods are improving and costs are likely to decrease with experience
- **Vigilance:** Once eradication has occurred, islands can remain invasive-free at relatively low cost through effective quarantine measures including early detection and rapid response approaches

Why should the Australian Government be concerned?

Islands continue to provide critical habitat for many threatened and migratory birds, mammals and other animals. This includes providing island arks for mammals threatened or extinct on the Australian mainland. Nine species of mammal now only survive on Australian islands, without which they would have added to the 19 mammal species already extinct in Australia over the last 200 years. Table 2 provides a list of some of the Commonwealth-listed threatened species found on islands.

Globally, invasive mammals are the major threat to island fauna and invasive rodents are likely the greatest cause of species extinctions and ecosystem changes.⁹ Australian islands have also been severely impacted by this threat, and consequently have been animal extinction hotspots. At least 20 unique native animal species or sub-species were driven to extinction by the arrival of alien rodents on our islands, and this accounts for more than half of Australia's 23 bird extinctions as well as two mammal extinctions.

The Australian Government has already established an improving track record for island conservation through recent initiatives focused on the management of Commonwealth Islands and World Heritage Listed Islands, such as Christmas Island and Macquarie Island, and through the development of actions such as the listing of rodents on offshore islands as a Key Threatening Process under the EPBC Act.

⁹ Howald et al. 2007. Invasive rodent eradications on islands, *Conservation Biology*, 21(5): 1258-1268

Although the vast majority of Australia's islands are within the jurisdiction of States and Territories, there are numerous reasons why the Commonwealth should have a clear interest in all islands.

These include:

International agreements

- The Convention on Biological Diversity

Given that 2010 is the International year of Biodiversity, the commencement of a National Island Biosecurity Plan, as part of the implementation of Island Rescue, would be a significant achievement for Australia in achieving the goals of the Programme of Work on Island Biodiversity. The island biodiversity programme of work will be reviewed in-depth by the 15th meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA); the COP will consider the review at its 11th meeting, in 2012. Australia is also a partner in the key CBD implementation program on islands (GLISPA)¹⁰ and remains a model for many smaller nations.

- Agreement on the Conservation of Albatrosses and Petrels

The multilateral agreement between 23 countries includes the agreement to "eliminate or control non-native species detrimental to albatrosses and petrels", and all Australian species breed exclusively on islands.

EPBC Act and Matters of National Environment Significance

Of the 8,300 offshore islands in Australia it is likely that the vast majority satisfy one or more of the following conditions:

- A World Heritage Property
- A Commonwealth Territory
- Contain a Commonwealth managed protected area over the whole or part of the island
- Are 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
 - World Heritage properties, National and Commonwealth Heritage places, Ramsar wetlands and Commonwealth reserves
- Contain critical habitats for one or more species listed under various conventions to which Australia is a signatory including the Convention on Migratory Species (marine turtle nesting-sites and many seabird nesting

¹⁰ Specific details of agreements made within the CBD on invasive species can be found at <http://www.cbd.int/decision/cop/?id=7197>

sites), Agreements on the Conservation of Albatrosses and Petrels (ACAP), and various Migratory Bird Agreements (JAMBA/CAMBA/KORAMBA).

The National Island Biosecurity Initiative would complement and assist in the implementation of a number of Threatened Species Recovery Plans and Threat Abatement Plans for invasive species (including rodents on offshore islands, tramp ants, cane toads and others).

See Table 2 for some examples of the extensive overlap between islands and Matters of National Environment Significance.

PROTECTING ISLAND BIODIVERSITY: A NATIONAL ISLAND BIOSECURITY INITIATIVE:

What needs to be done, and what will it cost?

This proposal for a National Island Biosecurity Initiative is an important component of Island Rescue and one that is urgently needed.

