

Enhancing island conservation outcomes: the policy and legal context, need, and options

John C.Z. Woinarski, Andrew A. Burbidge and April E. Reside

Summary

Collectively, Australian islands have many outstanding biodiversity values, and play a significant role in the conservation of Australia's biodiversity. However, many island species are highly susceptible to novel threats. Hence, although islands comprise <0.5% of the Australian landmass, about 30% of Australian extinctions since European settlement have been of island-endemic species and the three most recent Australian extinctions (all within the last decade) have been island-endemic species. This disproportionate rate of island biodiversity loss is partly due to characteristics of island species, but also reflects the inadequate consideration to date in national legislation and strategy of the special conservation needs for island biodiversity. For example, islands are not recognised as having particular conservation significance or as meriting conservation priority in the nation's primary conservation policy, *Australia's Biodiversity Conservation Strategy 2010–2030*. Here, we propose nine recommendations for amendments to legislation, strategy and management to better reflect and protect the significant biodiversity found on Australia's islands:

1 Implement more effective policy to constrain global climate change.

- 2 Include islands with outstanding conservation values as a Matter of National Environmental Significance.
- 3 Include 'significant wildlife breeding aggregations' as a Matter of National Environmental Significance.
- 4 Include a Data Deficient category within the conservation status categorisations of the *Environment Protection and Biodiversity Conservation Act 1999*.
- 5 Develop a systematic policy approach to biodiversity conservation on Australian islands, within a revised national biodiversity strategy.
- 6 Implement an ongoing program to eradicate priority threats from islands with significant biodiversity values.
- 7 Develop and implement an ongoing program for island biodiversity survey and monitoring.
- 8 Develop a national risk assessment for biodiversity values on all island.
- 9 Establish an enduring national management fund for the conservation of island biodiversity.

Introduction

The conservation need

Australia's many islands support much that is most distinctive in Australian biodiversity. These values

include many endemic species, refuges for species that have declined elsewhere in their range, largely unmodified environments, a high potential to act as translocation sites, and important colonial breeding sites for seabirds, marine turtles, seals and some non-marine species such as pied imperial pigeon (*Ducula bicolor*).

However, although islands (here considered to be those smaller than Tasmania) comprise <0.5% of the Australian land area (a total island area of 32 921 km² within a total Australian land area of 7 692 617 km²: Geoscience Australia 2004), island species have experienced a disproportionate share of Australia's biodiversity loss. Of 54 animal taxa considered Extinct under Australia's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), 21 (39%) occurred only on islands (Table 3.1). The proportion is especially high for birds, with 18 of the 22 (82%) Australian bird taxa listed as Extinct formerly occurring only on islands. For plants, island species have been less affected, with only one of the 36 (2.8%) Australian plant species listed as Extinct being formerly restricted to islands. In total, of all 90 Australian plant and animal species listed as Extinct, 22 (24%) occurred only on islands. However, these figures are an under-estimate, as the official EPBC Act list does not yet include several other recognised extinctions (Table 3.1). A further seven island-endemic taxa are extinct; therefore, 30% of all known Australian plant and animal extinctions since European settlement were of island-endemic species. Furthermore, at least two other island-endemic species have recently become extinct in the wild (the blue-tailed skink *Cryptoblepharus egeriae* and Lister's gecko *Lepidodactylus listeri*), two others have probably become extinct recently (Christmas Island shrew *Crocidura trichura* and Tiwi Island hooded robin *Melanodryas cucullata melvillensis*), and at least two more are perilously close to extinction (the King Island scrubtit *Acanthornis magnus greenianus* and King Island brown thornbill *Acanthiza pusilla archibaldi*) (Garnett *et al.* 2011; Eldridge *et al.* 2014; Woinarski *et al.* 2014b; Andrew *et al.* in press).

Except for a few notable pulses associated mostly with periods of introductions to islands of

black rats (*Rattus rattus*) or cats (*Felis catus*) (and in some cases, establishment of human settlement), these island extinctions have been relatively continuous since the 1780s (Fig. 3.1), and the rate of extinctions of Australia's island-endemic species shows no sign of diminishing. Indeed, the three most recent Australian extinctions have all been island-endemic species – the Christmas Island pipistrelle (*Pipistrellus murrayi*) in 2009, Bramble Cay melomys (*Melomys rubicola*) between 2009 and 2014, and the Christmas Island forest skink (*Emoia nativitatis*) in 2014 (Woinarski *et al.* 2017).

