





Home of the Gorgon Project off the state's northwest, Western Australia's second largest island is also recognised as one of the most important areas for native fauna conservation in Australia. The first management plan has been released for Barrow Island Nature Reserve, and for the nearby Boodie, Double and Middle Islands Nature Reserve, which together comprise the Barrow group nature reserves.

MY ISLAND HOME

Barrow Island by Michelle Rumball, Joanna Adele, Kim Onton and Paul Connolly

Barrow Island lies approximately 1,250 kilometres north of Perth and 56 kilometres west of the mainland, between Onslow and Dampier. The island was first gazetted in 1908 as a Class 'C' reserve and upgraded to Class 'A' in 1910 in recognition of the need to protect the island's unique plants and animals. In 1979 the 23,483-hectare island was classified as a nature reserve, set aside for the purpose of 'conservation of flora and fauna'.

The island has been host to petroleum and gas extraction operations since 1967 and, in 2009, construction of the Gorgon Project started (see 'Giant steps: industry and conservation make history through Gorgon', *LANDSCOPE*, Winter 2010). Chevron Australia is the operator of all petroleum operations on Barrow Island. The Department of Parks and Wildlife (DPaW), which has staff based on Barrow Island on a fly-in, fly-out roster, works closely with Chevron Australia and other government agencies to ensure the island's unique environment is protected and conserved.

Barrow's neighbouring islands, Boodie and Middle to the south, and Double to the east, cover 586.7 hectares in total. They were gazetted as a nature reserve in 1984 and, together with Barrow Island, are referred to as the Barrow group nature reserves.



LANDSCAPE FEATURES

The landscapes of the Barrow group nature reserves are characterised by spinifex grasslands dotted with large brown termite mounds, limestone coastal cliffs and caves, dry creek beds, white dunes and sandy beaches, mangroves, claypans and intertidal flats. The flora of Barrow Island Nature Reserve is, for the most part, typical of the nearby Pilbara and Carnarvon bioregions. Some 377 known flora species occur on the reserves, dominated by families such as Poaceae (grasses), Chenopodiaceae (goosefoots), Fabaceae (legumes, peas and wattles), Malvaceae (mallows) and Asteraceae (daisies) and in particular by the genera *Triodia* (hummock grasses) and *Acacia* (wattles).

The nature reserves contain several plant species of conservation significance, including the endemic species *Cucumis* sp. Barrow

Island, and 12 species that have a restricted distribution in the area and are at, or near, the geographical limits of their range. *Cucumis* sp. Barrow Island, *Helichrysum oligochaetum* and *Corchorus congener* are also listed as priority species (meaning they are poorly known, could be rare or near threatened but are in need of further survey work, or in need of monitoring). Additionally, tangling melaleuca (*Melaleuca cardiophylla*) is important because it is one of the key habitat types for restricted fauna species, including the Barrow Island population of the conservation-significant black and white fairy-wren (*Malurus leucopterus edouardi*). Two plant communities are listed as priority ecological communities in recognition of their significance.

The Barrow group nature reserves extend to the low water mark, and include the intertidal zone. This zone is rich with macroalgae, interspersed with seagrass meadows, both of which provide a food source for green turtles (*Chelonia mydas*), as well as shelter and food for a large variety of benthic species (animals and plants which live on the sea floor). These benthic species, in turn, are a food source for other marine turtle species such as the flatback (*Natator depressus*) and hawksbill (*Eretmochelys imbricata*), and both resident and migratory shorebirds.

ISLAND REFUGE

Due to their geographic isolation and the absence or scarcity of established non-indigenous species, the Barrow group nature reserves are an important refuge for many species that have either declined in number or become extinct on the mainland. The array of conservation-significant fauna species and populations includes species that are threatened, listed as priority species, endemic, short-range endemic, relictual (characteristic



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Main Obe's Beach, Barrow Island.
Photo – Marie Lochman

Left Mangroves (*Avicennia marina*) in Bandicoot Bay Conservation Area.
Photo – Michelle Rumball/DPaW



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of an earlier period in evolutionary or ecological history) or disjunct (geographically separated from other population occurrences of that species). These species include the black-footed rock-wallaby (*Petrogale lateralis lateralis*) and populations of the Barrow Island boodie (*Bettongia lesueur* ssp.), Barrow Island spectacled hare-wallaby (*Lagorchestes conspicillatus conspicillatus*), Barrow Island euro (*Macropus robustus isabellinus*) and Barrow Island golden bandicoot (*Isoodon auratus barrowensis*). There are 23 threatened fauna species known to occur in the reserves.