Biosecurity Year 1 – Data Analysis and Development of Framework

Objective: Develop a biosecurity framework that can be applied to all Australian islands

Specific Actions

1. Develop island database building on exists offshore islands database to include physical characteristics and additional environmental, social and economic data (3 months \$25k)
2. Conduct island prioritization and risk assessment project with States, Territories (\$30k over 3 months).
3. Engage Consultant to develop basic island biosecurity framework for discussion (5 days \$5k).
4. Workshop with states and territories on development of island biosecurity framework (1 day \$10k).
5. Island rescue project development and prioritization workshop (1 day \$10k)
6. Island Arks Symposium II (\$50k)

Total for start-up phase = \$130,000

Biosecurity Year 2 and 3: Planning and Early Implementation

Objective: Ensure all Priority 1 islands and Commonwealth islands have up-to-date comprehensive biosecurity plans and critical gaps and on-ground priorities are addressed.

1. Preparation or up-dating of biosecurity plans for all Priority 1 islands including Commonwealth islands (\$250,000).

2. Strengthening of existing Biosecurity Plans and on-ground actions based on competitive funding for identified gaps and priorities (\$750,000)

Total for Biosecurity Planning and Early Implementation Phase = \$1 million

Overall Total = \$1.13 million

Who will it benefit?

Apart from the clear intended biodiversity benefits, there are many other beneficiaries of this program:

Governments:

- Will be provided with a clear strategic and nationally consistent approach to island biosecurity.
- Will need to spend less money in the future on expensive and potentially futile attempts to rid islands of invasive pests

Island communities:

- Will have their natural, cultural and economic assets better protected
- Will be employed directly or indirectly as a result of the implementation of island biosecurity plans

Companies that work on islands:

- Will have clear and consistent guidelines on biosecurity processes and protocols
- Will be able to access economic opportunities arising from the development and implementation of biosecurity plans

What would a comprehensive National Island Biosecurity Framework look like?

We define a Biosecurity Framework to be a systematic approach to the development of a risk-based approach to the exclusion, eradication and control of potentially harmful organisms. The NIBI proposal developed in this document has a principal focus on exclusion and the early detection and rapid eradication of new arrivals. A simple version of the framework is shown in Table 1.

Our proposal is intended to complement existing control actions currently being carried out by government agencies by:

1. Quantifying the ecological values and potential risk for as many Australian islands as possible via the development of a national islands database¹¹.

¹¹ For a previous example and potential model for ranking and risk assessments see: Ecosure (2009). Prioritisation of high conservation status of offshore islands. Report to the Australian Government Department of the Environment, Water, Heritage and the Arts. Ecosure, Cairns, Queensland.

2. Establishing a priority ranking based on environmental and other values and potential risk from invasive species.
3. Establishing biosecurity plans for each level of priority:

For Priority 1 islands (which may include LHI, Heard and MacDonald, Norfolk, Macquarie, Barrow, Bigge, etc as identified by the database):

- Develop and adopt a specific Biosecurity Plan for each island including a Quarantine Management System that includes regular monitoring, early detection of invasive species and a rapid response capacity available, on island where appropriate.

For Priority 2 Islands:

- Develop and apply generic Biosecurity Plans including a generic Quarantine Management System for all access including periodic monitoring, early detection of invasive species and a rapid response capacity in region.

For Priority 3 Islands:

- Regional Biosecurity Plans developed including development of quarantine procedures for use by visitors; periodic monitoring, early detection of invasive species and a rapid response capacity in region.

What is the role of the Commonwealth?

- To work with the States and Territories to develop and manage a national islands database to document biodiversity conservation and other values and allocate biosecurity priorities.
- To fund the development of biosecurity plans for all Priority 1 islands and fund the development of generic (template) biosecurity plans for Priority 2 and Priority 3 islands.
- To fund implementation of biosecurity plans on islands that are also Commonwealth Territories.
- Support the implementation of biosecurity plans on Priority 1 Islands on the basis of a strategic allocation approach
- To fund a national conference on island biosecurity (the second Island Arks Symposium).