It is not a statistical artefact that Australia's island-endemic species have suffered such a disproportionate rate of loss. Many island species have a range of traits that render them particularly susceptible to extinction: they occupy a small area, often have small population sizes, have limited genetic diversity and low reproductive rates, lack immunity to introduced diseases, are naive to introduced predators and/or have few effective defences against introduced herbivores. These characteristics have provided little resilience for island-endemic species to the introduction of invasive species or disease, and to the land use changes that have affected many islands since human settlement. Consequently, at the global level, island species are disproportionately overrepresented among the world's recent extinctions (Alcover *et al.* 1998; Blackburn *et al.* 2004; Steadman 2006; Duncan and Blackburn 2007), with nearly two-thirds of recent global extinctions being island-endemic species (Jones *et al.* 2016).

While many island species may be more extinction-prone than mainland species, conservation management may also be simpler and more likely to succeed on islands. This is because islands often have fewer threats and, once controlled, threats may be less likely to reinvade from surrounding areas. Islands also often have fewer competing land uses than do mainland areas. Hence, biodiversity conservation on islands presents not only a challenge, but also a significant conservation opportunity.

Given the well-recognised biodiversity values of islands generally and of many Australian islands

Table 3.1. Australian species (and subspecies) known to have become extinct since 1788 that were formerly restricted to islands (smaller than Tasmania)

Scientific name	Common name	Island(s)	Extinction date
<i>Persoonia prostrata</i>		Fraser	unknown
<i>Solanum bauerianum</i> ^a	Bridal flower (Lord Howe Island)	Lord Howe, Philip	?1950s (last collected 1949)
<i>Streblotrichia speciosa</i> ^a	Phillip Island glory pea	Phillip (Norfolk group)	?1830s (last collected 1830)
<i>Emoia nativitatis</i>	Christmas Island forest skink	Christmas	2010s
<i>Dromaius ater</i>	King Island emu	King	1800s
<i>Dromaius baudinianus</i>	Kangaroo Island emu	Kangaroo	1820s
<i>Columba vitiensis godmanae</i>	Lord Howe white-throated pigeon	Lord Howe	1850s
<i>Gallicolumba norfolciensis</i> ^a	Norfolk Island ground-dove	Norfolk	1800s
<i>Hemiphaga novaeseelandiae spadicea</i>	Norfolk Island New Zealand pigeon	Norfolk	1900s
<i>Porphyrio albus</i>	White gallinule	Lord Howe	?1790s (last record 1788)
<i>Hypotaenidia philippensis macquariensis</i>	Macquarie Island buff-banded rail	Macquarie	1890s
<i>Nestor productus</i>	Norfolk Island kaka	Norfolk, Phillip	1850s
<i>Cyanoramphus novaeseelandiae subflavescens</i>	Lord Howe Tasman parakeet	Lord Howe	1860s
<i>Cyanoramphus novaeseelandiae erythrotis</i>	Macquarie Island red-fronted parakeet	Macquarie	1890s
<i>Ninox novaeseelandiae albaria</i>	Lord Howe southern boobook	Lord Howe	1950s
<i>Gerygone insularis</i>	Lord Howe gerygone	Lord Howe	1920s
<i>Lalage leucopyga leucopyga</i>	Norfolk Island long-tailed triller	Norfolk	1940s
<i>Rhipidura fuliginosa cervina</i>	Lord Howe grey fantail	Lord Howe	1920s
<i>Zosterops strenuus</i>	Robust white-eye	Lord Howe	1920s
<i>Zosterops albogularis</i>	White-chested white-eye	Norfolk	?1980s
<i>Turdus poliocephalus poliocephalus</i>	Norfolk Island thrush	Norfolk	1970s
<i>Turdus poliocephalus vinitinctus</i>	Lord Howe thrush	Lord Howe	1920s
<i>Aplonis fusca fusca</i> ^b	Norfolk Island Tasman starling	Norfolk	1950s
<i>Aplonis fusca hulliana</i> ^b	Lord Howe Tasman starling	Lord Howe	1920s
<i>Nyctophilus howensis</i>	Lord Howe long-eared bat	Lord Howe	1920s
<i>Pipistrellus murrayi</i> ^a	Christmas Island pipistrelle	Christmas	2000s
<i>Melomys rubicola</i> ^a	Bramble Cay melomys	Bramble Cay	2000s
<i>Rattus macleari</i>	Maclear's rat	Christmas	1900s
<i>Rattus nativitatis</i>	Bulldog rat	Christmas	1900s

^a Extinct taxa not yet formally listed as Extinct under the EPBC Act.

^b Listed as Extinct at species level.

specifically, the disproportionate and ongoing rate of loss of Australian island-endemic biodiversity and the broader (global) recognition of the susceptibility of island species generally, there is a good

case to consider that islands and island biodiversity merit particular conservation priority, and that such priority should be reflected and embedded in effective legislation, policy and management.

