



THE NORTH-WEST MARINE BIOREGIONAL PLAN

BIOREGIONAL PROFILE

CHAPTER 3

CONSERVATION VALUES OF THE NORTH-WEST MARINE REGION



A DESCRIPTION OF THE ECOSYSTEMS, CONSERVATION VALUES AND USES
OF THE NORTH-WEST MARINE REGION



Australian Government

Department of the Environment, Water, Heritage and the Arts

CHAPTER 3 CONSERVATION VALUES OF THE NORTH-WEST MARINE REGION

Marine Bioregional Plans will identify those components of marine biodiversity and heritage that are recognised as **conservation values** by the Australian Government. Knowing what the conservation values are for each Marine Region will help in making decisions about proposed developments and other ongoing activities.

For the purpose of marine bioregional planning, conservation values are defined as those elements of the Region that are either specifically **protected** under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or the *Historic Shipwrecks Act 1976*, or have been identified through the planning process as **key ecological features** in the Commonwealth marine environment. Key ecological features are not specifically protected under the EPBC Act, although the Commonwealth marine environment as a whole is a matter of national environmental significance under the EPBC Act. Key ecological features are being identified as conservation values within Commonwealth waters to help inform decisions affecting the marine environment in each Marine Region.

Matters specifically protected under Parts 13 and 15 of the EPBC Act are recognised conservation values. In the North-west Marine Region, these include listed threatened, migratory and marine species, cetaceans (whales, dolphins and porpoises), Commonwealth marine reserves, Ramsar sites and places listed on the Commonwealth Heritage List. Historic shipwrecks are also identified as conservation values by virtue of their protection under the *Historic Shipwrecks Act 1976*.

The marine conservation values identified in this chapter will be the subject of assessment during the development of the North-west Marine Bioregional Plan to:

- understand the threats posed by current and emerging activities;
- determine priorities for mitigating these threats; and
- provide guidance for future decisions under the EPBC Act on potential significant impacts on listed threatened and listed migratory species or the Commonwealth marine environment of the North-west Marine Region (see section 3.1 for definition).

The nature and location of conservation values will also be considered in the establishment of Marine Protected Areas (MPAs) as part of the National Representative System of MPAs (see Chapter 4). However, conservation values will not automatically be included in Commonwealth marine reserves. In accordance with the Regional Specifications (Section 4.2), only those marine conservation values for which spatial protection is both desirable and appropriate will be considered in developing the MPA network for the Region.

More information on the marine bioregional planning process in the North-west Marine Region can be found in Chapter 6.



Manta ray feeding at Scott Reef. Photo: Australian Institute of Marine Science.



3.1 Key ecological features of the marine environment

Under the EPBC Act, the ‘marine environment’ under Commonwealth jurisdiction is a **matter of national environmental significance** (see Section 23 of the Act). This means that any action that will have or is likely to have a significant impact on the Commonwealth marine environment must be referred to the Minister for the Environment, Heritage and the Arts for assessment and approval. National guidelines have been developed to help in determining whether actions are likely to have a significant impact and can be found at www.environment.gov.au/epbc/guidelines-policies.html.

The North-west Marine Bioregional Plan will identify and describe key ecological features of the North-west Marine Region’s marine environment. Once the Plan is finalised, these key ecological features will be considered in making decisions about whether an action is likely to have a significant impact on the Commonwealth marine environment.

For the purpose of marine bioregional planning, key ecological features of the marine environment meet one or more of the following criteria:

- a species, group of species or a community with a regionally important ecological role (e.g. a predator, or a prey species that interacts significantly with a large biomass or number of other marine species);
- a species, group of species or a community that is nationally or regionally important for biodiversity;
- an area or habitat that is nationally or regionally important for:
 - a) enhanced or high biological productivity (such as predictable upwellings),
 - b) aggregations of marine life (such as feeding, resting, breeding or nursery areas), or
 - c) biodiversity and/or endemism; or
- a unique seafloor feature with known or presumed ecological properties of regional significance.

Key ecological features in the North-west Marine Region have been identified by the Australian Government Department of the Environment, Water, Heritage and the Arts on the basis of advice from scientists about the ecological processes and characteristics of the Region. A scientific workshop was conducted in September

2007, bringing together marine scientists with specific experience and expertise in the Region. The workshop explored what is currently known about the ecosystems of the North-west Marine Region, and the scientific understanding of likely interactions and ecosystem processes. The outcomes of the workshop are available at www.environment.gov.au/coasts/mbp/north-west.

Chapter 2 identified features and areas of ecological importance in both State and Commonwealth waters within each provincial bioregion. The marine bioregional planning process focuses on matters within Commonwealth waters. Therefore, key ecological features have only been identified within Commonwealth waters of the North-west Marine Region.

Table 3.1 identifies the key ecological features of the North-west Marine Region recognised during the development of this Bioregional Profile, and summarises the rationale used to identify a specific feature as a conservation value in the Region (Chapter 2 provides further context for understanding the role of different features in the ecosystem). The collection of further and finer-scale information during the next stage of the planning process will improve our understanding of key ecological features in the Region. This information will also be used to confirm and refine the key ecological features identified during the profiling stage of the process and will underpin the analysis of threats facing the marine environment over the next 10–20 years. The North-west Marine Bioregional Plan will include a refined list of key ecological features.

Fourteen key ecological features have been identified so far within the North-west Marine Region. These include unique geomorphic (seafloor) or topographic features, as well as areas or habitats that are considered to be regionally important (Table 3.1). Figure 3.1 identifies the location of the key ecological features.