Table 1 Island Biosecurity Framework for Hypothetical Island Group, Western Australia

Overall Island Priority Rating	Environmental Priority Rating	Agricultural and social risk	Overall Risk Rating	Invasive species of concern	Invasive pathway	Biosecurity level required	Early detection	Rapid Response actions
Priority 1 islands	High	High	High	Rats	Shipping from mainland port	Mandatory bio-sanitary procedures required on island and place of departure	Permanent trapping around port area	Implement baiting response plan
	High	High	Medium	Foxes	Natural migration at low tide	Regular baiting at potential access points	Monthly surveys for scats	Implement baiting response plan
Priority 2 islands	High	Medium	Medium	Tramp Ants	Fishing boats	Develop best-practice guidelines and training for fishing operators	Regular inspection of incoming vessels	Implement emergency fumigation plan
Priority 3 islands	Low	Low	Low	House Mice	Shipping	Maintain baiting program in port area	Monthly trapping program	Implement baiting response plan

APPENDIX 1: EXAMPLES¹² OF ISLANDS AS MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Matter of National Environmental Significance	North-west	North	East (including GBR)	South-east	South-west	Oceanic	Examples
Threatened species and ecological communities			✓				Raine island – Herald Petrel (critically endangered), Bramble Cay – Bramble Cay Melomys (endangered)
		✓					Wesseley Islands – Tiwi Islands [11 EPBC listed fauna species, 6 flora species].
	✓						Barrow Island/ Boodie Island – Golden Bandicoot (vulnerable), Spectacled hare wallaby (vulnerable), Barrow Island Euro, Fairy Wren (Vulnerable), Burrowing bettong (Vulnerable) Dirk Hartog Island – Critical nesting habitat for loggerhead turtles, (other values include breeding area for wedge-tail shearwaters, bridle terns, Caspian terns and roseate terns) Bernier Island and Dorre Island – 4 EPBC listed species – banded hare wallaby, burrowing bettong, rufous hare wallaby, greater stick-nest rat. Muiron Islands – critical nesting habitat for loggerhead turtles and a major green turtle rookery. Serrurier Island – major nesting area for green turtles, Thevenard Island – major nesting area for flatback turtles. Montebello – Lowenday – Barrow Islands – significant nesting areas for green, hawksbill and flatback turtles. Lacepede Islands support some of the largest brown booby colonies in Western Australia.
					✓		Bald Island – 2 listed species including Gilbert’s Potoroo
		✓					Critical hawksbill nesting area on Crab Island
		✓					Bremer Island – 5 listed species – including the vulnerable mangrove mouse

¹² Note this is not intended to be a comprehensive list

Matter of National Environmental Significance	North-west	North	East (including GBR)	South-east	South-west	Oceanic	Examples
							Bribie Island - 8 listed threatened species and 52 marine / migratory species
						✓	Christmas Island - numerous species including threatened endemic species
						✓	Norfolk Island - numerous species including threatened endemic species
Migratory species				✓			Adele Island - 16 listed species
		✓					Albany Island - 7 listed species
	✓						Barrow Island/ Boodie Island - 25 listed species
		✓					Wessey Islands - 21 listed species
		✓					Torres Strait Islands - 4 on Boigu Island, Fraser Island
World Heritage properties			✓				
			✓				Great Barrier Reef islands
						✓	Heard and McDonald Islands
						✓	Lord Howe Island Group
						✓	Macquarie Island
	✓						Shark Bay Islands
Commonwealth marine areas	✓						Ningaloo Marine Park (Commonwealth Waters)
	✓						Kimberley Region (under consideration)
			✓				Cooringa - Herald National Nature Reserve
			✓				Lihou National Nature Reserve
			✓				Solitary Islands Marine Reserve (Commonwealth Waters)
						✓	Elizabeth and Middleton Marine National Nature Reserve
						✓	Lord Howe Island Marine Park (Commonwealth waters)
						✓	Macquarie Island Commonwealth Marine Reserve
				✓			South-east Commonwealth Marine Reserve Network
					✓		Great Australian Bight Marine Park
						✓	Heard and McDonald Islands Marine Reserve

