

# chapter 2

## prioritisation of high conservation status offshore islands

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ecosure

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## 2 Determining the Conservation Status of Australia's Offshore Islands

### 2.1 Analysis of DEWHA data

Five spatial datasets were provided by DEWHA's Environmental Resources Information Network (ERIN) for the purposes of this offshore islands assessment.

#### 2.1.1 Islands biodiversity data

DEWHA's Australian Islands Biodiversity Database (Island\_biodiv; DEWHA 2009b) holds information about most of Australia's offshore islands and the feral species that have been recorded at some point in time on those islands, along with the most recent information on their status on each island. Island data was generally provided to DEWHA by the appropriate state/territory agencies: WA (January 2005), TAS (October 2005), NT (October 2005), NSW (May 2006), VIC (March 2008), SA (May 2008) and QLD (July 2008). Some data is held for additional islands which were not included in state/territory provided data. Location, archipelago name (if applicable), state/territory jurisdiction and land tenure information is held for each of the recorded islands. Each island's area (ha) has been calculated using Arc GIS 9.3. Source information is held for each feral species, including translocated native species. At the time of data supply to Ecosure this whole dataset comprised 9 300 records.

#### 2.1.2 Threatened species data

DEWHA's Species of National Environmental Significance Database holds distributional data for all EPBC listed threatened flora and fauna species across the whole of the Commonwealth of Australia. These data feed the publically available Species Profile and Threats Database (SPRAT) online database (DEWHA 2009d). A subset of this dataset was spatially clipped by ERIN staff using ArcGIS 9.3 such that the data supplied to Ecosure were for offshore islands only (feralislands\_epbc species; DEWHA 2009e). Furthermore, the majority of exclusively marine species, such as whales, dolphins, fish, seahorses, sharks and the Dugong, were excluded from the supplied data since these species would not be considered in this biodiversity value assessment of Australia's offshore islands (see section 2.3 below).

Including Listed Critical Habitat (see section 2.1.4 below), DEWHA uses 24 different presence categories (allocated with non-sequential numerical ranks) for EPBC listed threatened species in the Species of National Environmental Significance Database (DEWHA 2009e). For example, 'Species or species habitat is known to occur within area' is Rank 26, 'Species or species habitat is likely to occur within area' is Rank 36 and 'Species or species habitat may occur in area' is Rank 46 in the DEWHA data. Other species presence categories with 'known', 'likely' or 'may' combinations of occurrences include: 'Breeding', 'Roosting', 'Foraging', 'Migration Route', 'Community' and 'Congregation or aggregation'. The remaining three species presence categories are: 'Listed Critical Habitat', 'Translocated population known to occur within area' and 'Extinct within area'. The supplied data also contained some invasive species distributions.

### 2.1.3 Seabird breeding data

DEWHA's Australian Seabird Breeding Islands Database holds records of the number of breeding pairs of seabirds and the year they were recorded on Australia's offshore islands and external territories excluding Antarctica (seabird\_breeding; DEWHA 2009f). Only the most recent population estimate for any island is held and a 'Y' denotes when breeding by a species has been known to occur on the specific island, but for which population information is not available.

### 2.1.4 Critical habitat data

DEWHA's EPBC Act (1999) - Register of Critical Habitat Maps dataset holds the distributional data for gazetted Critical Habitat (critical\_habitat; DEWHA 2009g). Two of Australia's eight delineated critical habitats occur on Macquarie Island, one for the Grey-headed Albatross and the other for the Wandering Albatross. These were included as flora (Appendix C) in the biodiversity value assessment (see section 2.3 below).

### 2.1.5 Vegetation data

DEWHA's National Vegetation Information System version 3.1 was supplied to Ecosure. However, detailed consideration of vegetation groups was outside of the scope of this project, and therefore vegetation assemblages have not been included in the biodiversity assessment. Where significant vegetation assemblages were mentioned in reviewed island literature, we included these in the 'other significant natural values' section of island profiles (Chapter 4). Similarly, detailed consideration of invasive plants (weeds) was outside of the scope of this project, but weeds that are mentioned in the reviewed island literature have been included in the 'other threats present' section of island profiles (Chapter 4).