Figure 3.1 Key ecological features of the North-west Marine Region

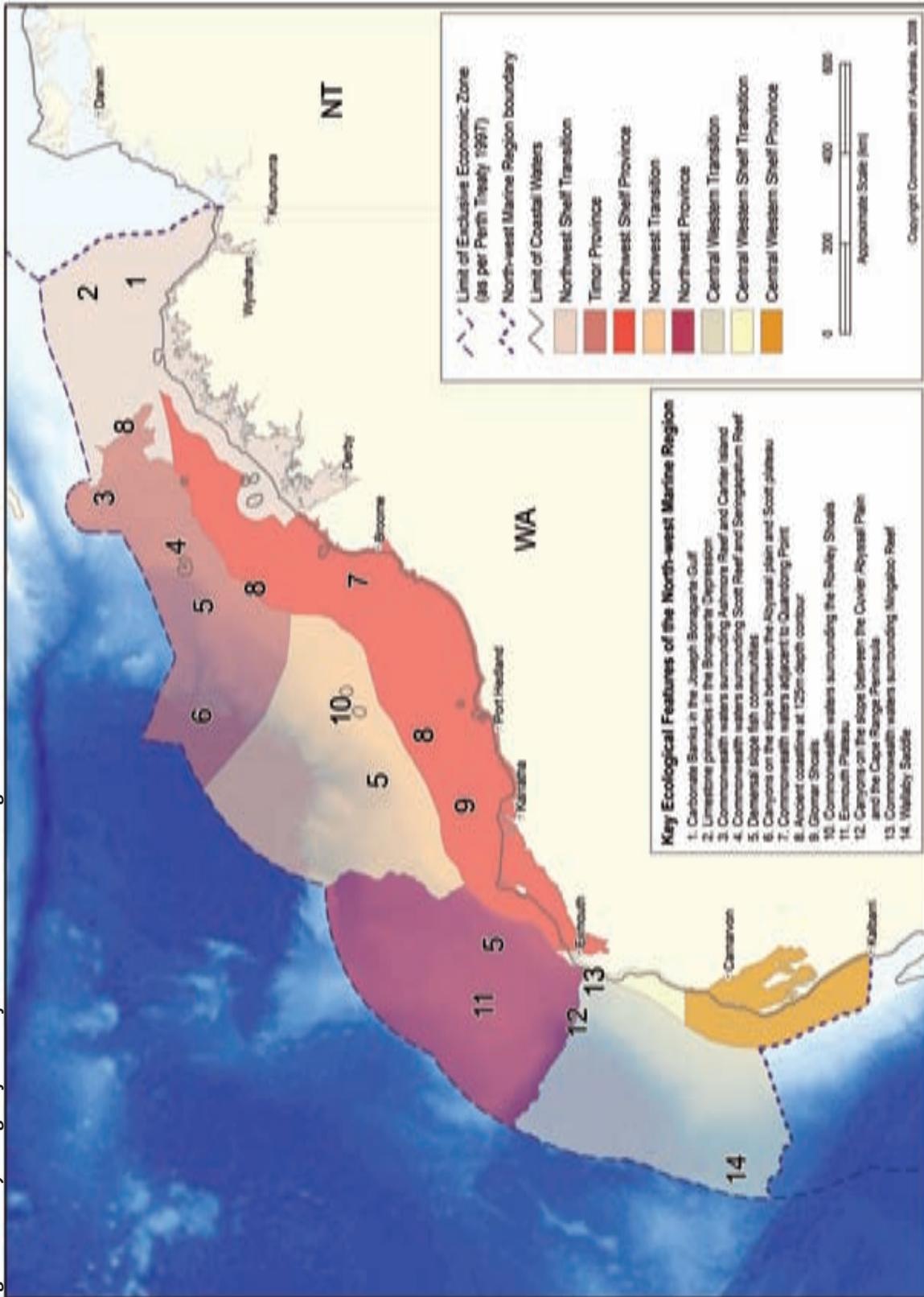


Table 3.1 Key ecological features of the North-west Marine Region

Key ecological features	Provincial bioregions IMCRA v.4.0	Rationale
1. Carbonate banks in the Joseph Bonaparte Gulf	Northwest Shelf Transition	<p>Unique seafloor feature</p> <p>The carbonate banks within the Joseph Bonaparte Gulf consist of a hard substrate with flat tops and steep sides that rise from water depths of 150–300 m. They rise to between 50–100 m of the surface. Each bank occupies an area generally less than 10 km² and is separated from the next bank by narrow channels. They are regionally significant as over 90 per cent of the carbonate banks in the North-west Marine Region are located within this bioregion, and overall the Region contains more than 70 per cent of the carbonate banks in the entire Australian Exclusive Economic Zone (EEZ).</p> <p>Scientists believe that the banks are either drowned carbonate platforms or have formed in association with seafloor hydrocarbon seeps, and the hard carbonate substrate is ideal for reef-building organisms. The carbonate banks are thought to be sites of enhanced biological productivity and support filter-feeding coral communities utilising suspended nutrients. The banks and channels are likely to support a high diversity of animals including reef fish, sponges, soft and stony corals, gorgonians, bryozoans, ascidians and other sessile filter feeders. The banks and channels are known to be important foraging areas for loggerhead turtles and the north-west Kimberley breeding population of flatback turtles. Olive ridley and green turtles are also likely to occur in the area.</p>
2. Limestone pinnacles in the Bonaparte Depression	Northwest Shelf Transition	<p>Unique seafloor feature</p> <p>The limestone pinnacles of the Bonaparte Depression are believed to be the remnants of calcareous shelf and coastal deposits which have eroded to their current elevations. They can be up to 50 m high and 50–100 km long and are an important seafloor feature because of their prevalence in this area. The pinnacles in the Bonaparte Depression represent 60 per cent of the limestone pinnacles in the entire North-west Marine Region, and 9 per cent of the limestone pinnacles in the entire Australian EEZ.</p> <p>The pinnacles are believed to be associated with enhanced local biological productivity, because the movement of water around these features is likely to facilitate the mixing of nutrients and sediments in the photic zone. Associated communities are thought to include sessile benthic invertebrates including hard and soft corals and sponges, and aggregations of demersal fish species such as snappers, emperors and groupers. The pinnacles are also thought to be important feeding sites for green, loggerhead, olive ridley and flatback turtles.</p>
3. Commonwealth waters surrounding Ashmore Reef and Cartier Island	Timor Province	<p>Enhanced biological productivity; feeding and breeding aggregations; high biodiversity</p> <p>Ashmore Reef and Cartier Island are Commonwealth marine reserves and have been relatively well-studied. They are regarded as biodiversity hotspots as they support a diverse array of pelagic and benthic marine species. The waters surrounding Ashmore and Cartier are areas of enhanced localised biological productivity in relatively unproductive waters. Localised upwelling and turbulent mixing around the reef systems provide nutrients to the system.</p> <p>The reefs provide varied habitat that attracts a diverse range of primary and secondary consumers, including a particularly diverse fish fauna. Toothed whales and dolphins are also found around these reefs.</p> <p>Large areas of seagrass in waters surrounding Ashmore Reef are important for a genetically distinct dugong population. Both Ashmore and Cartier reefs support an unusually high diversity and density of sea snakes, for which these reefs are internationally significant. They are also important staging points for migratory wetland birds and the site of some of the most important seabird colonies in the North-west Marine Region.</p>

Key ecological features	Provincial bioregions IMCRA v.4.0	Rationale
4. Commonwealth waters surrounding Scott and Seringapatam reefs	Timor Province	<p>Enhanced biological productivity; feeding and breeding aggregations; high biodiversity</p> <p>Scott and Seringapatam reefs are coral-dominated reefs which have been relatively well-studied and are regarded as biodiversity hotspots that support diverse pelagic and benthic marine species. The waters surrounding the reefs are areas of enhanced localised biological productivity in relatively unproductive waters due in part to the action of internal waves generated by internal tides.</p> <p>The reefs are regionally significant for their affinities with both the fauna of the Indo-Pacific region and Indonesia. The reefs support many species of fish, molluscs and echinoderms, some of which are not found elsewhere in Western Australia. The reefs and surrounding waters support a high diversity of fish species including small pelagic and tropical reef species, groupers, emperors, dolphinfish, marlin and sailfish. Sperm, blue and small toothed cetaceans are thought to visit the area. Scott Reef supports a small but genetically distinct breeding population of green turtles and both reefs are important for sea snakes and seabirds. Despite their proximity to each other, Scott and Seringapatam reefs have distinctly different sponge fauna.</p>
5. Demersal slope fish communities	Timor Province, Northwest Transition, Northwest Province	<p>Communities with high species biodiversity and endemism</p> <p>Demersal slope fish assemblages in the Timor Province, the Northwest Transition and the Northwest Province are characterised by high endemism and species diversity. The level of endemism of demersal fish species in these bioregions is high compared to anywhere else along the Australian continental slope.</p> <p>The Northwest Province, specifically the continental slope between North West Cape and the Montebello Trough, has more than 500 fish species, 76 of which are endemic, making it the most diverse slope bioregion in Australia. The slope of the Timor Province and the Northwest Transition also contains more than 500 species of demersal fish, of which 64 are considered to be endemic, and is the second richest area for demersal fish species across the entire Australian continental slope. The demersal fish species occupy two distinct demersal community types (biomes) associated with the upper slope (water depths of 225–500 m) and the mid-slope (water depths of 750–1000 m).</p>
6. Canyons on the slope between the Argo Abyssal Plain and Scott Plateau	Timor Province	<p>Enhanced biological productivity; feeding aggregations; unique seafloor feature</p> <p>The canyons on the slope between the Argo Abyssal Plain and Scott Plateau and the north of Scott Reef are believed to be up to 50 million years old and are associated with small periodic upwellings that locally enhance biological productivity. Deep ocean currents upwelling in the canyon create a nutrient rich, cold water habitat attracting fish aggregations that in turn attract large predatory fish, sharks and toothed whales and dolphins. Whaling records from the 19th century indicate that aggregations of sperm whales occurred on the Scott Plateau. There is also anecdotal evidence that the Scott Plateau may be a breeding ground for sperm whales and beaked whales.</p>
7. Commonwealth waters adjacent to Quondong Point	Northwest Shelf Province	<p>Enhanced biological productivity; feeding aggregations</p> <p>Waters surrounding Quondong Point are an area of enhanced localised biological productivity attracting large feeding aggregations of birds and baitfish. Aggregations of humpback whales, other cetaceans, marine turtles and dugongs are also regularly reported here and the area may provide important habitat for sawfish, although this is yet to be confirmed. The physical and biological processes that result in enhanced biological productivity in this area are not well understood but may be associated with a unique combination of bathymetry and oceanography.</p>