Matter of National Environmental Significance	North-west	North	East (including GBR)	Southeast	Southwest	Oceanic	Examples
Great Barrier Reef Marine Park			✓				Whitsunday Islands, Capricorn Cays, Low Isles
World Heritage	✓						The Shark Bay region represents a meeting point of three major climatic regions. It contains plant species that are unique and considered new to science, five of Australia's 26 species of endangered Australian mammals, as well as 35 percent of Australian bird species and abundant marine flora and fauna.
			✓				Fraser Island is the largest sand island in the world. It was inscribed on the World Heritage List in recognition of its outstanding natural universal values. It features complex dune systems that are still evolving, and an array of rare and unique features in this sand environment, including dune lakes and tall rainforests.
			✓				The Great Barrier Reef was one of Australia's first World Heritage Areas. It is the world's largest World Heritage Area, and is probably the best-known marine protected area in the world. It is the world's most extensive coral reef system and is one of the world's richest areas in terms of biological diversity.
						✓	HIMI is the only sub-Antarctic island group that has an intact ecosystem, to which no known species has been introduced directly by humans, and where the ongoing evolution of plants and animals occurs in a natural state. The vast numbers of penguins and seals that occupy the beaches are considered one of the great wildlife sights of the world.

Matter of National Environmental Significance	North-west	North	East (including GBR)	Southeast	Southwest	Oceanic	Examples
						✓	The Lord Howe Island Group has spectacular landscapes, including volcanic mountains, and diverse low-lying rainforests, palm forests and grasslands. There are a large number of species of native plants, of which many are endemic to Lord Howe Island, and colonies of endangered seabirds.
						✓	Macquarie Island provides evidence of the rock types found at great depths in the earth's crust and of plate tectonics and continental drift, the geological processes that have dominated the earth's surface for many millions of years. It is an island of unique natural diversity, a site of major geoconservation significance and one of the truly remarkable places on earth.
Wetlands of international importance						✓	Ashmore island within Ashmore Island Marine Reserve. The three vegetated islands and several sand cays of the Reserve include important seabird and turtle nesting sites and support large populations of migratory shorebirds and breeding seabirds.
						✓	Coral Sea Reserves (Coringa-Herald and Lihou Reefs and Cays). The islets and cays of the site are composed of sand, rock and coral rubble, and each has a fringing coral reef. The islets are low (not exceeding 5 m above mean sea level) with limited freshwater bodies fed by direct overhead rainfall, and no upstream surface or groundwater sources. Some islets support freshwater sufficient for vegetation such as Pisonia forests, shrubs and/or other herbs and grasses, which in turn are important for roosting and nesting for birds.

Matter of National Environmental Significance	North-west	North	East (including GBR)	South-east	South-west	Oceanic	Examples
			✓				The Great Sandy Strait Ramsar site is located in south-eastern Queensland and includes Great Sandy Strait, Tin Can Bay, Tin Can Bay Inlet, parts of Fraser Island and the mainland. It is a sand passage estuary between the mainland and the World Heritage-listed Fraser Island. Fraser Island has formed sufficiently close to the mainland to block the flow of a substantial river system, creating a double-ended estuary with a shifting (though relatively stable) pattern of mangroves, sand banks and mud islands
						✓	The Cocos (Keeling) Islands are a group of 27 coral islands forming two atolls 24 km apart and located 2900 km northwest of Perth in the Indian Ocean. North Keeling Island, with an area of just 1.2 km ² . As an island atoll in its most natural state, North Keeling is a significant biological resource and is internationally important for the conservation of biodiversity. The Ramsar site is one of the few remaining islands where rats have not yet been introduced, and is generally unaffected by feral animals.
			✓				The Moreton Bay Ramsar site is located in and around Moreton Bay, east of Brisbane in Queensland. Moreton Bay is a semi-enclosed basin bounded on its eastern side by two large sand islands. Islands in the site include all of Moreton Island, and parts of North and South Stradbroke Islands, Bribie Island and the Southern Bay Islands.
				✓			Swan Bay and Islands of Port Philip Bay

APPENDIX 2

ISLANDS – AN INVALUABLE RESOURCE

More than 8300 islands occur within Australia. They range in size from Tasmania (64,519 km²) and Melville Island (5,765 km²) to islets of a few square metres. Islands occur within all of Australia's jurisdictions: Australian Capital Territory 1 (at Jervis Bay), Commonwealth 70, New South Wales 102, Victoria 184, South Australia 346, Northern Territory 887, Tasmania 1000, Queensland 1995 and Western Australia 3747.