### 2.1.6 Linking DEWHA datasets

DEWHA's Australian Islands Biodiversity Database (Island\_biodiv; DEWHA 2009b) was first used to select the islands that warranted further examination. According to the project scope, we initially looked at those islands on which feral species had been recorded at some point in time (see section 2.1.1 for provision of data to DEWHA by state/territory departments). Islands were then separated into two groups by area; in agreement with DEWHA, large islands (at least 200 ha) were prioritised for the conservation values assessment. A preliminary assessment of small islands (less than 200 ha) produced a list of small islands that have been recorded with at least one feral species and which also have records, or the possible presence of, EPBC listed threatened species (DEWHA 2009e). A list of smaller islands which could be considered for assessment of their conservation values is provided in Chapter 6 of this report; an initial information gathering exercise was conducted for these islands (section 2.3), but they are not considered in further detail in the remainder of this report.

The datasets supplied by DEWHA do not share a common identifier and so relevant data from each dataset needed to be linked spatially using Arc GIS 9.3 (ESRI 2009) and exported into Microsoft® Excel 2007 spreadsheet (Microsoft Corporation 2007). Large islands that have feral species were then linked with spatial data for EPBC listed threatened species (Appendix D). We

also extracted islands that have no feral species records, but are within 1 km of the mainland and/or other islands with feral species (Appendix D) and linked these islands to threatened species data; 1 km was agreed with DEWHA as an appropriate distance for consideration of self-introduction of rats by swimming across open water. Seabird breeding data was then linked such that each large (> 200 ha) island's records of seabird breeding, feral species presence and possible or recorded EPBC threatened species were contained in a single dataset. This dataset then required extensive 'cleaning' and reordering to generate a working dataset containing a single record (row) for any individual threatened species or feral species per island. Further details of this process and our recommendations for ongoing offshore islands data compilation have been provided to DEWHA in a separate document, and are only summarised here to allow adequate interpretation of the data preparation methods in this report.

The process of combining the various data, linked to island location, created a large number of data permutations. For example, each recorded presence category for a listed species (see section 2.1.2 above) combined with each feral species recorded on that island. Furthermore, whereas feral records for islands and threatened species records were recorded in unique rows, seabird breeding records are recorded in 86 species' columns. We therefore primarily sorted these data to:

- eliminate any remaining species that are exclusively marine and therefore are not considered to contribute to an offshore island's biodiversity value
- eliminate any invasive species distribution records carried over from the Species of National Environmental Significance Database (specifically island related feral species records were retained from the Australian Islands Biodiversity Database)
- transpose seabird breeding records from columns to rows, so that each breeding record for a species contains all relevant island information
- remove exact duplicate records; for example, multiples of the same species on any particular island
- reduce records for any one species to a single row per island; for example, an actual record of a species breeding took precedence over any 'likely' or 'may' species presence records; i.e. removal of pseudo duplicates, and
- consolidate records for the same species where a different scientific name, common name or spelling has been used; for example, where a species scientific name has changed, and where a species was recorded in the EPBC threatened species data (where scientific name is used) and also recorded in the seabird breeding database (where an abbreviation of the species common name is used).

Each species current listing status under the EPBC Act was checked using DEWHA's SPRAT database (DEWHA 2009d). Each species common name and current scientific name was also checked with DEWHA records online. In addition, updates were incorporated during the course of the project, such as an Update of the List of Migratory Species released on 12 March 2009, and in effect from 23 March 2009 (DEWHA 2009i). Once the working data had been cleaned and updated to this point, we began incorporating new species records and updating species

presence records (actual records replaced possible occurrence) using information gathered from our targeted literature review and/or state/territory contacts (see section 2.2 below).