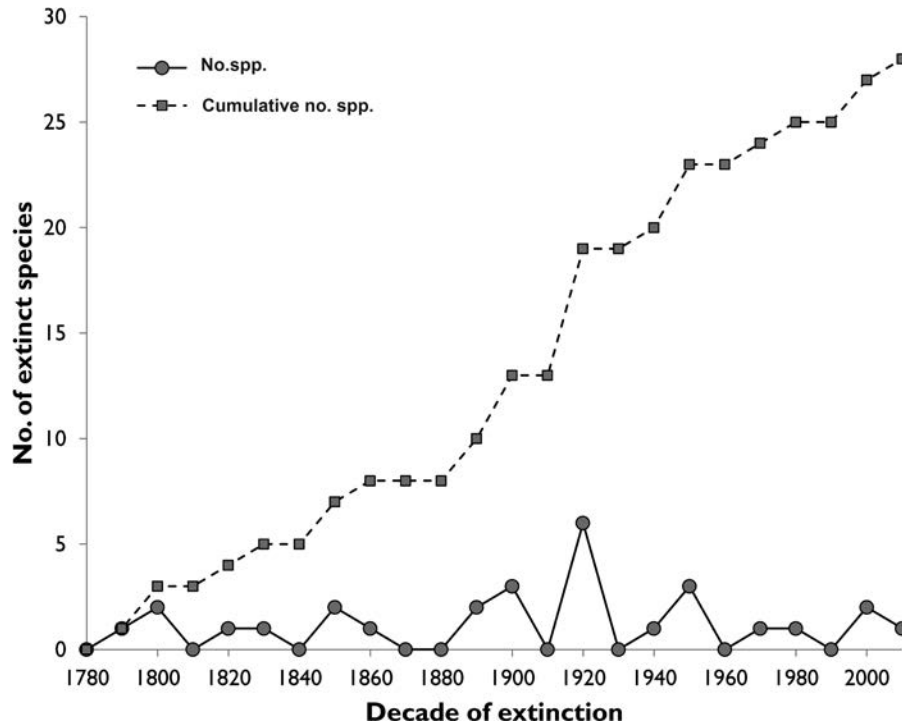


Fig. 3.1: Estimated dates of extinctions for Australian island-endemic species. Note that most of these dates relate to the last known record, and in many cases the species may have persisted long after this date. Of species listed in Table 3.1, this graph excludes *Persoonia prostrata*, for which the decade of extinction cannot be reliably estimated. Squares and dashed line mark cumulative number of extinctions of island-endemic species; filled circles and solid line represent the number of extinctions of island-endemic species within a given decade (e.g. 1920 refers to the decade from 1920 to 1929).

Current legal, policy and management context for islands

Australia's environmental policies and legislation are complex and suboptimal. The Australian constitution vests primary responsibility for most environmental matters with the states and, subsequently, the territories. The notable exception is for 'Matters of National Environmental Significance', which are determined in part by international treaties to which the national government is a signatory: these are currently restricted to a tightly circumscribed set of nine features. Many of these features are managed cooperatively by the Australian and relevant state/territory governments. The state/territory and national governments jointly develop and implement some environmental policies, with the most substantial relevant example being *Australia's Biodiversity Conservation Strategy 2010–2030* (Natural Resource Management Ministerial Council 2010).

Consequently, the conservation management of biodiversity in Australia involves a somewhat haphazard set of idiosyncratic state/territory policies and legislation, overlaid in some instances by national policies and legislation. Furthermore, some environmental responsibilities are held in some cases by local governments (although this tier of administration is absent on many islands). Collectively, these multiple responsibilities result in little coherence in, but rather markedly disparate, conservation approaches, concern and outcomes for Australian islands (as they do for Australia's mainland areas). Further complicating the policy and legal framework for island conservation management is the substantial variation among islands in terms of ownership and tenure, development history, biosecurity settings, extent of exploitation, threatening processes and human population size.

This policy potpourri partly mirrors the remarkable environmental range spanned by Australian

islands – in origin, size, climate, isolation, geomorphology and topography, among other factors. Accordingly, there is comparable variation in their conservation values and threats. This chapter considers the conservation consequences of this disjointed policy and legislative context across the set of Australia's islands, and suggests options for a more coherent and effective approach to the conservation of biodiversity on Australian islands. Much of the content relates to national policy and legislation, because a comprehensive review of all state and territory policy and legislation is impractical.