Australia's islands are a very valuable resource for biodiversity conservation as well as for recreation, tourism and other uses. Some have communities living on them, including Aboriginal communities.

Islands fall into two major categories: oceanic islands and continental islands. Australia's oceanic islands, which arose from volcanic or tectonic action from deep oceans, are Christmas, Lord Howe, Norfolk, Macquarie, Heard and McDonald. The mid-Indian Ocean Cocos (Keeling) Islands are cays on two atolls. The plants and animals on oceanic islands arrived by random colonisation via sea or air from nearby continents. As a result, virtually every oceanic island biota is unique and they are also often sites of high speciation. Because they are much smaller than continents, oceanic islands are fragile and highly susceptible to disturbance, especially by invasive species.

Most continental islands were isolated by rising sea levels over the past 14,000 to 6,000 years. Such islands retain elements of their original biodiversity, modified through species loss due to changing climates, small size and changes in soil chemistry from wind-blown salt. Many larger and some smaller continental islands have unique assemblages of plants and animals. Some have populations of species that are threatened with extinction on mainland Australia, an example being the eight species of mammals that became extinct on continental Australia but survived on islands.

Cays are a specialised type of low lying island that arose through the accumulation of sand or coral rock on reefs. Like oceanic islands, most of their plants and animals (apart from seabirds) arrived by random colonisation, but for cays that are close to the mainland, the plant and non-flying animals on them are mainly those of nearby shores. Cays are particularly important for seabird and sea turtle breeding.

Most islands have not suffered the same degree of disturbance as mainland Australia; disturbances such as feral animals, weeds, frequent fire, land clearance and pollution, and this means they can be yardsticks against which changes on the mainland can be measured. However, for some islands, the arrival of invasive species due to a lack of quarantine in the past has led to extinctions. Oceanic islands have been particularly hard hit. On Christmas Island there are now more than 175 species of exotic plants and more than 100 species of exotic animals. Four of the five native and endemic mammals are extinct and the remaining one is in decline. The current ecological cascade, driven mainly by a mutualistic association between introduced scale insects and the introduced yellow crazy ant, is a possible contributor (along with other invasive species) to the extinction of the

Christmas Island Pipistrelle (a bat) and threatens six of the seven terrestrial reptiles and well as some bird species. Macquarie Island's seabirds are threatened by rats, rabbits and mice and the current eradication project will cost \$25 million. On Lord Howe Island, five species of birds and at least 13 species of invertebrates are extinct due to the arrival of rats and mice and the estimated cost of eradicating them is \$8 million. Even subantarctic Heard Island has three introduced animal species—a thrip, a mite and an earthworm—and a weed, an annual grass.

On our continental islands at least 40 populations of terrestrial mammals have become locally extinct due to invasive species: foxes, cats, rats, rabbits and others. However, these are a minority; fortunately, many islands are still in a pristine or near pristine state.

From a biodiversity conservation point of view, Australia's islands are an amazingly valuable resource and should receive a high degree of protection and management. Many threatened or near threatened species have a relatively safe haven on islands. The majority of our breeding seabirds nest only on islands and of those that nest on both islands and mainland beaches, island populations are faring best—the fairy tern has declined drastically in eastern Australia where it breeds on beaches, but in Western Australia, where it breeds mostly on islands it is faring much better. A similar situation exists for sea turtles: mainland rookeries are subjected to nest predation by pigs, dogs and foxes and disturbance by people and their vehicles. Islands can also be places where species threatened with extinction on the mainland can be introduced to places where the threatening process is absent; recent examples include northern quoll to Astell and Pobassoo Islands, mala (rufous hare-wallaby) to Trimouille Island, Prosperine rock-wallaby to Hayman Island and Gilbert's potoroo to Bald Island.