Barrow Island's significance as a fauna refuge provides an important reservoir from which founder populations can be sourced for fauna reconstruction programs on other islands and the mainland. For example, a number of species have been translocated by DPaW from the island to Lorna Glen—a former pastoral station and proposed conservation park in WA's rangelands. Translocations of golden bandicoots and boodies from Barrow Island to Lorna Glen occurred in 2010 and 2011 as part of the department's *Operation Rangelands*

Above The Barrow group nature reserves provide a haven for Barrow Island euros.
Photo – Jiri Lochman

Right Barrow Island boodies are endemic to Barrow and Boodie islands.
Photo – Marie Lochman

Below right Bat's wing coral tree (*Erythrina vespertilio*) has a restricted distribution on Barrow Island Nature Reserve.
Photo – Kevin Crane/DPaW



Restoration, one of the world's largest wildlife reconstruction programs (see also 'Going nuts for boodies' on page 37 and 'Into the wild: restoring rangelands fauna', *LANDSCOPE*, Winter 2009). Golden bandicoots, spectacled hare-wallabies, boodies, black and white fairy-wrens and spinifex birds were also moved to Hermite and Alpha islands in the nearby Montebello Islands group as part of the *Montebello Renewal* project (see 'Montebello Renewal', *LANDSCOPE*, Summer 1996-97).





Above Flatback turtles are hatched in rookery sites on the Barrow group nature reserves.
Photo – Kevin Crane/DPaW

Left Marine turtle tracks can be seen on nesting beaches.
Photo – Michelle Rumball/DPaW



Thirteen mammal species, 43 terrestrial reptile species, one species of frog, four species of marine turtle and three subterranean vertebrate species have been recorded on Barrow Island Nature Reserve. More than 2,000 taxa of invertebrates, including 34 subterranean invertebrates, have also been recorded on the island. An unknown diversity of fish and marine invertebrates inhabit intertidal areas. The reserves are also home to 119 migratory and resident bird species.

TURTLES AND BIRDS

The sandy beaches of the Barrow group nature reserves are important rookery sites for marine turtles, particularly green and flatback females that arrive early each summer to undertake the arduous process of nesting. Intertidal habitats are important for nesting female turtles, as well as for foraging juveniles, and some resident adults. It is thought that the Barrow group nature reserves provide habitat critical to the survival of these species. These reserves are close to the south-west limit for nesting flatbacks. Hawksbill turtles are also regular visitors to the reserves for nesting, with loggerhead turtles (*Caretta caretta*) visiting and nesting occasionally.

Thousands of shorebirds also inhabit the islands, with these coastlines recognised for their regional, national and international

significance to shorebirds, including migratory birds that both use the area as a staging site (where they feed and rest along their epic flights) and a destination (where they spend most of their non-breeding season). In particular, Barrow Island Nature Reserve is designated as an Important Bird Area by Birdlife International because of its importance to shorebirds. It is equal tenth among the 147 important sites for seven species of migratory shorebird in Australia, and is the fourth and fifth most important site in Australia for the ruddy turnstone (*Arenaria interpres*) and grey-tailed tattler (*Tringa brevipes*) respectively.

Tidal mudflats are a feature of the southern parts of Barrow Island Nature Reserve, providing habitat and feeding sites for many shorebirds. The mudflat habitat of Bandicoot Bay in the south of the reserve supports many of these bird species and, in recognition of this, has been designated a conservation area for benthic fauna and seabird protection within the Barrow Island Marine Management Area. The nature reserve is also regionally significant for the threatened fairy tern (*Sterna nereis*) and the resident sooty oystercatcher (*Haematopus fuliginosus ophthalmicus*). Double Island is considered a regionally significant site for breeding wedge-tailed shearwaters (*Ardenna pacificus*). Other species such as the bridled

Right Ruddy turnstones are species of shorebird that frequents Barrow Island Nature Reserve.
Photo – Rob Drummond/Lochman Transparencies

tern (*Onychoprion anaethetus*) and white-bellied sea eagle (*Haliaeetus leucogaster*) also breed on the reserves. In total, the Barrow group nature reserves provide habitat to 68 bird species protected under the Commonwealth Environment Protection and Biodiversity Conservation Act, which include 40 species listed under international agreements and two threatened species.

MYSTERIES DISCOVERED UNDERGROUND

Barrow Island Nature Reserve is well recognised for its important, species-rich subterranean collection of creatures. It contains a priority ecological community known as 'Barrow Island subterranean fauna', which includes threatened and priority species as well as several species previously undescribed, not known from other locations, or only known from one or two specimens.

Particularly special are the three known subterranean vertebrate species, including a blind snake, which is the first truly troglobitic reptile to be described globally. This species was discovered from an oil well casing on the island. It lacks pigment, has very reduced eyes and an extremely long and slender worm-like morphology. Underground waters are also home to a species of eel, likely to belong to the genus

What's in a name?

'Troglobitic' refers to terrestrial species that live entirely underground in air-filled caves, cavities or interstices in the karst above the watertable. 'Stygobitic' refers to aquatic species that live entirely in water-filled cavities and interstices in the karst, which include the blind gudgeon (*Milyeringa justitia*), a small, pale, eyeless fish that is similar to *Milyeringa veritas* from Cape Range.



“Barrow Island Nature Reserve is well recognised for its important, species-rich subterranean collection of creatures.”