National and collaborative approach, policy and legislation

Australia's islands are mostly within state and territory jurisdictions. However, several island groups with significant biodiversity values are the primary responsibility of the Australian Commonwealth government, for historical, strategic and other reasons. Collectively, the tally of islands managed by the Commonwealth comprises about 85 islands of area >1 ha (2% of Australia's islands) with a total area of 562 km² (1.7% of the total area of Australia's islands) (Geoscience Australia 2004). There is administrative variation even among these Commonwealth-administered groups. Norfolk Island (and its satellite islands) is currently managed as an Australian external territory. Christmas Island has been managed as an Australian external territory since being acquired by the Australian government in 1958, although with varying levels of local (shire) administrative responsibility. The Cocos (Keeling) Islands group is a relatively recent acquisition by the Australian government, and is managed as an Australian external territory, with limited local responsibilities. However, for Christmas Island and the Cocos (Keeling) Islands group, the Western Australian government provides some environmental services and responsibilities under specific bilateral agreements with the Commonwealth government. The isolated, small and uninhabited Ashmore and Cartier Islands are managed as Australian external territories, as is a small set of uninhabited islands in the Coral Sea. The sub-Ant-

arctic Heard and McDonald Islands are also managed as Australian external territories. While sub-Antarctic islands have some management responsibility vested in the Australian Antarctic Division, most other Australian external territories are vested in the Department of Infrastructure and Regional Development. Some small uninhabited islands around the continental shelf of Australia's claimed Antarctic territory are also managed by the Australian government, likewise with some administrative responsibilities vested in the Australian Antarctic Division. The Commonwealth also has some direct responsibilities for Bowen Island in Booderee National Park (jointly managed by Indigenous landholders and the Australian government's Parks Australia) in Jervis Bay, and Barron and Field Islands in Kakadu National Park (also jointly managed by Indigenous landholders and Parks Australia).

National environmental policy and legislation extends to these islands, and to other islands where a Matter of National Environmental Significance is involved. The variable distribution of these matters across Australian islands is summarised in the following three paragraphs.

World Heritage listing (under the *Convention Concerning the Protection of the World Cultural and Natural Heritage*) provides some profile and protection to biodiversity on Norfolk Island, islands of the Great Barrier Reef, Fraser Island, islands in the Heard-McDonald group, Macquarie Island and Lord Howe Island. Islands are also included as part of other broader World Heritage listings, notably the Shark Bay area (which includes Bernier, Dorre, Faure and Dirk Hartog Islands, all with significant biodiversity values, particularly for the conservation of threatened mammal species); the Tasmanian World Heritage area (which includes Maatsuyker and other islands); Kakadu National Park; and the Ningaloo Coast World Heritage area (which includes Muiron Islands) (Chapter 10). This set encompasses only a portion of those Australian islands with highest biodiversity value.

Species or ecological communities listed as threatened under the EPBC Act are afforded some

Table 3.2. Nationally listed threatened species for some taxonomic groups on Australian islands

Taxonomic group	No. of threatened species (excluding extinct species)	No. (%) of these species occurring only on islands	No. (%) of these species occurring on both mainland and islands	No. of islands with threatened spp.
Plant	1263	73 (5.8)	48 (3.8)	44
Terrestrial invertebrate	53	12 (22.6)	2 (3.8)	12
Frogs	29	0 (0)	3 (10.3)	12
Terrestrial reptiles	52	10 (19.2)	5 (9.6)	26
Terrestrial mammals	96	12 (12.5)	37 (38.5)	110 ^a

Note that for these tallies, Tasmania is not considered an island; the set of terrestrial mammals here excludes primarily marine species; tallies relate to extant EPBC Act listed taxa only; island occurrences relate to ongoing presence and may include some recent introductions of threatened species; bird tallies are not included.

^a Does not include records for the vulnerable grey-headed flying-fox (*Pteropus poliocephalus*), which is a dispersive visitor to many additional islands.

protection by the Australian government, mostly against acute threats, even on islands primarily managed by state and territory governments. There is no current account of nationally listed threatened species by islands, but our assessment for some taxonomic groups (Table 3.2) indicates that many Australian islands support nationally listed threatened species, which are offered at least notional protection due to that listing. However, given that the three most recent extinctions of Australian species were all listed as threatened nationally, this protective mechanism is self-evidently inadequate (Woinarski *et al.* 2017). In contrast to the occurrence of many threatened species on islands, only one of Australia's 75 listed terrestrial threatened ecosystems occurs primarily on islands: Kangaroo Island narrow-leaved mallee (*Eucalyptus cneorifolia*) woodland.

Of Australia's 65 wetland sites listed with international significance (and hence afforded some protective status) under the *Convention on Wetlands of International Importance* ('Ramsar convention'), 22 include all or parts of some islands, with notable examples including Ashmore Reef, islands in the Coral Sea, Moreton Island and other nearby islands within the Moreton Bay site, Pulu Keeling (North Keeling Island) and small sites on Christmas, King and Flinders Islands.

Of the 21 Key Threatening Processes listed under the EPBC Act, only one relates directly to islands: 'Predation by exotic rats on Australian off-

shore islands of less than 1000 km² (100,000 ha)'. The explicit recognition of this threat prompted a planning response (DEWHA 2009) and some funding to eradicate introduced rats on islands.