Key ecological features	Provincial bioregions IMCRA v.4.0	Rationale
8. Ancient coastline at 125 m depth contour	Northwest Shelf Province, Northwest Shelf Transition	<p>Unique seafloor feature</p> <p>The shelf of the North-west Marine Region contains several terraces and steps which reflect the gradual increase in sea level across the shelf that occurred during the Holocene. The most prominent of these occurs episodically as an escarpment through the Northwest Shelf Province and Northwest Shelf Transition, at a depth of approximately 125 m.</p> <p>It has been suggested that humpback whales, whale sharks and other migratory pelagic species may use this escarpment as a guide as they move through the Region. The topographic variation of the ancient coastline may also facilitate small localised upwellings as a result of internal tide activity or regional mixing associated with seasonal changes in currents and winds. These areas of enhanced biological productivity could attract baitfish which may provide food for migrating species.</p>
9. Glomar Shoals	Northwest Shelf Province	<p>Unique seafloor feature; high biodiversity</p> <p>The Glomar Shoals are a unique seafloor feature of highly fractured molluscan debris, coralline rubble and coarse carbonate sand that occurs approximately 30–40 km offshore of Dampier in Commonwealth waters, between depths of 26–70 m. Anecdotal evidence indicates that this area has localised increased biological productivity which attracts fish such as Rankin cod, brownstripe snapper, red emperor, crimson snapper and frypan bream, all of which are caught in large numbers by commercial fisheries in this area.</p>
10. Commonwealth waters surrounding the Rowley Shoals	Northwest Transition	<p>Enhanced biological productivity; feeding and breeding aggregations; high biodiversity</p> <p>The Rowley Shoals are a collection of three atoll reefs: Clerke, Imperieuse and Mermaid, which are thought to be sites of enhanced biological productivity due to the action of the breaking of internal waves generated by internal tides. Breaking internal waves cause mixing and the resuspension of nutrients up into the photic zone, which triggers enhanced primary productivity. The productive waters are circulated throughout the reef system and are readily available to primary consumers.</p> <p>Mermaid Reef is the only reef of the Rowley Shoals which occurs entirely in Commonwealth waters, and is a Commonwealth marine reserve. Clerke and Imperieuse reefs occur in State waters, and form the Rowley Shoals Marine Park. The reefs have been relatively well studied and are noted for their high species diversity. Biodiversity surveys of the reefs have identified 184 species of corals, 264 species of molluscs, 82 species of echinoderms and 389 species of finfish. Unique sponge faunal assemblages are associated with each of the reefs. Because of the predominantly southward flow of currents past the Rowley Shoals and beyond, the Rowley Shoals are also thought to provide a source of invertebrate and fish recruits for reefs further south.</p> <p>Steep changes in slope around the reefs attract a range of migratory pelagic species such as dolphins, tuna, billfish and sharks. Surveys around Mermaid Reef have confirmed that there is a high diversity of sharks around the Rowley Shoals, including grey reef and silvertip whaler sharks. Sharks are found in considerable numbers on the Rowley Shoals, compared with their low abundance on Scott and Ashmore reefs, which have been adversely affected by overfishing in the MoU Box.</p>
11. Exmouth Plateau	Northwest Province	<p>Unique seafloor feature</p> <p>The Exmouth Plateau covers an area of approximately 50 000 km² and consists of a generally rough and undulating surface at water depths of approximately 500 m to more than 5000 m. The plateau is thought to be dotted with numerous pinnacles. It is an important geomorphic feature that modifies the flow of deep waters, and has been identified as a site where internal waves are generated by internal tides. The plateau also receives settling detritus and other matter from the pelagic environment.</p>

Key ecological features	Provincial bioregions IMCRA v.4.0	Rationale
12. Canyons on the slope between the Cuvier Abyssal Plain and the Cape Range Peninsula	Northwest Province, Central Western Transition	<p>Enhanced productivity; aggregations of marine life; unique seafloor feature</p> <p>The canyons on the slope between the Cuvier Abyssal Plain and the Cape Range Peninsula include the Cape Range Canyon and the Cloates Canyon. They are believed to be associated with upwelling as they channel deep water from the Argo Abyssal Plain up onto the slope, where it mixes with the overlying water layers at the canyon heads. The upwelling zones at the canyon heads are sites of species aggregations such as sweetlip emperor fish. The soft bottom habitats within the canyons themselves are likely to support important assemblages of epibenthic species.</p> <p>Biological productivity at the head of Cape Range Canyon in particular is known to support species aggregations, including whale sharks. The canyons are thought to be significant contributors to the biodiversity of the adjacent Ningaloo Reef, as they channel deep water nutrients up to the reef, stimulating primary productivity.</p>
13. Commonwealth waters surrounding Ningaloo Reef	Northwest Province, Central Western Transition, Central Western Shelf Transition, Northwest Shelf Province	<p>Unique seafloor feature; high biodiversity; aggregations of marine life</p> <p>Ningaloo Reef is globally significant as the only extensive coral reef in the world that fringes the west coast of a continent. Ningaloo Reef extends for over 260 km along the Cape Range Peninsula.</p> <p>The Commonwealth waters around Ningaloo Reef are a Commonwealth marine reserve. As the reef is located next to an arid hinterland and receives very little terrestrial run-off, it is almost entirely dependent on processes in the marine environment for nutrient input and maintenance of its ecology.</p> <p>The waters of the reef are a site of enhanced biological productivity, due to upwelling associated with the adjacent canyons on the slope and interactions between the Ningaloo Current and the Leeuwin Current.</p> <p>The reef is known to support an extremely abundant array of marine species including over 200 species of coral and more than 460 species of reef fish, as well as molluscs, crustaceans and other reef plants and animals. Marine turtles, dugongs and dolphins frequently visit the reef lagoon. The Commonwealth waters around Ningaloo include areas of potentially high and unique sponge biodiversity. Upwellings on the seaward side support aggregations such as whale sharks and manta rays (these waters are the main known aggregation area for whale sharks in Australian waters). Humpback whales are seasonal visitors to the outer reef edge and seasnakes, sharks, large predatory fish and seabirds also utilise the reef and surrounding waters.</p>
14. Wallaby Saddle	Central Western Transition	<p>Unique seafloor feature; aggregations of marine life</p> <p>The Wallaby Saddle occurs on the slope within this bioregion, towards the edge of Australia's EEZ. It represents almost the entire area of this type of geomorphic feature in the North-west Marine Region. It is shallower than adjoining abyssal areas to the north and south and is believed to be associated with upwelling as deeper more nutrient-rich waters are pushed up onto the saddle. Aggregations of sperm whales are known to occur on the Wallaby Saddle and it is believed that they feed on aggregations of baitfish that are attracted to the productive waters.</p>



3.2 Nationally protected species

Species listed under the EPBC Act are commonly referred to as ‘protected species’ because it is an offence to kill, injure, take, trade, keep or move a listed species without authorisation. Under the EPBC Act, species can be listed as threatened, migratory, or marine. Cetaceans are also protected under the Act through the establishment of the Australian Whale Sanctuary. Further information on the EPBC Act is provided in Appendix B. Nationally protected species include:

- **Threatened species** – those species that have been identified as being in danger of becoming extinct;
- **Listed migratory species** – those species that are listed under:
 - *the Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention),*
 - *the Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and their Environment 1974 (JAMBA),*
 - *the Agreement between the Government of Australia and the Government of the People’s Republic of China for the Protection of Migratory Birds and their Environment 1986 (CAMBA),*
 - *the Agreement between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds 2007 (ROKAMBA),*
 - *the Partnership for the Conservation of Migratory Waterbirds and the Sustainable Use of their Habitats in the East Asian Australasian Flyway (Flyway Partnership),* or
 - any other relevant international agreement, or instrument made under other international agreements approved by the Minister for the Environment, Heritage and the Arts.