Ophisternon (also known from Cape Range and from near Pannawonica), which has been observed, but no specimen so far retained. These intriguing species are all restricted, or likely to be restricted, to the Barrow group nature reserves. Much more remains to be discovered about these strange creatures and their environments in the future.

It is thought that subterranean ecosystems on Barrow Island Nature Reserve may be at least partially dependent on food chains based upon chemoautotrophic bacterial systems that metabolise naturally occurring petroleum chemical products rising upward from the hydrocarbon reserves far below. The bacteria which support this food chain may be considered a keystone species.

Above ground, termite mounds are a distinct feature of Barrow Island Nature Reserve, rising like pinnacles from the arid landscape. Much more than just homes to small insects, they make a significant contribution to ecological processes by providing habitat and a food resource for other species (including many vertebrates such as Stimson's python (*Antaresia stimsoni*)), as well as mobilising nutrients within the ecosystem (see 'Termite mounds: more than just termites', *LANDSCOPE*, Spring 2013).

HISTORICAL SIGNIFICANCE

Barrow Island Nature Reserve has a significant fossil record, including the remains of many species that are now locally extinct. It also has a significant pre-historic human record, with many Aboriginal cultural heritage sites including artefacts discovered from when Aboriginal people were held on the island against their will by pearlers. While the Barrow group nature reserves are not claimed under native title, Aboriginal groups have expressed an interest in the heritage of the islands. Indigenous and colonial heritage on Barrow Island are the subject of a major Australian Research Council-funded program being led by The University of Western Australia.

The reserves and their surrounds have a long history rich with exploration, whaling, barracoon and slave markets, pearling, turtle hunting, fishing, oil and gas extraction, and nature conservation, with interests in quarantine, pastoralism and phosphate mining.

Barrow Island was the site of some major pearling camps in the late 1800s. There is also considerable data established from long-term ecological research since the early 1900s, and particularly since the mid-1960s, when petroleum exploration and operations first started. This information has informed present-day management planning and practices for the area.

CAREFUL MANAGEMENT REQUIRED

The many and varied values of the Barrow group nature reserves mean good management of the reserves is critical to their conservation. One of the major



threats to biodiversity is the introduction of non-indigenous species, such as weeds and non-native animals including rodents, ants, geckoes and frogs. Non-indigenous species can be introduced in a number of ways, including via floating debris, birds, strong winds and vessels or aircraft carrying contaminated goods. Black rats were introduced to Barrow, Middle, Boodie and Double islands by the pearlers in the late 1890s. They were successfully eradicated from 1984–1992.

Before the construction phase of the Gorgon Project, a 2009 vegetation survey established the presence of 12 non-native plant species on Barrow Island, three species on Boodie Island, and one on Middle Island. Buffel grass (*Cenchrus ciliaris*), which occurs on Barrow and Boodie islands, is one of the species of highest concern as it is known to significantly impact island vegetation communities. Kapok (*Aerva javanica*) is another high priority species for surveillance. Chevron Australia has made a commitment to control the spread of these existing weed species and eradicating any new non-indigenous plants and animals. These weed management measures are an important contribution to the long-term conservation security of these islands.

The risk of introduction and spread of non-indigenous species increases with human activity. During the construction phase of the Gorgon Project, Chevron Australia developed and implemented a government-approved quarantine management system to prevent introduction of non-indigenous species to the island, to avoid proliferation of existing non-indigenous species and to detect



Above left DPaW staff discuss rehabilitation of a site on Barrow Island Nature Reserve.
Photo – Wesley Manson/DPaW

Above Ecosystem rehabilitation is already progressing over some cleared and unused areas of Barrow Island Nature Reserve.
Photo – Michelle Rumball/DPaW

and eradicate non-indigenous terrestrial plants and animals and marine pests that may be introduced as a result of project activities. DPaW staff review and monitor quarantine activities on the islands as part of their management role on Barrow Island, as well as at mainland Gorgon Project sites in WA.

Protecting the many values of the Barrow group nature reserves is a multifaceted challenge, especially in the context of the strict environmental management requirements associated with the Gorgon Project. From threatened mammals, marine turtles and migratory shorebirds, extensive karst systems and the subterranean species they support, to important pre-historical and colonial historical sites, the new management plan for the reserves outlines the actions the department will take to manage this significant area.

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The authors would like to acknowledge the many DPaW staff who assisted with the preparation of the Barrow group nature reserves management plan, in addition to the many external individuals, industry bodies and agencies that made valuable contributions, particularly the Conservation Commission of Western Australia, Chevron Australia Pty Ltd, Department of Mines and Petroleum and Department of State Development.

The Gorgon Project is operated by an Australian subsidiary of Chevron and is a joint venture of the Australian subsidiaries of Chevron, ExxonMobil, Shell, Osaka Gas, Tokyo Gas and Chubu Electric Power. The Barrow Island oil field is operated by an Australian subsidiary of Chevron and is a joint venture between Chevron, Santos Offshore and Mobil Australia Resources.