## 2.2 Information gathering/literature review

### 2.2.1 Island management plans

Using a preliminary list of 162 large islands, and 197 small islands, with at least one feral species record and threatened species record, an extensive keyword search was conducted online within relevant state/territory agency websites and generally using the Google® Search Engine. To target the acquisition of any available island management and/or pest management plans, island information searches typically included combinations of:

- island name and state
- archipelago name
- location information
- management plan
- flora and/or fauna
- pest control and/or eradication, etc.

All relevant island management documents were downloaded and stored within a state/territory folder. As gaps in the acquired information were identified, additional documents and information were obtained from appropriate state/territory contacts, rangers and/or other island employees.

In discussion with DEWHA, the following offshore island external territories were not included in our islands priority assessment:

- Christmas Island - Christmas Island National Park
- Cocos (Keeling) Islands - Pulu Keeling National Park
- Heard and MacDonald Islands ([www.heardisland.aq](http://www.heardisland.aq)), and
- Norfolk Island - Norfolk Island National Park.

We considered it appropriate to exclude these high conservation status islands from this exercise because are already recognised as priority areas by the Australian Government (e.g. Commonwealth Parks and Reserves, DEWHA 2009j). Well defined management priorities for these islands are included in recent management plans that comprehensively cover initiatives and specific goals for invasive species.

### 2.2.2 Vertebrate pest information

Threat Abatement Plans (TAPs) were downloaded from the DEWHA website for each of the feral species listed as a Key Threatening Process under the EPBC Act (see section 1.2.2, Chapter 1): Black Rat, Brown Rat, Cane Toad, Cat, Goat, House Mouse, Pacific Rat, Pig, Rabbit, Red Fox. Additional pest management documents, case studies and research papers were downloaded for these species.

Additional vertebrate pest management information was acquired through online searches for other potentially high impacting pests such as Water Buffalo and Horse, which are considered a major concern by DEWHA (DEH 2004; DEWHA 2008g). Common Myna, Domestic Dog and Dingo are other potentially high impact species (see Appendix A). Specific searches were conducted within specialist websites such as:

- Invasive Animals Cooperative Research Centre (IA CRC) website ([invasiveanimals.com](http://invasiveanimals.com))
- IUCN/SSC Invasive Species Specialist Group (ISSG) Global Invasive Species Database ([issg.org/database/species](http://issg.org/database/species)), and
- Pest Portal ([feral.org.au](http://feral.org.au)).

Invasive freshwater fish were not included in the vertebrate pests assessment.

### 2.2.3 Threatened species recovery plans

Recovery plans for EPBC listed threatened fauna and flora species were downloaded from the DEWHA website. Species factsheets, listing advice notices, and state or location specific species action or recovery plans were acquired using online keywords searches.

As the project progressed, additional online searches were conducted for those species listed as threatened under at least one state/territory legislative act (see appendices B and C). Species searches were also conducted in specialist online databases such as:

- Birds Australia's *Atlas of Australian Birds* ([birdsaustralia.com.au](http://birdsaustralia.com.au))
- Birds in Backyards ([birdsinbackyards.net](http://birdsinbackyards.net)), and
- Frogs of Australia ([frogs.org.au](http://frogs.org.au)).

Additional published sources were referenced to obtain specific information, such as a mammal's size range, which is relevant for assessing potential impacts from feral cat predation (see section 1.3, Chapter 1); for example, Strahan (1995).

### 2.2.4 Seabird breeding

Seabird breeding data was primarily updated using records in papers published in Corella's Seabird Islands Series (ABSA 2008) and also referring to the appropriate volumes of the *Handbook of Australian, New Zealand and Antarctic Birds* (HANZAB; Higgins and Davies 1996, Marchant and Higgins 1993, 1990a,b).

