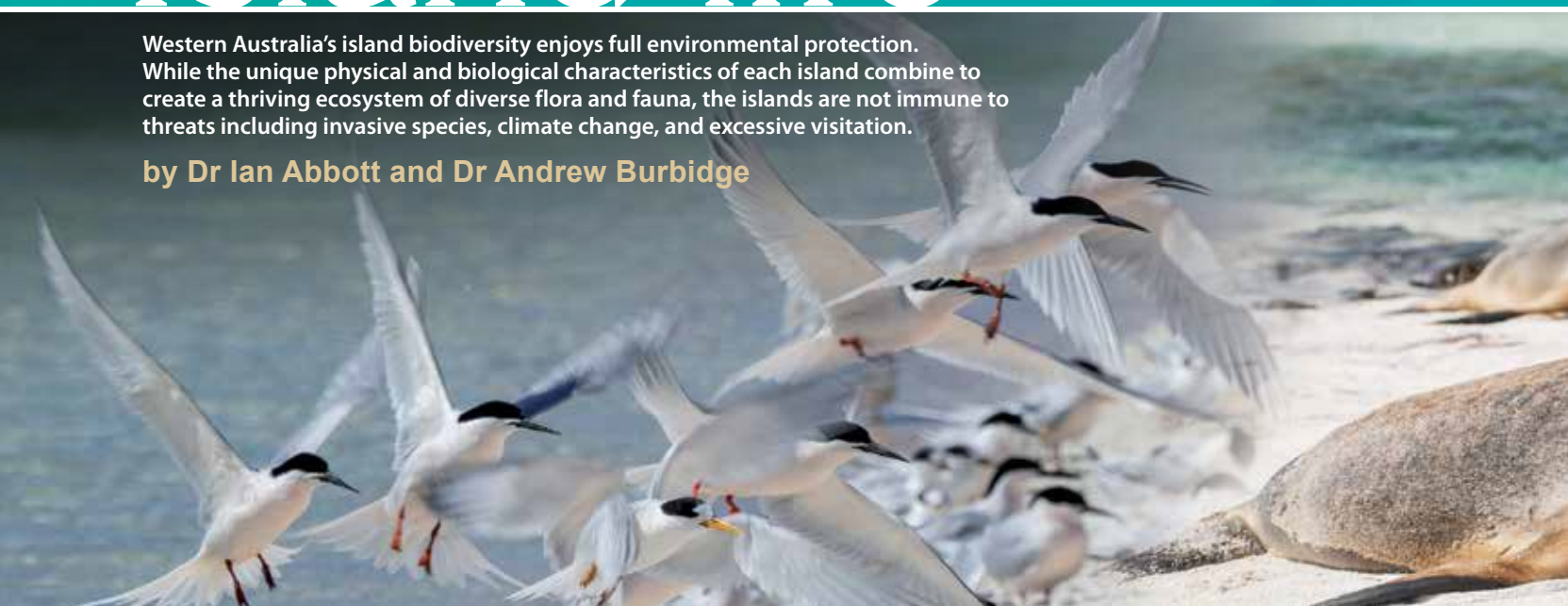
Island life

Western Australia's island biodiversity enjoys full environmental protection. While the unique physical and biological characteristics of each island combine to create a thriving ecosystem of diverse flora and fauna, the islands are not immune to threats including invasive species, climate change, and excessive visitation.

by Dr Ian Abbott and Dr Andrew Burbidge



Western Australia has nearly half of Australia's 8300 islands, with most (2633) occurring in the Kimberley region. All islands are very important for biodiversity conservation in Western Australia. In WA, almost every island south of the Kimberley is a conservation reserve, while most Kimberley islands are now within indigenous protected areas, a situation unique in the world.

Even though they constitute only 0.12 per cent of WA's land area, islands are essential for conserving the State's natural environment and biodiversity.

Recently, conservationists have focused their attention on creating safe havens for rare species that may never have occurred on any WA island but are now endangered or extinct on the mainland due to foxes, feral cats, wildfires, and habitat destruction.

Nature conservation on WA islands began in 1874 when shooting of the banded stilt on Rottnest Island was prohibited. In 1898, it became illegal to shoot seabirds and collect their eggs for food in the Houtman Abrolhos. The crown jewel decision was the reservation of Barrow Island in 1908 for the protection of its mammal and bird fauna.

WA's island biodiversity now enjoys full legal protection, and several islands demonstrate that it is possible for astute nature conservation management to coexist with a naval base (Garden Island), an oil and natural gas hub (Barrow Island), and mass tourism (Rottnest Island).

Other threats such as exotic plant species continue to pose a problem. Silver gulls feeding around rubbish tips on the mainland can transfer seeds of weeds (mostly British and South African plant species) to their island breeding colonies. These species flourish in the soil fertilised by seabirds.