Eradication of invasive species from islands is possible. Six species of invasive animals—black rat, house mouse, rabbit, fox, feral cat and goat—have been eradicated from more than 50 Australian islands and more eradications are planned. Weed control has also been successful. But this is a case where prevention is much better than the cure, as eradication is usually only possible where there are no 'non-target' species such as native mammals that may be affected by the eradication technique and in the long run, good quarantine is the best option. And eradications are not cost-effective if there is a high likelihood of reinvasion due to lack of quarantine.

Island biodiversity is a precious resource for the future, and its conservation can be best achieved through maintenance of natural resilience. Reducing impacts from invasive species is a key to this resilience. Where it has been compromised ecosystem collapses can occur resulting in the extinction of unique species.

TABLE 2: COMMONWEALTH LISTED THREATENED SPECIES (EXCLUDING EXTINCT SPECIES) SELECTED THROUGH A SEARCH USING THE TERM “ISLAND” (DATA FROM SPRAT)

<i>Abutilon julianae</i>	Norfolk Island Abutilon	Critically Endangered
<i>Acanthiza pusilla archibaldi</i> = <i>Acanthiza pusilla archibaldi</i>	King Island Brown Thornbill	Endangered
<i>Acanthiza pusilla archibaldi</i>	Brown Thornbill (King Island)	Endangered
<i>Acanthornis magna greeniana</i>	Scrubtit (King Island)	Critically Endangered
<i>Acanthornis magnus greenianus</i> = <i>Acanthornis magna greeniana</i>	Scrubtit (King Island)	Critically Endangered
<i>Accipiter fasciatus natalis</i> = <i>Accipiter hiogaster natalis</i>	Christmas Island Goshawk	Endangered
<i>Accipiter hiogaster natalis</i>	Christmas Island Goshawk	Endangered
<i>Achyranthes margaretarum</i>	Phillip Island Chaffy Tree	Critically Endangered
<i>Aprasia rostrata rostrata</i>	Hermite Island Worm-lizard	Vulnerable
<i>Arachnorchis insularis</i> = <i>Caladenia insularis</i>	French Island Spider-orchid	Vulnerable
<i>Arachnorchis ovata</i> = <i>Caladenia ovata</i>	Kangaroo Island Spider-orchid	Vulnerable
<i>Asplenium listeri</i>	Christmas Island Spleenwort	Critically Endangered
<i>Bettongia lesueur</i> unnamed subsp.	Burrowing Bettong (Barrow and Boodie Islands), Boodie	Vulnerable
<i>Beyeria subtecta</i>	Kangaroo Island Turpentine Bush	Vulnerable
<i>Blechnum norfolkianum</i>	Norfolk Island Water-fern	Endangered
<i>Burmannia</i> sp. Bathurst Island (R.Fensham 1021)		Endangered
<i>Burmannia</i> sp. Melville Island (R.Fensham 1021) = <i>Burmannia</i> sp. Bathurst Island (R.Fensham 1021)		Endangered
<i>Buteo buteo oshiroi</i>	Daito Island Buzzard	Migratory(JAMBA)
<i>Caladenia insularis</i>	French Island Spider-orchid	Vulnerable
<i>Caladenia ovata</i>	Kangaroo Island Spider-orchid	Vulnerable
<i>Calyptorhynchus lathamii halmaturinus</i>	Glossy Black-Cockatoo (Kangaroo Island), Glossy Black-Cockatoo (South Australian)	Endangered
<i>Carduelis sinica kittlitzii</i>	Bonin Islands Japanese Greenfinch	Migratory(JAMBA)
<i>Chalcophaps indica natalis</i>	Emerald Dove (Christmas Island)	Endangered
<i>Chionis minor nasicornis</i>	Black-faced Sheathbill (Heard Island)	
<i>Choeroichthys latispinosus</i>	Muiron Island Pipefish	Marine
<i>Christinus guentheri</i>	Lord Howe Island Gecko	Vulnerable
<i>Crociodura attenuata trichura</i>	Christmas Island Shrew	Endangered