## 2.3 Assessment of biodiversity values

### 2.3.1 Intrinsic biodiversity value

To help assess island biodiversity values, a biodiversity value was attributed to native fauna and flora species listed under the EPBC Act or listed under an Australian state/territory legislative act (Table 2.1). Full details for species included in the assessment are provided in Appendix B and Appendix C. No EPBC listed Threatened Ecological Communities are recorded as present on any of the islands that were closely considered in this assessment; if any had been, those ecological



communities would have been included within the empirical biodiversity assessment.

**Table 2.1 Biodiversity value of listed threatened fauna and flora.**

EPBC STATUS	STATUS ABBREVIATION	FAUNA AND/OR FLORA	BIODIVERSITY VALUE
Critically Endangered	CR	flora/fauna	4
Endangered	EN	flora/fauna	3
Vulnerable	VU	flora/fauna	2
Migratory and/or Marine(Bonn, CAMBA, JAMBA and/or ROKAMBA)	-	fauna only	1
Not Listed (but listed under state/territory legislation)	-	flora/fauna	1

In addition, a recently listed Extinct species under the EPBC Act (DEWHA 2009d), Sharp-snouted Day Frog, was considered to have a biodiversity value equivalent to a CR species, i.e. 4. This species was included in the biodiversity value assessment as it is possible that the species may still occur on islands which have habitat suitable for a refugial population of this species (see section 2.3.2).

Seabirds that are non-landing and/or non-breeding on Australia's offshore islands were removed from the biodiversity assessment since the inclusion of these species, which will typically have been recorded over the ocean or as straddlers/vagrants, was considered to bias the biodiversity records for some islands. Species excluded from species lists for most islands were:

- Amsterdam Albatross
- Antipodean Albatross
- Atlantic Yellow-nosed Albatross
- Black-browed Albatross (except on Macquarie Island)
- Blue Petrel (except on Macquarie Island)
- Buller's Albatross
- Campbell Albatross
- Chatham Albatross
- Chinstrap Penguin
- Fiordland Penguin
- Fluttering Shearwater
- Gentoo Penguin (except on Macquarie Island)
- Gibson's Albatross
- Great Skua (except on Macquarie Island)
- Grey-headed Albatross (except on Macquarie Island)
- Hutton's Shearwater
- Indian Yellow-nosed Albatross
- Kerguelen Petrel
- Northern Giant-Petrel (except on Macquarie Island)
- Royal Albatross



- Sooty Albatross (Lesser Mantled Sooty Albatross was retained; see Appendix B)
- South Georgian Diving Petrel
- Southern Giant-Petrel (except on Macquarie Island)
- Streaked Shearwater
- Tristan Albatross
- Wandering Albatross (except on Macquarie Island)
- Westland Petrel
- Wilson's Storm-Petrel (except on Macquarie Island)

Species not listed under the EPBC Act but listed under an Australian state/territory legislative act were included as biodiversity even if not listed under the jurisdiction's (State/Territory) legislation; e.g. Bush Stone-curlew was included as biodiversity on islands where they are listed to occur in Queensland (where they are not listed as threatened) as well as in NSW (where they are listed as threatened). We believe this is appropriate for a national overview of biodiversity on Australia's offshore islands.

### 2.3.2 Biodiversity presence value

To assess island biodiversity values, a biodiversity presence value was attributed to native fauna and flora species (Table 2.2). For consistency with the DEWHA data (see section 2.1.2 above), we used three presence categories: 'known' (confirmed records), and 'likely' and 'may' (based on suitable habitat and/or nearby records and species mobility).