Further information on the CMS, JAMBA, CAMBA and ROKAMBA is provided in Appendix A;

- **Cetaceans** – all species of cetacean (comprising whales, dolphins and porpoises) are protected in Australian Commonwealth waters through the establishment of the Australian Whale Sanctuary under the EPBC Act; and
- **Listed marine species** – species occurring naturally in a Commonwealth marine area that

the Australian Government recognises as requiring protection to ensure their long-term conservation. Listed marine species occurring in the North-west comprise:

- sea snakes (family Hydrophiidae);
- dugongs (genus *Dugong*);
- marine turtles (families Cheloniidae and Dermochelyidae);
- seahorses, sea-dragons, pipefish and ghost pipefish (families Syngnathidae and Solenostomidae); and
- birds (seabirds, shorebirds, waterbirds and other coastal or migratory species that occur naturally in Commonwealth marine areas).

Species can be listed under more than one category; for instance marine turtles are listed as threatened species, migratory species and as marine species.

Under the EPBC Act, species listed as ‘threatened’ or ‘migratory’ are matters of national environmental significance. (Species listed as ‘extinct’ or ‘conservation dependent’ are not matters of national environmental significance under the EPBC Act). Proposals for activities likely to have a significant impact on matters of national environmental significance must be referred to the Australian Government Minister for the Environment, Heritage and the Arts for approval. The requirement to refer proposals for actions likely to have a significant impact on matters of national environmental significance applies to activities proposed not only in areas managed by the Commonwealth but also in areas managed by the States and Territories.

Significant Impact Guidelines for Matters of National Environmental Significance have been produced to provide advice to proponents on when referrals should be submitted for approval. These guidelines provide specific advice about the kinds of actions likely to have a significant impact on threatened and migratory species. The guidelines also provide specific advice about the kinds of actions likely to have a significant impact on the Commonwealth marine environment. Under these guidelines, any actions in the Commonwealth marine environment that will have, or are likely to have, “a substantial adverse effect on a population of a marine species or cetacean including its life cycle (e.g. breeding, feeding, migratory behaviour, life expectancy) and spatial distribution” are identified as actions that should be referred for approval. These guidelines are available

at <www.environment.gov.au/epbc/guidelines-policies.html>.

Species listed under the EPBC Act are also protected from adverse interactions with commercial fishing operations. Under the EPBC Act, all fisheries managed under Commonwealth legislation, and State managed fisheries that have an export component, must be assessed to ensure that, over time, those fisheries are managed in an ecologically sustainable way. These fishery assessments are conducted using the *Guidelines for the Ecologically Sustainable Management of Fisheries*. These guidelines specify that fisheries must be conducted in a manner that does not threaten by-catch species and that “avoids mortality of, or injuries to, endangered, threatened or protected species”. Further information about fisheries assessments carried out under the EPBC Act is available at <www.environment.gov.au/coasts/fisheries>.

The EPBC Act includes other forms of protection for listed species to ensure that human activities do not threaten their survival in the wild (see Appendix B for further information and relevant links).

3.2.1 Protected species in the North-west Marine Region

The North-west Marine Region is an important area for many species that are protected under the EPBC Act. Many of the species listed under the EPBC Act are also protected under State legislation.

In the North-west Marine Region there are 151 species protected under the EPBC Act that are *known to occur*: 17 species listed as threatened, 73 as migratory, 21 cetaceans and 126 listed as marine (Table 3.2). In addition, there are another 75 species that *may occur* or *occur infrequently* in the Region. Species that *may occur* or *occur infrequently* in the North-west Marine Region are defined as those:

- that are accidental visitors to the Region; or
- that on the best available information about their range, are considered likely to occur in the Region.

Appendix C lists all species protected under the EPBC Act that are *known to occur* and all that *may occur* or *occur infrequently* in the North-west Marine Region.



Table 3.2 Number of protected species known to occur in the Region by broad taxonomic group (as at March 2008)

	Listed Threatened Species		Listed Migratory Species	Cetaceans (whales, dolphins and porpoises)	Listed Marine Species
	Endangered	Vulnerable			
Sharks	-	4	2	-	-
Bony Fish	-	-	-	-	17
Sea Snakes	-	-	-	-	20
Marine Turtles	2	4	6	-	6
Birds	1	3	54	-	82
Dugongs	-	-	1	-	1
Cetaceans	1	2	10	21	-
Totals	4	13	73	21	126

At the time of finalisation of this Bioregional Profile, there are no species listed as ‘critically endangered’ in the Region. There are also no species known to have become extinct in the Region.

Protected species group report cards have been prepared for each of the broad taxonomic groups listed under the EPBC Act that are known to occur in the Region (Appendix D). The report cards identify threatened and migratory listed species, describe their ecology, identify important areas for threatened and migratory species within the Region, explain what processes and activities pose a threat to their continued survival and identify how these threats are being mitigated. The report cards also point to relevant references and research for further reading. The report cards are available at <www.environment.gov.au/coasts/mbp/north-west>, and will be updated as new information becomes available. Protected species group report cards are available for sharks, bony fish, sea snakes, marine turtles, birds, dugongs, and cetaceans (whales, dolphins and porpoises) occurring in the North-west Marine Region.

Species listed as ‘threatened’ or ‘migratory’ under the EPBC Act are considered matters of national environmental significance. Important areas for threatened and migratory species have been identified in the North-west Marine Region and in State waters adjacent to the Region. Table 3.3 identifies breeding areas, nursery and calving areas, feeding areas and resting areas for threatened or migratory sharks, marine

turtles, birds, dugongs and cetaceans. These areas were identified on the basis of available information, expert advice and the following criteria:

- **sharks:** nursery grounds and feeding areas;
- **marine turtles:** aggregation areas, nesting and foraging areas;
- **birds:** colonies, feeding areas, and staging areas for migratory shorebirds;
- **dugongs:** feeding and breeding areas; and
- **cetaceans** (whales, dolphins and porpoises): aggregation areas, feeding areas, calving areas and migration resting areas.

Additional important areas for species protected under the EPBC Act may be identified during the next stage of the planning process, as further and finer scale information about the Region is collected. This information will underpin the analysis of the threats protected species may face over the next 10–20 years, and will be included in the North-west Marine Bioregional Plan.

Table 3.3 Important breeding, feeding and resting areas for species listed as threatened or migratory under the EPBC Act

Where available, further information and references for important areas for threatened and migratory species are provided in Appendix D.