Silvereyes have spread the fruit of African boxthorn (*Lycium ferocissimum*) to several islands. Although it is a relatively simple process to eradicate boxthorn bushes, it is much more difficult to eliminate introduced grasses and the ice plant (*Mesembryanthemum crystallinum*), which often cover much of the soil and eliminate native plant species.

VISITORS AND RESIDENTS

One intriguing attribute of islands is their enigmatic pattern of distribution of some related species. For example, Rottnest Island has the quokka (a wallaby) and dugite (a snake), whereas nearby Garden Island instead has the tammar wallaby and two different species of snake (carpet python, tiger snake). Goanna (*Varanus*) species occur on many Pilbara and Kimberley islands, but which species is present on a particular island varies remarkably. Determining the causes of these disparities awaits scientific study.

The Houtman Abrolhos, west of Geraldton, one of WA's best-known archipelagoes, illustrates another interesting feature of islands. Fourteen seabird species breed on 122 islands but are not evenly distributed. The bridled tern (*Onychoprion anaethetus*) (breeding on 90 islands) and Pacific gull (*Larus pacificus*) (63) are the most widely distributed, whereas two species, brown noddy (*Anous stolidus*) and lesser noddy (*A. tenuirostris*), breed only on three or fewer islands.

Absence of predatory mammals has led to prodigious populations of some species.

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Main Northern part of the Dampier Archipelago, Pilbara, showing Gidley and adjacent un-named islands.
Photo – David Bettini
Inset from left Roseate terns (*Sterna dougallii*) and a single fairy tern (*Sternula nereis*), Houtman Abrolhos. *Photo – Cliff Winfield*; Australian sea lions (*Neophoca cinerea*), Houtman Abrolhos. *Photo – Chris Surman*; Rothschild's rock-wallaby (*Petrogale rothschildi*) occurs on islands in the Dampier Archipelago. *Photo – Jiri Lochman*

Above Tammar wallaby (*Notamacropus eugenii*), West Wallabi Island, Houtman Abrolhos. *Photo – Andrew Burbidge*

Above left Silvereye (*Zosterops lateralis*). *Photo – Sallyanne Cousans*

Left Quokka (*Setonix brachyurus*), Rottnest Island. *Photo – Tourism WA*

Above Tiger snakes (*Notechis scutatus*) occur on Garden and Carnac Islands near Perth.
Photo – Sallyanne Cousans

Above right Seabird colony Ashmore Reef island.
Photo – Rohan Clarke/Monash University

Right Lesser noddy (*Anous tenuirostris*). Houtman Abrolhos.
Photo – Chris Surman

What makes islands often so different from the coastal region of the adjacent mainland?

- Twenty-five species of seabirds nest almost exclusively on islands, safe from predators.
- Two species of seals breed on many islands of the south-west, and four species of sea turtles nest on islands between Shark Bay and the Kimberley.
- Many medium-sized species of mammals persist on larger islands, safe from two very destructive exotic predators—the fox and the cat. Four of the native species (Shark Bay bandicoot, banded hare-wallaby, boodie, Shark Bay mouse) were found only on Bernier, Dorre, and/or Barrow Islands, because they became extinct on the mainland as a result of disease and predation by foxes and cats.

Hundreds of thousands of wedge-tailed shearwaters (*Ardenna pacifica*), sooty terns (*Onychoprion fuscatus*), and brown noddy terns have been counted breeding in the Abrolhos.

Tammar wallabies and quokkas remain abundant on some islands compared with mainland populations. Tammar wallabies have been illegally introduced to North Island (Houtman Abrolhos). Without carpet pythons, a natural predator, the population became hyperabundant and has denuded the island of palatable vegetation leading to the disappearance of the endemic Abrolhos painted button-quail (*Turnix varius scintillans*). Removal of the wallabies is underway.

The relatively few instances where introduced mammals, especially the red fox and the domestic cat, have established on islands from shipwreck, swimming from the mainland, or via deliberate release, have shown how destructive invasive species can be. More than 20 populations (mostly of native mammal species) have been extirpated on 12 islands by foxes or feral cats. These vermin have now been eradicated from all WA islands, and a serious effort has been made to repatriate the extirpated native species with great success. In addition, house mice, black rats, rabbits, sheep and goats have been eradicated from most islands.

INTERCONNECTIVITY

Although islands share a common trait of being surrounded by water, they differ from each other because each has a unique combination of physical and biological characteristics. Physical characteristics include area, shape, elevation, topography, distance from the mainland, degree of exposure to wave action caused by gales, cyclones, and tsunamis, geology, amount of soil present, climate (temperature, annual rainfall, seasonality of rainfall), and how long the island has been separated from the mainland. Most of these factors interact to provide the environmental setting for the species that occur on islands.