As with legislation, relevant national strategies and policies have no specific island consideration. The nation's primary conservation policy, *Australia's Biodiversity Conservation Strategy 2010–2030* (Natural Resource Management Ministerial Council 2010), has no mention of islands (other than in two figure captions), let alone recognition of the biodiversity importance of islands or of the conservation susceptibility of island biota, or any consideration of a strategic response to the conservation of biodiversity on Australian islands. Australia's primary strategy for the development of its conservation reserve system, *Directions for the National Reserve System: A Partnership Approach* (National Reserve System Task Group 2010), likewise a collaboration of states/territories and Commonwealth governments, has a brief mention of the need for conservation on islands and uses Kangaroo Island as one case study, but otherwise provides no strategic or coherent approach to island conservation. Indeed, many islands were not included in initial versions of the Interim Biogeographical Regionalisation of Australia (Thackway and Cresswell 1995), the basis for planning the national reserve system (Hobbs 2014). This omission is notwithstanding that their often high level of endemism renders some islands irreplaceable in any conservation

reserve design that seeks comprehensive inclusion of biodiversity elements (Pressey *et al.* 1994).

Many islands have high biodiversity value coupled with extreme pressures such that a substantial component of biodiversity is highly susceptible to loss: this is essentially the definition of a biodiversity hotspot (Myers *et al.* 2000). However, when the Australian government sought in 2003 to identify hotspots as a prioritisation filter for conservation resourcing (<https://www.environment.gov.au/biodiversity/conservation/hotspots/national-biodiversity-hotspots#hotspot15>), it included (in part) only one island (Mt Lofty/Kangaroo Island) among the 15 defined hotspots. More recently (in 2015), the Australian government's *Threatened Species Strategy* (Commonwealth of Australia 2015) recognised an explicit priority for island conservation, and included specific targets to eradicate feral cats from five islands of high biodiversity value.

Some bilateral agreements (between Commonwealth and state governments) influence conservation management on some islands. A good example is the shared responsibility for the eradication of invasive species on Macquarie Island (managed by the Tasmanian government as a conservation reserve). There are also shared arrangements between the Commonwealth and Queensland governments for the management of the Great Barrier Reef, including many islands. A perhaps less successful example is the Regional Forest Agreement process, embedded within the EPBC Act, that allows bilateral provisions ostensibly to balance timber production and biodiversity conservation in some designated areas (including parts of Bruny Island, Tasmania), but which has had some notable failures in conservation outcomes (Lindenmayer *et al.* 2015).

State/territory approaches, policy and legislation

As with national shortcomings, for state and territory jurisdictions there is little or no legislation or policy that recognises the particular biodiversity values of islands and targets island conservation management (Table 3.3). Western Australia has been exceptional (Box 3.1), having long managed its many islands as important conservation assets,

with systematic programs of survey, pest eradication, translocation and some biosecurity practice (Algar *et al.* 2002; Burbidge and Morris 2002; Gibson *et al.* 2012). However, this formidable effort (with significant conservation outcomes) has not been firmly rooted in law or policy. Some elements of these conservation management actions have also occurred, albeit typically less substantially, in most other states and the Northern Territory.

States and territories maintain their own lists of threatened species (including many species that occur entirely or partly on islands). The associated state/territory legislation and policy settings provide some protection for these species and some prioritisation for resourcing for their conservation management – although, as with national legislation, listing *per se* offers little conservation safeguard or assurance of management investment. In a welcome step, there is a current collaborative Commonwealth/states/territories process to harmonise the individual jurisdictional listings of threatened species.

Conservation management on individual Australian islands is highly variable. Conservation reserves occur in, or encompass, many Australian islands (Chapter 2). For many of these reserved islands, conservation management plans (with some statutory authority) provide a description of island conservation values and management priorities designed to maintain or recover those values. Notable state examples include management plans for Hinchinbrook Island National Park (Queensland Parks and Wildlife Service 1999), Shark Bay islands (DEC 2012) and Barrow Island (DPW 2015). For some islands included within Indigenous Protected Areas, Healthy Country plans have been developed by landholder groups, in part as a basis for ongoing Commonwealth investment (Wunambal Gaambera Aboriginal Corporation 2010; Moorcroft *et al.* 2012). In other cases, only part of an island is reserved, but island-wide recovery plans for sets of co-occurring threatened species have been developed and implemented: examples include those for Lord Howe Island (DECC (NSW) 2007), King Island (Threatened Species Section

Box 3.1: Legal and policy settings and management for the conservation of biodiversity on Western Australian islands

Western Australia has more islands than any other state or territory – 3747 – of which 2285 are >1 ha and 300 >100 ha. Most (2633) are in the Kimberley but, apart from the Great Australian Bight, islands exist along most of the coastline. South of the Kimberley, major groups include the Dampier Archipelago (42 islands), the Montebello Islands (180 islands), Houtman Abrolhos (150 islands) and the Archipelago of the Recherche (232 islands).