Important Areas	Rationale
Shark Bay – Dirk Hartog Island	<p>Resting area – humpback whales An important resting area for migrating humpback whales, particularly for females and calves on their southern migration. Also home to resident populations of bottlenose dolphins.</p> <p>Breeding and feeding area – marine turtles Supports the largest breeding population of loggerhead turtles in Australia and the third largest in the world. Dirk Hartog Island has been identified as critical nesting and internesting habitat for loggerhead turtles. Shark Bay has been identified as a critical feeding habitat for loggerhead and green turtles.</p> <p>Breeding area – seabirds Wedge-tailed shearwaters, bridled terns, Caspian terns, and roseate terns breed in this area.</p> <p>Breeding and feeding area – dugongs The Shark Bay population of dugongs is thought to be one of the largest in the world and is estimated to include approximately 10 000 individuals.</p>
Ningaloo Reef – North West Cape	<p>Feeding area – whale shark This is the main known aggregation area in Australian waters for whale sharks, where they feed on concentrations of krill and zooplankton.</p> <p>Breeding area – marine turtles North West Cape is a major green turtle nesting area and an important nesting area for loggerhead turtles.</p>

Important Areas	Rationale
Exmouth Gulf (including Muiron Islands)	<p>Resting area – humpback whales An important resting area for migrating humpbacks, particularly for females and calves on their southern migration.</p> <p>Breeding area – marine turtles The Muiron Islands off North West Cape have been identified as critical nesting and internesting habitat for loggerhead turtles and also support a major green turtle rookery.</p> <p>Breeding and feeding area – dugongs A population of approximately 1000 individuals has been recorded in the Gulf, although numbers are thought to have decreased after the destruction of seagrass beds during Cyclone Vance in 1999.</p>
Serrurier Island	<p>Breeding area – marine turtles A major nesting area for green turtles and may also be a foraging area for this species.</p> <p>Breeding area – birds Caspian terns, little terns, wedge-tailed shearwaters and ospreys breed on Serrurier Island and nearby Airlie Island.</p>
Thevenard Island	<p>Breeding area – marine turtles Supports a significant flatback turtle rookery and small numbers of green turtles.</p> <p>Feeding area – marine turtles Feeding area for green turtles.</p>
Montebello – Lowendal – Barrow islands and surrounding waters	<p>Resting area – humpback whales Resting area for migrating humpback whales. Also has resident populations of common bottlenose dolphins and Indo-Pacific humpback dolphins.</p> <p>Breeding area – marine turtles Green, hawksbill and flatback turtles regularly nest in this area. Occasional nesting by loggerhead turtles has also been recorded on Barrow Island. Barrow Island and surrounding waters within a 20 km radius have been listed as critical nesting and internesting habitat for green turtles and also support an important flatback turtle rookery. The Montebello Islands and surrounding waters have been identified as critical nesting and internesting habitat for both flatback and hawksbill turtles. Varanus Island (part of the Lowendal Islands) and surrounding waters have been identified as critical nesting and internesting habitat for hawksbill turtles and supports an important flatback turtle rookery. Summer mating aggregations of green turtles occur to the west of Barrow Island and within the Montebello Island group.</p> <p>Feeding area – marine turtles Possible green turtle foraging grounds occur over the Barrow Shoals off the south-east coast of Barrow Island. Hawksbill turtle feeding grounds occur in the Mary Anne and Great Sandy Island groups to the south of the Barrow Shoals. There is also some evidence that juvenile flatback turtles use the Barrow Island region as developmental habitat.</p> <p>Breeding area – birds These islands support significant colonies of wedge-tailed shearwaters and bridled terns. The Montebello Islands support the biggest breeding population of roseate terns in Western Australia. Ospreys, white-bellied sea-eagles, eastern reef egrets, Caspian terns, and lesser crested terns also breed in this area.</p> <p>Feeding area – seabirds Observations suggest an area to the west of the Montebello Islands may be a minor zone of upwelling in the Region, supporting large feeding aggregations of terns. There is also some evidence that the area is an important feeding ground for Hutton’s shearwaters and soft-plumaged petrels.</p> <p>Feeding area/staging post – migratory shorebirds Barrow Island is ranked equal tenth among 147 sites in Australia that are important for migratory shorebirds. Barrow, Lowendal and Montebello islands are internationally significant sites for six species of migratory shorebirds, supporting more than one per cent of the East Asian-Australasian Flyway population of these species.</p>
Mangrove Islands	<p>Aggregation area – marine turtles Aggregations of male green turtles occur on the Mangrove Islands prior to the nesting season. However, the purpose of these aggregations is unknown.</p>



Important Areas	Rationale
Onslow to Dampier Archipelago	<p>Breeding area – birds Islands between Onslow and the Dampier Archipelago are important nesting sites for wedge-tailed shearwaters, roseate terns, crested terns, Caspian terns, bridled terns, ospreys, eastern reef egrets, beach stone-curlews and white-bellied sea-eagles.</p>
Dampier Archipelago	<p>Breeding area – marine turtles Rosemary Island and all surrounding waters within a 20 km radius have been identified as critical nesting and internesting habitat for flatback turtles. The island also supports the most significant hawksbill turtle rookery in Western Australia and one of the largest in the Indian Ocean. Dampier Archipelago also supports major green and flatback turtle nesting sites.</p> <p>Breeding area – birds Important nesting areas for wedge-tailed shearwaters, bridled terns, fairy terns, roseate terns, Caspian terns, eastern reef egrets, beach stone-curlews, ospreys and white-bellied sea-eagles.</p>
Port Hedland	<p>Breeding area – marine turtles Important flatback turtle rookeries occur at Port Hedland and Cape Thouin. Critical nesting and internesting habitat for flatback turtles has also been identified at Mundabullangana Beach.</p>
Bedout Island	<p>Breeding area – seabirds Bedout Island supports one of the largest colonies of brown boobies in Western Australia. Masked boobies, lesser frigatebirds, roseate terns and common noddies also breed in the area.</p>
Eighty Mile Beach – Roebuck Bay	<p>Breeding area – marine turtles Major rookery for flatback turtles.</p> <p>Feeding area/staging post – migratory shorebirds Eighty Mile Beach and Roebuck Bay are two of the most important areas in Australia for migratory shorebirds. The area regularly supports up to 500 000 birds at any one time, with more than 850 000 birds using the area annually. The area is an internationally significant site for 20 species, regularly supporting more than one per cent of the East Asian-Australasian Flyway population.</p> <p>Breeding and feeding area – cetaceans Roebuck Bay is thought to be an important area for Australian snubfin dolphins and other inshore dolphin species.</p>
Mermaid Reef – Rowley Shoals	<p>Breeding area – seabirds Red-tailed tropicbirds, white-tailed tropicbirds and little terns breed in this area.</p> <p>Feeding area/staging post – migratory shorebirds Sand cays of the Rowley Shoals may be important resting and feeding sites for migratory shorebirds.</p>
Quondong Point	<p>Feeding area – marine turtles Feeding area for flatback, loggerhead, hawksbill and green turtles.</p> <p>Aggregation area – cetaceans High densities of migrating humpbacks as well as false killer whales, pygmy blue whales and dolphins.</p>
Lacepede Islands	<p>Breeding area – marine turtles The Lacepede Islands and surrounding waters within a 20 km radius have been identified as critical nesting and internesting habitat for green turtles, supporting the largest green turtle rookeries in Western Australia.</p> <p>Breeding area – seabirds The Lacepede Islands support some of the largest brown booby colonies in Western Australia. Lesser frigatebirds, bridled terns, roseate terns and common noddies also breed in the area.</p>