These species include bacteria, viruses, fungi, mosses, lichens, invertebrates, vascular plants, frogs, reptiles, birds, and mammals. The species interact in various ways: reptiles, land birds, and smaller mammals eat insects, spiders, and other invertebrates; some mammals browse foliage of plants; some birds eat fruits; and some mammals prey on other animals.

Seabirds feed on fish and marine invertebrates captured at sea but transfer the nutrients acquired to their breeding islands. Their excreta fertilises island soils, altering the composition of the flora and providing improved nutrition for animals feeding on foliage and on the larger populations of invertebrates. Islands accessible to Aboriginal people have experienced cultural burning, hunting of mammals and reptiles, and consumption

Animals translocated to WA islands, providing safe havens

Species	Island reintroductions	Island introductions
dibbler (*Parantechinus apicalis*)	Dirk Hartog	Escape, Gunton
Shark Bay bandicoot (*Perameles bougainville*)	Faure, Dirk Hartog	
golden bandicoot (*Isoodon auratus*)	Hermite	Doole
boodie (*Bettongia lesueur*)	Boodie, Faure	Alpha
nilgyte (Gilbert's potoroo) (*Potorous gilbertii*)		Bald, Middle
rufous hare-wallaby (*Lagorchestes hirsutus*)		Dirk Hartog, Trimouille
spectacled hare-wallaby (*Lagorchestes conspicillatus*)	Hermite	
Rothschild's rock-wallaby (*Petrogale rothschildi*)		West Lewis
maning (banded hare-wallaby) (*Lagostrophus fasciatus*)	Faure, Dirk Hartog	
djoongari (Shark Bay mouse) (*Pseudomys gouldii*)	Faure, Dirk Hartog	North West
wopilkara (greater stick-nest rat) (*Leporillus conditor*)	Dirk Hartog	Salutation
noisy scrub-bird (*Atrichornis clamosus*)		Bald
Barrow Island black-and-white fairy-wren (*Malurus leucopterus edouardi*)		Hermite
spinifexbird (*Eremiornis carteri*)	Hermite	

Left Faure Island, Shark Bay.
Photo – David Bettini

Above Dibbler (*Parantechinus apicalis*).
Photo – Jiri Lochman

Below Boat tour, Rottnest Island.
Photo – Tourism WA

of breeding seabirds, marine turtles, and their eggs.

Immediately before islands were formed by the rise in sea level following the end of the last ice age, they likely had a full complement of species then present on the mainland coast. A lengthy period of isolation, from about seven to 14 millennia, has resulted in many of the original species failing to persist to the present.

The composition of species has changed because islands have limited physical space and smaller islands have increased exposure to salt-bearing winds that change the habitat, while some species outcompete others, and predators eliminate some of their prey and then themselves become extinct. None of these changes happens in a totally predictable way, resulting in unique patterns in the occurrence of some species.

NOW AND THEN

Island names bestowed by Aboriginal people are generally not well known. Capturing this cultural information in consultation with Traditional Owners and assigning dual names to islands is an important process. It is not widely recognised that many WA islands are historically important. Dutch ships sailing towards Batavia were wrecked within the Houtman Abrolhos in 1629 and 1727 and their crews were the first Europeans to see Australian marsupial, plant, seabird, and seal species. Several renowned navigators (Dirk Hartog, William Dampier, Willem de Vlamingh, George Vancouver, Bruny d'Entrecasteaux, Matthew Flinders, Nicolas Baudin, and Phillip King) sailed in WA waters between 1616 and 1829. They landed on a few islands and named many. Aboriginal names of islands should have priority over European names.

Sadly, more threats to island populations are likely due to changing environmental conditions. Small, low, sandy or coral rock islands are likely to be destroyed by increased exposure to wave action caused by rising sea-levels, a result of global warming.

Human visitation is another potential threat, but well-managed nature-based tourism enables visitors to WA to see the unique natural characteristics of some of our islands with minimal impact. Most islands are not conducive to overnight visitation and most ecotourism visitors to islands sleep on tourist boats and small cruise ships.

Dr Ian Abbott and Dr Andrew Burbidge AO, both now retired, were research scientists in WA Government departments that preceded DBCA. They also held senior administrative positions. Both have studied the biodiversity of islands, with emphasis on island biogeography and the functioning of island ecosystems (Abbott) and biological survey, the monitoring of seabird populations, eradication of vermin, and the restoration of depleted island ecosystems (Burbidge).

Island Jewels: The Natural History of Western Australia's Islands *co-authored by Ian Abbott and Andrew Burbidge was published in 2022 and can be purchased online or from selected bookshops.*