Despite no explicit mention in legislation, islands have long been a major plank in the state's conservation policy and practice as many are critical for mammal, seabird and marine turtle conservation, and as examples of ecosystems unaltered by the many changes wrought on mainland Australia since European settlement. Of particular importance for mammals are Bernier and Dorre Islands in Shark Bay (inhabited by four species that became extinct on the mainland) and Barrow Island (including one species that became extinct on the mainland). Seabirds have been recorded breeding on >500 Western Australian islands and marine turtles nest on most sandy island beaches north of Shark Bay (Burbidge *et al.* 1996).

Most islands in the Kimberley are exclusive native title. Many of these have been or will be declared as Indigenous Protected Areas and are increasingly covered by Healthy Country plans (Moorcroft *et al.* 2012) managed by Aboriginal rangers.

Most islands south of the Kimberley are nature conservation reserves, declared under the *Land Administration Act 1997* and managed pursuant to the *Conservation and Land Management Act 1984*, while the *Biodiversity Conservation Bill 2015* covers the protection and conservation of flora and fauna state-wide. Islands with other tenures include Dirk Hartog (a

national park), the Houtman Abrolhos (a multi-purpose reserve controlled by the Department of Fisheries and a proposed national park), Rottneest (a recreation area managed by a Board) and Garden Islands near Perth (a naval base, HMAS *Stirling*).

There is a long history of biological surveys on Western Australian islands. The first major one was of the Archipelago of the Recherche (Willis 1953) and the most recent was of the larger Kimberley islands undertaken in association with Traditional Owners (Gibson and McKenzie 2012). There has also been a long history of island management, especially the eradication of invasive mammals, including goat (*Capra hircus*), rabbit (*Oryctolagus cuniculus*), black rat, house mouse (*Mus domesticus*), fox (*Vulpes vulpes*) and feral cat (Algar *et al.* 2002; Burbidge and Morris 2002; Morris 2002). Feral cats have now been eliminated from almost all Western Australian islands. Biosecurity planning is increasingly important (Chapter 6). The current and potential value of Western Australian islands as refuges for biodiversity threatened by factors widespread on mainland areas has long been recognised (Abbott 2000) and the state's islands have been widely but strategically used for translocations, mostly of mammals, with such cases carefully regulated by specific translocation guidelines.

Resourcing remains a major issue. Islands are often remote from towns and require vessels or helicopters for access. Without regular surveillance, problems such as the arrival of invasive species, species loss and island degradation are likely. Because of the importance of islands to biodiversity conservation, there is a need for better legislative and policy protection for Western Australian islands and, particularly, regular surveillance for invasive species.

2010), Bruny Island (Cochran 2003) and Kangaroo Island (Taylor 2008).

To some extent, the conservation effectiveness of island-wide recovery plans is dependent upon the extent to which the island's land use is directed towards biodiversity conservation: conservation management plans on populated islands with many other land uses and interests almost inevitably involve many more compromises than for unpopulated islands that are entirely conservation reserves.

Although there are many bad examples, there are also some examples of 'best practice' planned cohabitation of resource extraction and biodiversity conservation on island. In these, development is constrained to less sensitive areas, and biodiversity impacts are offset by substantial investments in targeted conservation management (Chapter 9).

The main risk to most island species is the introduction of invasive species. For many and perhaps most Australian islands, there are no

Table 3.3. Main relevant policy settings relating to biodiversity conservation on islands in Australian states and territories

Jurisdiction	No. of islands >1 ha	Main biodiversity conservation policy or legislation	The extent to which islands are specifically considered in that policy
New South Wales	87	<i>Biodiversity Conservation Bill 2016</i> <i>Local Land Services Amendment Bill 2016</i> <i>Coastal Protection Act 1979</i> <i>Coastal Management Act 2016 No. 20</i> <i>Environmental Trust Act 1998</i> <i>Heritage Act 1977</i> <i>Biosecurity Act 2015 No. 24</i> <i>Lord Howe Island Act 1953 No. 39</i> <i>National Park Estate (Reservations) Act 2002 No. 137</i> <i>Wilderness Act 1987 No. 196</i> <i>Saving Our Species 2016–21</i>	Generally no specific recognition of island biodiversity, although some special provisions for Lord Howe Island; no specific island conservation objectives
Northern Territory	612	No biodiversity conservation strategy <i>Territory Parks and Wildlife Conservation Act 2000</i>	No specific consideration of island conservation; no specific island conservation objectives
Queensland	1713	<i>Nature Conservation Act 1992</i> <i>Queensland Marine Parks Act 2004</i> <i>Great Barrier Reef Marine Park Act 1975</i>	Some provisions for Torres Strait Islander land; no specific island conservation objectives
South Australia	238	<i>No Species Loss: A Nature Conservation Strategy for South Australia 2007–17</i>	Some recognition of biodiversity values of islands (especially Kangaroo Island, and nesting seabird colonies); no specific island conservation objectives
Tasmania	289	<i>Threatened Species Protection Act 1995</i> <i>Nature Conservation Act 2002</i> <i>National Parks and Reserves Management Act 2002</i> <i>Natural Heritage Strategy for Tasmania 2013-2030: Securing Our Natural Advantage</i>	Values of ‘islands’ permeate the natural heritage strategy, and some specific recognition of biodiversity values of particular islands (Macquarie, Bruny, Maria); no specific island conservation objectives
Victoria	138	<i>Flora and Fauna Guarantee Act 1988</i> <i>Victoria’s Biodiversity: Our Living Wealth</i> <i>Protecting Victoria’s Environment: Biodiversity 2037</i>	Some recognition of biodiversity value of Phillip Island; no specific island conservation objectives
Western Australia	2285	<i>Biodiversity Conservation Act 2016</i> <i>Conservation and Land Management Act 1984</i>	No specific island policies, but long history of island biological surveys and eradication of invasive species