Important Areas	Rationale
Kimberley coast	<p>Calving area – humpback whales The main calving area for the West Australian population of humpback whales is centred around Camden sound but extends to south of Broome and north of the Maret Islands. High densities of migrating humpbacks are observed in Pender Bay.</p> <p>Breeding and feeding area – cetaceans Shallow coastal waters and estuaries along the Kimberley coast, particularly Pender Bay, Beagle Bay and tidal creeks around Yampi Sound and between Kuri Bay and Cambridge Gulf are important areas for Australian snub-fin dolphins and Indo-Pacific humpback dolphins.</p>
Adele Island	<p>Breeding area – seabirds This area supports large colonies of brown boobies and lesser frigatebirds as well as smaller populations of red-footed boobies, masked boobies and lesser crested terns.</p>
Bonaparte Archipelago	<p>Breeding area – marine turtles The Maret Islands and other islands of the Bonaparte Archipelago including the Montalivet islands, Albert Island and the Lamarck Islands support significant green and flatback turtles rookeries.</p>
Scott Reef	<p>Breeding area – marine turtles Supports a small but genetically distinct breeding population of green turtles.</p> <p>Feeding area/staging post –birds Scott Reef is an important staging post for migratory shorebirds and a foraging area for seabirds including roseate terns, lesser frigatebirds and brown boobies.</p>
Browse Island	<p>Breeding area – marine turtles Major rookery for green turtles.</p> <p>Aggregation area – cetaceans Offshore waters surrounding Browse Island support a larger number of cetacean species than any other area on the Western Australian coast, including large pods of oceanic dolphins, pygmy killer whales, false killer whales, melon-headed whales, minke whales and pilot whales. May also be a feeding area for blue whales.</p>
Ashmore Reef – Cartier Island	<p>Breeding area – marine turtles Critical nesting and internesting habitat for green turtles, supporting one of three genetically distinct breeding populations in the North-west Marine Region. Low levels of nesting activity of loggerhead turtles have also been recorded here.</p> <p>Feeding area – marine turtles Supports large and significant feeding populations of green, hawksbill and loggerhead turtles. It is estimated that approximately 11 000 marine turtles feed in the area throughout the year.</p> <p>Breeding and feeding area – dugongs Ashmore Reef is thought to support a small (less than 50 animals) but genetically distinct population.</p> <p>Breeding area – seabirds These islands support some of the most important seabird colonies on the North West Shelf including colonies of bridled terns, common noddies, brown boobies, eastern reef egrets, frigatebirds, tropicbirds, red-footed boobies, roseate terns, and lesser crested terns.</p> <p>Feeding area/staging post – migratory shorebirds Ashmore Reef and Cartier Island are important staging areas for many migratory shorebirds.</p>
Montgomery Reef	<p>Feeding area – marine turtles Records of green turtles, and possibly other species.</p>
Cape Dommett	<p>Breeding area – marine turtles Major rookery for flatback turtles.</p>
Joseph Bonaparte Gulf	<p>Feeding area – marine turtles Carbonate banks in the Joseph Bonaparte Gulf are foraging areas for flatback and loggerhead turtles. Green, olive ridley and flatback turtles are thought to forage around pinnacles in the Bonaparte Depression.</p>



3.3 Protected places

The Australian Government has responsibility for the conservation of Australia’s natural, indigenous and historic heritage, including the management of protected places on the World, National and Commonwealth Heritage Lists and the Register of the National Estate. Protected places likely to occur in the marine environment include Marine Protected Areas and historic shipwrecks.

Marine Protected Areas – Within the North-west Marine Region, there are four existing Commonwealth marine reserves which contribute to the National Representative System of MPAs – Ningaloo Marine Park (Commonwealth Waters), Mermaid Reef Marine National Nature Reserve, Ashmore Reef National Nature Reserve and Cartier Island Marine Reserve (see Figure 3.2). In addition, there are a number of existing and proposed MPAs in State waters adjacent to the Region. These include (among others) the Rowley Shoals Marine Park, Ningaloo Marine Park (State Waters), Barrow Island Marine Management Area and the proposed Dampier Archipelago Marine Park, as well as over 300 island conservation reserves and a number of proposed coastal reserves along the Pilbara and Eighty Mile Beach coasts.

More information on MPAs in State waters can be found at <www.naturebase.net>.

Also within the Region, Mermaid Reef, Ashmore Reef, Seringapatam Reef and the Commonwealth waters of the Ningaloo Marine Area and Scott Reef are listed on the Commonwealth Heritage List. In Western Australian State waters adjacent to the Region, Shark Bay and the Dampier Archipelago, including the Burrup Peninsula, are listed on the National Heritage List.

National Heritage – An area encompassing Ningaloo Reef, Cape Range and Exmouth Gulf was nominated to the National Heritage List in October 2005. In March 2008, the Australian Heritage Council found that parts of the Ningaloo Reef-Cape Range-Exmouth Gulf nominated area, including Ningaloo Marine Park (State and Commonwealth Waters) and the Muiron Islands Marine Management Area, might have outstanding heritage value to the nation. Following public consultation, the Council will consider recommending the place for inclusion in the National Heritage List. Further information on the Commonwealth and National Heritage lists can be found at <www.environment.gov.au/heritage>.

Figure 3.2 Existing Marine Protected Areas in the North-west Marine Region

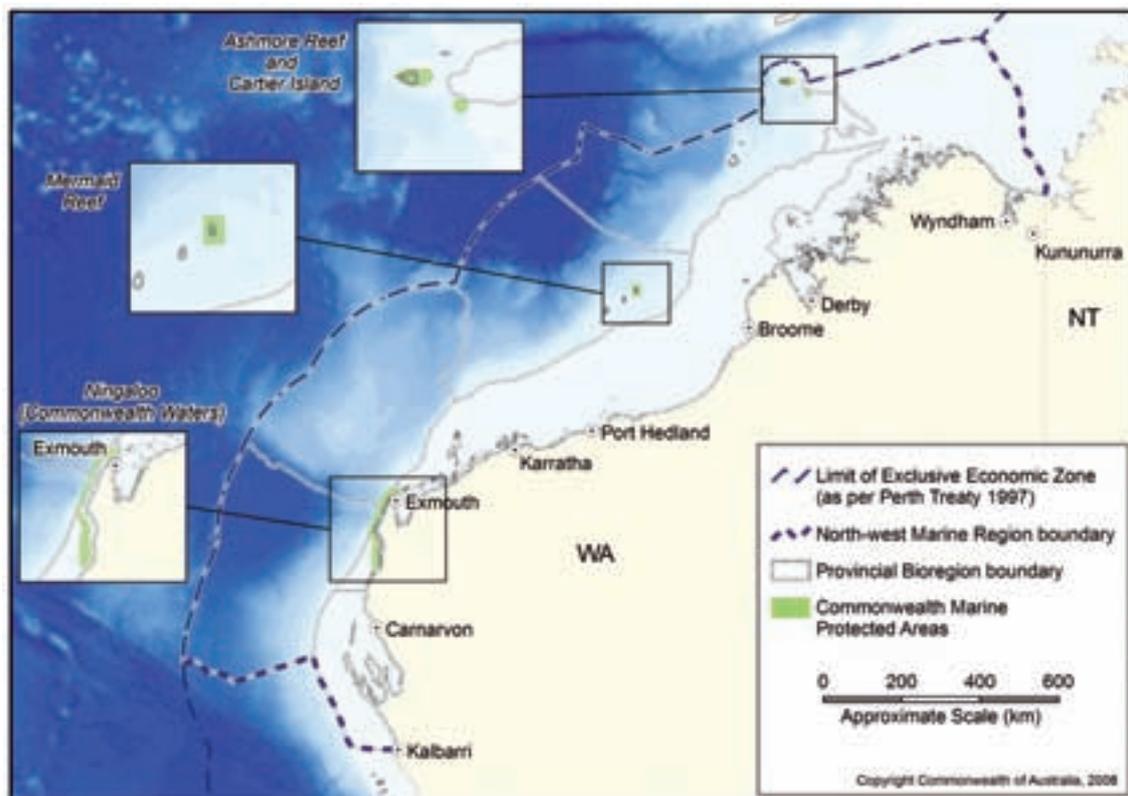
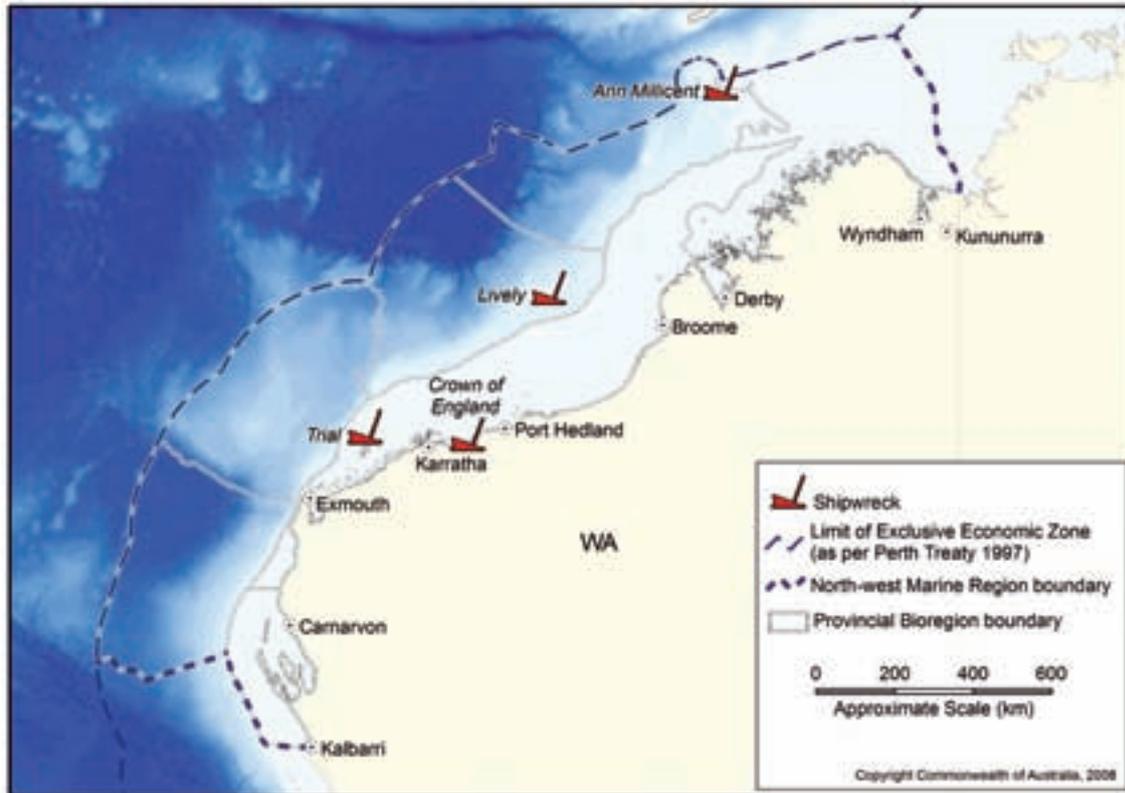