<i>Crocidura tenuata trichura</i> = <i>Crocidura attenuata trichura</i>	Christmas Island Shrew	Endangered
<i>Ctenotus angusticeps</i>	Airlie Island Ctenotus	Vulnerable
<i>Ctenotus lancelini</i>	Lancelin Island Skink	Vulnerable
<i>Cyanoramphus cookii</i>	Norfolk Island Green Parrot	Endangered; Migratory(JAMBA)
<i>Cyanoramphus novaezelandiae cookii</i> = <i>Cyanoramphus cookii</i>	Norfolk Island Green Parrot, Red-crowned Parakeet (Norfolk Island)	Endangered; Migratory(JAMBA)
<i>Cyclodina lichenigera</i> = <i>Oligosoma lichenigera</i>	Lord Howe Island Skink	Vulnerable
<i>Dendrobium brachypus</i> = <i>Thelychiton brachypus</i>	Norfolk Island Orchid	Endangered
<i>Doryrhamphus malus</i> = <i>Doryrhamphus negrosensis</i>	Masthead Island Pipefish	Marine
<i>Doryrhamphus negrosensis</i>	Flagtail Pipefish, Masthead Island Pipefish	Marine
<i>Doryrhamphus negrosensis malus</i> = <i>Doryrhamphus negrosensis</i>	Masthead Island Pipefish	Marine
<i>Dryococelus australis</i>	Lord Howe Island Phasmid, Land Lobster	Critically Endangered
<i>Egernia stokesii aethiops</i>	Baudin Island Spiny-tailed Skink	Vulnerable
<i>Elymus multiflorus</i> subsp. <i>kingianus</i>	Phillip Island Wheat Grass	Critically Endangered
<i>Elymus multiflorus</i> var. <i>kingianus</i> = <i>Elymus multiflorus</i> subsp. <i>kingianus</i>	Phillip Island Wheat-grass	Critically Endangered
<i>Eucalyptus insularis</i>	Twin Peak Island Mallee	Endangered
<i>Euphorbia norfolkiana</i>	a shrub, Norfolk Island Euphorbia	Critically Endangered
<i>Falco peregrinus fruitii</i>	Volcano Islands Peregrine Falcon	Migratory(JAMBA)
<i>Fregata andrewsi</i>	Christmas Island Frigatebird, Andrew's Frigatebird	Vulnerable; Marine; Migratory(CAMBA)
<i>Gallicolumba norfolciensis</i>	Norfolk Island Ground-Dove	Migratory(JAMBA)
<i>Gallirallus philippensis andrewsi</i>	Buff-banded Rail (Cocos (Keeling) Islands)	Endangered
<i>Hibiscus insularis</i>	Phillip Island Hibiscus	Critically Endangered
<i>Isodon auratus barrowensis</i>	Golden Bandicoot (Barrow Island)	Vulnerable
<i>Lagorchestes conspicillatus conspicillatus</i>	Spectacled Hare-wallaby (Barrow Island)	Vulnerable
<i>Lagorchestes hirsutus bernieri</i>	Rufous Hare-wallaby (Bernier Island)	Vulnerable
<i>Lagorchestes hirsutus dorrae</i>	Rufous Hare-wallaby (Dorre Island)	Vulnerable