existing legal constraints on the importation of plants or animals (e.g. cats) from nearby mainland areas. This may be particularly the case for populated islands and where all or most land is privately owned. There are some notable exceptions: in Western Australia, regulations prohibit the introduction of invasive species to islands that are nature reserves, as are most islands south of the

Kimberley. However, enforcement of such regulations has generally been limited.

Options for improving the policy and legal settings

Australia’s current legal, policy and management approach to the conservation of island biodiversity

is piecemeal and inadequate (Woinarski *et al.* 2014a). The distinctive and important, but highly susceptible, conservation values of the large set of Australian islands have not been appropriately recognised. The history of many island extinctions shows that island species can rapidly be rendered extinct following introductions of invasive species, such that policy (and management) needs to be proactive and precautionary (Martin *et al.* 2012). Here, we present a set of nine recommendations for better recognising and safeguarding the nationally and internationally significant biodiversity values occurring across Australian islands.

Changes needed to legislation and policy

1 *Implement more effective policy to constrain global climate change.*

Global climate change threatens the future of much of the world's biodiversity. Island biota may be particularly susceptible, as many island species have little capability for adaptation because of their limited genetic variation and islands may offer few altitudinal or other options for distributional shifts to track changing climate conditions. The distinctive (and endemic-rich) but limited extent of cloud forest on the peaks of Mounts Gower and Lidgbird on Lord Howe Island is one example of an island environment at severe risk from climate change (DECC (NSW) 2007). Many islands are low-lying and may be inundated in extreme weather events or more gradually diminished by rising sea levels. The recent extinction of the Bramble Cay melomys due to episodic inundations of the only island on which it occurred may be the forerunner of the loss of many other island species as a consequence of global climate change (Watson 2016). Currently, measures taken internationally and nationally to reduce greenhouse gas emissions will be insufficient to stave off much climate change and a consequential increased rate of extinctions, especially in island species. Much loss of Australia's island biota will occur unless Australian policy on cli-

mate change and greenhouse gas emissions is significantly improved.

2 *Include islands with outstanding conservation values as a Matter of National Environmental Significance.*

To better reflect and more effectively address the significant potential for islands to contribute to the conservation of Australia's (and indeed the world's) biodiversity, and in light of the ongoing loss of Australian island biodiversity, the EPBC Act needs to be amended to include islands with outstanding biodiversity values as a Matter of National Environmental Significance. Wherever possible, amendments to the EPBC Act should be complemented by inclusion of appropriate provisions in state and Northern Territory legislation. With criteria relating to numbers of endemic species, species richness and/or breeding aggregations, it is relatively straightforward to identify such priority islands (Ecosure 2009).

3 *Include 'significant wildlife breeding aggregations' as a Matter of National Environmental Significance.*

Some national protection is afforded, albeit indirectly, for sites supporting significant aggregations of some groups of species (notably waterfowl and other aquatic species) through established thresholds and protocols used in defining wetland sites of international significance (Ramsar Convention Bureau 2002), and for shorebird species (Gallo-Cajiao 2014). However, there is no comparable recognition and protection offered to sites that support significant breeding aggregations of other wildlife groups (Fig. 3.2). In Australia, most such sites (e.g. for seabirds, seals and marine turtles) are now on islands. Such sites may be critical for the conservation of many species because, at some time of their lifecycle, much of the species' total population is concentrated in a small area. Threshold criteria for defining the significance of such sites can be readily transferred from existing shorebird and waterfowl site criteria (e.g. >1% of the world population breeding at the site). Some of these aggregations are cur-



Fig. 3.2: The southern end of Pelsaert Island in the Houtman Abrolhos, Western Australia, has significant breeding aggregations of wedge-tailed shearwater (*Ardenna pacifica*) that nest in burrows, sooty tern (*Onychoprion fuscatus*) that nest on the ground and common noddy (*Anous stolidus*) that nest on low shrubs. Most birds in this photograph are common (or brown) noddies. Over one million seabirds occur here during the breeding season. Photo: Andrew Burbidge.

rently afforded protection because the species concerned are listed as threatened; however, many of the aggregations comprise species not listed as threatened.