**Table 2.2 Biodiversity value of listed threatened fauna and flora.**

EPBC PRESENCE CATEGORY (see section 2.1.2)	FAUNA AND/OR FLORA	BIODIVERSITY PRESENCE VALUE
'known' (includes confirmed records added from the literature)	flora/fauna	3
'likely'	flora/fauna	2
'may' (includes situations where highly mobile fauna species are known from adjacent areas/neighbouring islands)	flora/fauna	1

### 2.3.3 Total biodiversity value

In this assessment, total biodiversity value is a product of the intrinsic biodiversity value (national scale) and island specific biodiversity presence value (Figure 2.1). In an attempt to minimise bias towards islands that have been well surveyed and/or documented, we included a lower value for species that are likely or may occur on a specific island. For example: a Critically Endangered (CR) species that has been recorded ('known') to be present on an island was given a total biodiversity value of 12, whereas a CR species that is likely to occur on an island was given a value of 8, and a CR species that may occur on an island was given a value of 4. A Vulnerable (VU) species that is known to be present on an island was given a total biodiversity of 6, whereas a VU species that is likely to occur on an island was given a value of 4, and a VU species that may occur on an island was given a value of 2.



**Figure 2.1 Formula for calculating total biodiversity value of offshore islands.**

The total biodiversity value was used as the primary sort function for determining the Top 100 (> 200 ha) islands of high conservation status.

## 2.3.4 Other significant natural values

Other significant natural values of islands that were reported in the reviewed literature are provided in island profiles (see Chapter 4), but are not considered in the empirical biodiversity value assessment described in this Chapter. We decided not to include additional empirical ranking for these features as to do so would essentially be doubling-up on the biodiversity values already attributed for the presence of fauna and flora species. These values include, but are not limited to:

- Important seabird and/or shorebird breeding sites
- Turtle nesting sites
- Restricted distribution/endemic species, and
- Other established national or international environmental values, such as gazetted as Nature Reserves or National Parks, inclusion in World Heritage Areas, inclusion on the Australian Register of the National Estate (DEWHA 2009k), wetlands listed on DEWHA's *Directory of Important Wetlands in Australia* (environment.gov.au/water) or under *The Ramsar Convention on Wetlands 1971* ([ramsar.org](http://ramsar.org)).

## 2.4 Assessment of vertebrate pest impacts

### 2.4.1 Intrinsic feral 'value'

Vertebrate pests were attributed an intrinsic impact value as an indication of their potential for environmental impact in a situation where they are able to cause those impacts unmitigated (Table 2.3).

**Table 2.3 Intrinsic feral 'value' of vertebrates introduced to offshore islands.**

POTENTIAL FERAL IMPACT	INTRINSIC FERAL 'VALUE'
EPBC Key Threatening Process or species of 'major concern'	4
high	3
medium	2
low	1

## 2.4.2 Feral presence 'value'

To assess island specific feral impact value, a feral presence value was attributed according to information acquired from state/territory agencies as provided in the DEWHA Australian Islands Biodiversity Database (DEWHA 2009b), or gleaned from more recent documents and/or data, or from correspondence with key stakeholders during the course of this project (Table 2.4).

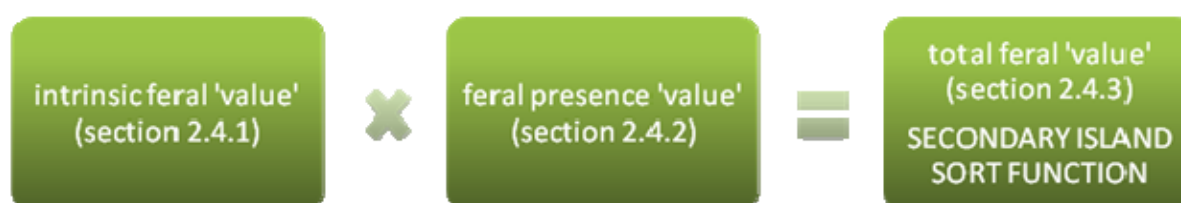
**Table 2.4 Feral presence 'value' of vertebrates introduced to offshore islands.**