Figure 3.3 Historic shipwrecks of the North-west Marine Region



World Heritage – The Australian Government is committed to also nominating Ningaloo Reef-Cape Range for inclusion on the World Heritage List. The Department of the Environment, Water, Heritage and the Arts is currently preparing the nomination in close consultation with the Western Australian Government. The nominated area is likely to include the entire Ningaloo Marine Park (State and Commonwealth Waters). Further information on the World Heritage List can be found at whc.unesco.org/en/list.

The Shark Bay World Heritage Area lies within State waters adjacent to the Region. This area is recognised for its outstanding natural heritage values including its diverse seagrass assemblages, its large dugong population, and its importance as a resting area for migrating humpback whales, a nesting area for marine turtles, and a nursery habitat for many species of fish and crustaceans. Further information on the Shark Bay World Heritage Area can be found at www.sharkbay.org.

Wetlands of International Importance – Ashmore Reef is included on the list of Wetlands of International Importance under the *Convention on Wetlands of International Importance 1971* (Ramsar Convention) for its variety of marine habitats, its biodiversity, including

populations of threatened or endangered species and ecological communities, its important seabird rookeries, and its role as a staging-post for migratory shorebirds. Three sites in State waters adjacent to the North-west Marine Region are also listed as Ramsar sites: Eighty Mile Beach, Roebuck Bay and the Ord River Floodplain. Eighty Mile Beach and Roebuck Bay support globally significant populations of migratory shorebirds, while the Ord River Floodplain is the most biologically diverse, contiguous floodplain and mangrove system in Western Australia. More information on these sites can be found at www.ramsar.org or on the Western Australian Department of Environment and Conservation website www.dec.wa.gov.au/management-and-protection/wetlands/wa-s-ramsar-sites.html.

Historic Shipwrecks – There are four known historic shipwrecks in the Region (see Figure 3.3). All historic shipwrecks older than 75 years, including any that are as yet undiscovered, are protected under the *Historic Shipwrecks Act 1976*. More information on the *Historic Shipwrecks Act 1976* can be found in Appendix B.



3.3.1 Commonwealth marine reserves in the North-west Marine Region

Ningaloo Marine Park (Commonwealth Waters)

Ningaloo Marine Park (Commonwealth Waters) stretches approximately 300 km along the west coast of the Cape Range Peninsula near Exmouth, and covers 2436 km². The Commonwealth marine reserve is adjacent to the Ningaloo Marine Park (State Waters), which covers 2640 km². Ningaloo Marine Park (Commonwealth Waters) was proclaimed in May 1987 under the *National Parks and Wildlife Act 1975*, which was replaced by the EPBC Act. The park has since been extended twice (in July 1992 and again in April 2004), to include two areas that were formerly the subject of petroleum exploration permits. The State park was also extended in 2004 to include the whole of the Ningaloo Reef within the Marine Park. Ningaloo Marine Park (Commonwealth Waters) is managed cooperatively by the Department of the Environment, Water, Heritage and the Arts, the Western Australian Department of Environment and Conservation and the Western Australian Department of Fisheries.

Ningaloo Reef is one of the longest fringing barrier reefs in the world and has been included on the IUCN List of Coral Reefs of International Significance. As a whole, the combined State and Commonwealth Ningaloo Marine Parks provide a unique representation of an entire marine ecosystem, from the intertidal environments of the coastline to the coral reef and lagoon and the deep oceanic environments of the edge of the continental shelf. The parks lie along a transition zone between tropical northern and temperate southern flora and fauna, with a number of tropical species reaching their southern limit in the parks.

Ningaloo Reef contains a high diversity of corals (more than 200 species), reef fish (more than 460 species), molluscs, crustaceans and other reef plants and animals. Many deepwater pelagic species such as marlin, sailfish and swordfish are also found much closer to shore here than in other parts of Australia and the world, because of the narrow continental shelf and the influence of the Leeuwin Current. More information on the ecology of Ningaloo Reef and surrounding waters can be found in Chapter 2.

The reef also provides important habitat for several threatened or migratory species. Ningaloo is one of the few places in the world where whale sharks congregate

regularly in significant numbers. It is also part of the annual migration route for humpback whales and supports a high density of threatened marine turtles. The area is part of the migratory route of many trans-equatorial shorebirds or waders, and provides valuable feeding grounds for many migratory seabirds. It is also an important feeding area for manta rays in autumn and winter.

Under the EPBC Act, Commonwealth marine reserves are assigned to an IUCN protected area category reflecting the management objectives for each reserve (see <www.environment.gov.au/parks/iucn.html> for more information on the IUCN's reserve categories). The Ningaloo Marine Park (Commonwealth Waters) is managed as an IUCN Category II – National Park: Protected Area Managed Mainly for Ecosystem Conservation and Recreation. As such, commercial fishing, petroleum and mining activities are not permitted. A range of other activities such as recreational fishing and commercial tourism activities are allowed under permit from the Director of National Parks.

The EPBC Act also prohibits actions affecting native species inside the park unless authorised under the *Ningaloo Marine Park (Commonwealth Waters) Management Plan 2002* (EA 2002). Further information on the Ningaloo Marine Park is available at <www.environment.gov.au/coasts/mpa/ningaloo>.

Mermaid Reef Marine National Nature Reserve

Mermaid Reef is the most northerly reef of the Rowley Shoals, which lie 300 km west of Broome. The reserve was established in March 1991 by proclamation under the *National Parks and Wildlife Conservation Act 1975*, which was replaced by the EPBC Act. The Mermaid Reef Marine National Nature Reserve covers a total area of 5.4 km², including the seabed and subsurface to a depth of 1000 m.

The two other reefs in the Rowley Shoals, Clerke Reef and Imperieuse Reef, include permanent sand cays above the high water mark and fall under State jurisdiction. These two reefs constitute the Rowley Shoals Marine Park, which was declared as a Class A Marine Reserve by the West Australian Government in 1990. The Department of the Environment, Water, Heritage and the Arts manages Mermaid Reef National Nature Reserve through a cooperative management arrangement with the Western Australian Department of Environment and

Conservation and the Western Australian Department of Fisheries.