<i>Leiopisma lichenigerum</i> = <i>Oligosoma lichenigera</i>	Lord Howe Island Skink	Vulnerable
<i>Lepidodactylus listeri</i>	Christmas Island Gecko, Lister's Gecko	Vulnerable
<i>Leucocarbo atriceps nivalis</i>	Imperial Shag (Heard Island), Heard Shag	Vulnerable; Marine
<i>Leucocarbo atriceps purpurascens</i>	Imperial Shag (Macquarie Island)	Vulnerable; Marine
<i>Macropus robustus isabellensis</i> = <i>Macropus robustus isabellinus</i>	Barrow Island Euro	Vulnerable
<i>Macropus robustus isabellinus</i>	Barrow Island Wallaroo, Barrow Island Euro	Vulnerable
<i>Malurus leucopterus edouardi</i>	White-winged Fairy-wren (Barrow Island), Barrow Island Black-and-white Fairy-wren	Vulnerable
<i>Malurus leucopterus leucopterus</i>	White-winged Fairy-wren (Dirk Hartog Island), Dirk Hartog Black-and-White Fairy-wren	Vulnerable
<i>Mathewsoconcha phillipii</i>	Phillip Island Helicarionid Land Snail	Critically Endangered
<i>Melanodryas cucullata melvillensis</i>	Hooded Robin (Tiwi Islands)	Endangered
<i>Melicytus latifolius</i>	Norfolk Island Mahoe	Critically Endangered
<i>Mitrella</i> sp. Melville Island (C.R.Dunlop 6556) NT Herbarium = <i>Mitrella tiwiensis</i>		Vulnerable
<i>Ninox natalis</i>	Christmas Island Hawk-Owl	Vulnerable
<i>Ninox novaeseelandiae undulata</i>	Norfolk Island Boobook Owl, Southern Boobook (Norfolk Island)	Endangered; Migratory(JAMBA)
<i>Ninox squampila natalis</i> = <i>Ninox natalis</i>	Christmas Island Hawk-Owl	Vulnerable
<i>Ninox squampila natalis</i> = <i>Ninox natalis</i>	Christmas Island Hawk-Owl	Vulnerable
<i>Oligosoma lichenigera</i>	Lord Howe Island Skink	Vulnerable
<i>Pachycephala pectoralis xanthoprocta</i>	Golden Whistler (Norfolk Island)	Vulnerable
<i>Petrogale lateralis pearsoni</i>	Pearson Island Rock-wallaby	Vulnerable
<i>Petroica multicolor multicolor</i>	Pacific Robin (Norfolk Island)	Vulnerable
<i>Phaethon lepturus fulvus</i>	White-tailed Tropicbird (Christmas Island), Golden Bosunbird	Marine
<i>Phalacrocorax nivalis</i> = <i>Leucocarbo atriceps nivalis</i>	Imperial Shag (Heard Island), Heard Shag	Vulnerable; Marine
<i>Phreatia limenophylax</i>	Norfolk Island Phreatia	Critically Endangered
<i>Phyllodactylus guentheri</i> = <i>Christinus guentheri</i>	Lord Howe Island Gecko	Vulnerable
<i>Pipistrellus murrayi</i>	Christmas Island Pipistrelle	Critically Endangered
<i>Pomaderris halmaturina</i> subsp. <i>halmaturina</i>	Kangaroo Island Pomaderris	Vulnerable
<i>Pseudemoia lichenigera</i> = <i>Oligosoma lichenigera</i>	Lord Howe Island Skink	Vulnerable
<i>Pterodroma arminjoniana</i> s. str.	Round Island Petrel, Trinidad Petrel	Critically Endangered

<i>Pteropus melanotus natalis</i>	Christmas Island Flying-fox	
<i>Ramphotyphlops exocoeti</i> = <i>Typhlops exocoeti</i>	Christmas Island Blind Snake	Vulnerable
<i>Sminthopsis aitkeni</i>	Kangaroo Island Dunnart	Endangered
<i>Sminthopsis griseoventer boullangerensis</i> = <i>Sminthopsis griseoventer</i>	Boullanger Island Dunnart	Vulnerable
<i>Strepera graculina crissalis</i>	Lord Howe Island Currawong, Pied Currawong (Lord Howe Island)	Vulnerable
<i>Turdus poliocephalus erythropleurus</i>	Island Thrush (Christmas Island)	Endangered
<i>Typhlops exocoeti</i>	Christmas Island Blind Snake	Vulnerable
<i>Tyto novaehollandiae melvillensis</i>	Masked Owl (Tiwi Islands)	Endangered
<i>Xylopa</i> sp. Melville Island (DNA D30127) = <i>Xylopa monosperma</i>		Endangered
<i>Xylopa</i> sp. Melville Island (J.Russell-Smith 2148) NT Herbarium = <i>Xylopa monosperma</i>	a shrub	Endangered