VERTEBRATE PEST PRESENCE INFORMATION	FERAL PRESENCE 'VALUE'
Known to occur on the island and believed to be a feral/free ranging population	3
Known to occur but believed to be restricted in range (e.g. fenced in) or under an existing control/eradication program	2
Known to occur but believed to be domestic pet/captive only	1
Information suggests the species has been successfully eradicated, removed, died out, or did not establish on the island	0

## 2.4.3 Total feral 'value'

In this assessment, total feral 'value' is a product of the intrinsic feral 'value' and island specific feral presence 'value' (Figure 2.2). Where a feral species has been recorded on an island, but is believed to be no longer present, their record has been retained in the dataset for data integrity and the potential to amend these records in the future (e.g. if reinvasion/reintroduction occurs), but the presence 'value' of zero produces a total feral 'value' of zero.

The total feral value was used as the secondary sort function for determining the Top 100 islands (> 200 ha) of high conservation status; that is, the full list of islands under consideration were first sorted on total biodiversity value, and secondly sorted on total feral 'value', such that if two islands had the same total biodiversity value, the one with the higher feral 'value' would fall just above the one with the lower feral 'value'.



**Figure 2.2 Formula for calculating total feral 'value' of offshore islands.**

## 2.4.4 Feral impacts matrices

The tertiary island sort function for determining the Top 100 (> 200 ha) islands of high conservation status relative to vertebrate feral pest status was the sum total of specific feral impacts on the resident threatened fauna and flora on islands. For this component of the assessment, a unique value of impact from a potential interaction between a specific vertebrate pest and threatened species was generated in matrices for threatened fauna (Appendix E) and threatened flora (Appendix F). Where these species-specific interactions occur on islands, the value was entered

for the island data; where such a species combination does not occur, or where the feral species is no longer present on the island, the value is zero. In this way the list of islands under consideration was first sorted on the total biodiversity value, secondarily sorted on the total feral value, and finally sorted on the sum of specific feral-threatened species impacts.



**Figure 2.3 Flowchart showing the use of primary, secondary and tertiary sort functions to determine the priority 100 offshore islands.**

### 2.4.5 Risk of feral invasions

A detailed risk assessment of feral invasions was not included in the empirical assessment of island conservation status in relation to vertebrate pest species status. Such an exercise was beyond the scope of this project, but we acknowledge that risk of (re)invasion is an important consideration in decision-making regarding whether to proceed with a specific pest eradication program (see Chapter 7). We consider the risk of feral invasions within island profiles in the context of pest eradication risks, biosecurity issues and recommended actions (see Chapter 4).

## 2.5 Preparation of island profiles

Based on the three contributing criteria from sections 2.3 and 2.4, a priority list of the Top 100 (> 200 ha) islands of high conservation status was generated from the assessment process detailed above. A summary of the Top 100 priority list of offshore islands is provided in Chapter 3.

For completion of island profiles, standard island information (e.g. island name, state/territory, land area, land tenure and status) was gleaned from our working dataset, which was derived from the DEWHA supplied datasets, but updated and added to during this project. For example, we identified more archipelago names for the islands under consideration. An overview map of the Top 100 priority islands (> 200 ha) was produced using ArcGIS 9.3 (ESRI 2009), and referenced to ascertain which islands should be grouped together for island profiles (Appendix G). The geographical context of islands was examined using Google™ Earth, and distances between islands in a recognised group, or within close proximity of each other, and distance to the nearest point of coastal mainland were measured using the ruler tool set to kilometres.

All island locations were cross-referenced with the *Gazetteer of Australia 2008* using Geoscience Australia's online Place Name Search (Geoscience Australia 2009). Latitudes and Longitudes provided in the Gazetteer are used for consistency. Island areas (ha) provided in the island profiles are all derived from the DEWHA data, since relatively few documents provided island area information, and in cases where island areas were provided in the reviewed literature, there were often inconsistencies in areas reported. Although these areas have been spatially calculated in GIS, using these values enables easier cross-referencing with the working dataset.