- 4 *Include a Data Deficient category within the conservation status categorisations of the EPBC Act, with appropriate management implications and commitment to redress the lack of information.*

Such a change would be consistent with the protocols of the IUCN (IUCN Standards and Petitions Subcommittee 2016), which largely form the basis for conservation status assessment nationally and in most states and territories. This category may be particularly relevant for island species, because remoteness renders

much island biota poorly known and documented. The remoteness of many islands from major population centres also means that island species are less likely to be regularly monitored and hence their population trends are unlikely to be well resolved.

- 5 *Develop a systematic policy approach to biodiversity conservation on Australian islands, within a revised national biodiversity strategy.*

This should include:

- development of specific conservation management planning for all of the most significant islands in every state;
- development and implementation of substantially enhanced biosecurity

protocols for all islands, especially those with high conservation values (Chapter 6);

- appropriate levels of constraints on new developments on any currently undeveloped islands;
- evaluating the potential for, and risks of, islands as translocation sites for threatened species unlikely to persist on the mainland (Chapter 7).

6 *Implement an ongoing program to eradicate priority threats from islands with significant biodiversity values.*

Australia's *Threatened Species Strategy* has identified the need to control (or preferably eradicate) priority threats to threatened species on some islands. To date (January 2017), five islands have been proposed as sites for the eradication of feral cats. However, feral cats occur on nearly 100 Australian islands (Legge *et al.* 2017), and many other islands have uncontrolled populations of other invasive species. The national control and eradication program presaged in the *Threatened Species Strategy* should be sequentially and systematically expanded to propose that invasive species that are major threats to island biodiversity are eradicated from substantially more Australian islands.

7 *Develop and implement an ongoing program for island biodiversity survey and monitoring.*

The biota of many islands is unknown or poorly known. For example, there are more than 2600 islands in the Kimberley but fewer than 30 have been surveyed reasonably comprehensively (Gibson *et al.* 2012). Biodiversity inventory of Australian islands has been neither systematic nor comprehensive, and it is likely that there is much unrecognised endemism. This may be particularly likely for some of the less conspicuous invertebrate groups, which typically are underrepresented in current listings of Australian threatened species (Walsh *et al.* 2012). Targeted surveys of some invertebrate groups on some islands have demonstrated remarkable levels of radiation and endemism, including many taxa of great antiquity (Iredale 1944; Ponder 1982; Criscione and Köhler 2013). Yet

there have been few such surveys for relatively uncharismatic groups of species, and it is likely that further surveys on more islands will reveal many more island-endemic species, many of which may have requirements for urgent conservation actions. Furthermore, it is not simply less charismatic taxonomic groups that have been undersampled or undiscovered on islands – genetic analyses show much previously unrecognised endemism in island representatives of what were formerly considered single widespread species (Rosauer *et al.* 2016).

8 *Develop a national risk assessment for biodiversity values on all islands.*

To better understand, safeguard and manage the biodiversity values of Australian islands, a national program for risk assessment of Australian islands should be developed. Islands with high risks of biodiversity loss, and susceptible island species, should be priorities for preventative and remedial management.

9 *Establish an enduring national management fund for the conservation of island biodiversity.*

Although there have been recent examples of substantial investments in the management of threats on Australian islands (notably eradication programs for invasive species on Macquarie and Dirk Hartog Islands), there is generally limited or no resourcing for conservation management on most Australian islands, and many remain entirely unmanaged. A strategic and long-term program initiated by governments to conserve wildlife on Australian islands is warranted. Many islands, particularly in northern Australia, are now managed by Indigenous ranger groups as Indigenous Protected Areas (Chapter 8). Currently, these programs have only short-term investment commitments, and require far more substantial longer-term security.

Concluding comments

The Australian and state and territory governments have statutory obligations to protect biodiversity and prevent extinction. Clearly this

obligation is not being met on Australian islands. Islands present a special conservation opportunity. In many cases (because of their relatively small size and unconnected nature) conservation may be far more tractable and cost-effective on islands than on mainland areas. Furthermore, islands do not yet have many of the threats facing mainland environments, and relatively simple biosecurity precautions may long prevent the arrival or establishment of such threats. Indeed, it is clear that eradication of invasive species from islands and the subsequent restoration of island biotas is extremely cost-effective compared with many other conservation actions (Genovesi 2011; Jones *et al.* 2016). Australia has a long history of treating its island estate with disdain or inadequate care, of not recognising islands for their biodiversity significance and susceptibility. The extraordinary biodiversity of Australia's islands has suffered severely from such a history of ill-use and neglect. It is time to redress the damage.

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