The Rowley Shoals, including Mermaid Reef, have national and international significance due to their relatively pristine character, geomorphological interest and diverse fauna, including many species of molluscs, echinoderms and finfish which have not been recorded elsewhere in Western Australia, and which reflect the shoals' strong links with Indonesian fauna. It is thought that the shoals are an important stepping stone in maintaining gene flow among the northwest Australian coastal reefs. The reefs have been listed on the IUCN List of Coral Reefs of International Significance and are considered to be the best examples of shelf-edge oceanic reefs in Australian waters. The remote location of the reefs means that they do not have a history of disturbance by coral predators, such as the crown-of-thorns starfish.

The Mermaid Reef Marine National Nature Reserve is classified as an IUCN Category Ia – Strict Nature Reserve. As such, the reef is managed primarily for scientific research, limited commercial tourism and educational purposes, and is closed to all forms of fishing and collecting. The Mermaid Reef Management Plan (EA 2000) expired on 16 May 2007, and a draft management plan will be released for public comment in 2008. Until the new plan takes effect, the reserve is being managed in a manner consistent with its IUCN Category Ia classification, under approvals issued by the Director of National Parks. Further information on the Mermaid Reef National Nature Reserve is available at www.environment.gov.au/coasts/mpa/mermaid.

Ashmore Reef National Nature Reserve and Cartier Island Marine Reserve

Ashmore Reef and Cartier Island lie off the coast of northern Western Australia approximately 600 km north of Broome. The Ashmore Reef National Nature Reserve was established in August 1983 under the *National Parks and Wildlife Act 1975*, which was replaced by the EPBC Act. The Ashmore Reef National Nature Reserve covers an area of approximately 583 km², and was designated as a Wetland of International Importance under the Ramsar Convention on 21 October 2002.

Cartier Island Marine Reserve, approximately 45 km to the south-east of Ashmore Reef, was established in June 2000 (also under the *National Parks and Wildlife Act 1975*) and covers approximately 167 km².

These reserves protect unique and vulnerable marine ecosystems with high biological diversity which, like the Rowley Shoals, are thought to be important biological stepping-stones between centres of biodiversity in the Indo-Pacific and reef ecosystems on the North West Shelf – possibly playing an important role in the maintenance of biodiversity in reef systems farther south.

The Ashmore Reef and Cartier Island reserves protect critical habitat for an unusually high diversity and abundance of sea snakes, and provide feeding and breeding areas for three species of marine turtle. Ashmore Reef is an important staging post for many migratory shorebirds and supports substantial seabird breeding colonies. The reef also supports a small population of dugongs that is thought to be genetically distinct from other Australian populations.

Both reserves include the seabed and substrate to a depth of 1000 m. The two reserves lie within an area subject to a Memorandum of Understanding (MoU) between Indonesia and Australia which provides for continued Indonesian traditional fishing activities in an area known as the MoU Box. The MoU Box also includes Scott Reef and Seringapatam Reef. More information on the MoU can be found in Appendix A.

As a result of its proximity to Indonesia and the MoU arrangements allowing traditional Indonesian fishing in the MoU Box, Ashmore Reef is frequently visited by traditional Indonesian fishermen. Although no commercial fishing is allowed in Ashmore, traditional fishermen do visit the area to shelter, obtain fresh water from the well on West Island and visit grave sites. The Department of the Environment, Water, Heritage and the Arts and the Australian Customs Service work together to inform users about the rules of the reserves. The *Ashmore Guardian* has been stationed at Ashmore Reef since April 2008 and provides a near permanent presence to ensure the reefs' protection.

Cartier Island Marine Reserve and the majority of Ashmore Reef National Nature Reserve are classified as IUCN Category Ia – Strict Nature Reserve, and are closed to the public. At Ashmore, West Island Lagoon and part of West Island is zoned as IUCN Category II – National Park. Visits to the reserves are limited to this area, although historically there have been few visitors to the reserves. Commercial fishing and oil and gas exploration are not allowed in the reserves, and commercial tourism and scientific research must be conducted under a permit. Cartier Island and the surrounding area within



a 10 km radius is a declared Defence Practice Area, although it is not currently in active use.

Due to the risk of unexploded ordinance, visitor access to Cartier Island is prohibited and the area is closed to shipping. These reserves are managed under the *Ashmore Reef National Nature Reserve and Cartier Island Marine Reserve Management Plan* (EA 2002), which expires in June 2009. As with other Commonwealth marine reserves, it is prohibited under the EPBC Act to kill, injure, take, trade, keep or move a member of a native species in these reserves except in accordance with the management plan. Further information on the Ashmore Reef National Nature Reserve and the Cartier Island Marine Reserve is available at www.environment.gov.au/coasts/mpa/ashmore.

3.3.2 Historic shipwrecks

Most historic shipwrecks are found in State waters. However, there are four historic shipwrecks which are known or believed to lie within the Commonwealth waters of the North-west Marine Region. These are:

- the **Trial**, which is the earliest known shipwreck in Australian waters. It is an English East Indian ship wrecked on Trial Rocks north of the Montebello Islands in 1622, on its way to the port of Batavia in Indonesia from Plymouth in England;
- the **Lively**, an English whaler vessel believed wrecked on the western edge of Mermaid Reef in 1818;
- the **Ann Millicent**, an iron hulled barque wrecked on the southern reef edge of Cartier Island in 1888; and
- the **Crown of England**, foundered during a cyclone at Depuch Island in 1912.

It should be noted that information about the location of shipwrecks is often approximate and that other historic shipwrecks may yet be discovered within the Region.

Historic shipwrecks are recognised and protected under the *Historic Shipwrecks Act 1976*, which protects historic wrecks and associated relics found in waters from the low water mark to the edge of the continental shelf. Under the *Historic Shipwrecks Act*, all wrecks more than 75 years old are protected, together with their associated relics. The Minister for the Environment, Heritage and the Arts can also make a declaration to protect any historically significant wrecks or articles and

relics that are less than 75 years old. More information on the *Historic Shipwrecks Act* can be found in Appendix B.

The Act aims to ensure that historic shipwrecks are protected for their heritage values and maintained for recreational and educational purposes. It also regulates activities that may result in the damage, interference, removal or destruction of an historic shipwreck or associated relic. Under the *Historic Shipwrecks Act*:

- anyone who finds the remains of a ship or articles associated with a ship is required to give notification of the location as soon as practicable to the Minister for the Environment, Heritage and the Arts; and
- historic relics must not be removed, or the physical fabric of a wreck disturbed, unless a permit has been obtained.

The Act also provides for protected zones to be declared around wrecks that may be at particular risk of being interfered with. Permits are required to enter protected zones, which can cover an area up to a radius of 800 m. There are currently no declared protected zones under the *Historic Shipwrecks Act* in the North-west Marine Region. The only protected zone in Western Australia is in State waters adjacent to the Region around the wreck of the *Zuytdorp*, a Dutch East India Company ship wrecked on the Western Australian coast north of Kalbarri.

Further information about historic shipwrecks and the *Historic Shipwrecks Act* can be found at www.environment.gov.au/heritage/shipwrecks.



Coral at Ashmore Reef. Photo: Kriton Glenn, Department of the Environment, Water, Heritage and the Arts.

3.4 Consideration of pressures on regional conservation values

There is a range of pressures currently impacting or likely to impact upon conservation values in the Region. While Appendix D describes some of the threats relevant to species listed under the EPBC Act, threats to all conservation values will be considered in detail in the next stage of the bioregional planning process, the development of the Draft Marine Bioregional Plan.

Australia's marine biodiversity is under increasing pressure from many uses of the marine environment including fisheries, shipping, petroleum and mineral extraction, tourism and recreation. Pressures from changing land use, including agricultural and urban run-off and coastal development, also exist. Climate change is an increasingly significant concern (see Box 3.1). Increasing population globally, regionally and locally will also result in increasing threats to biodiversity and pressures on resources.

Australia's oceans have been the subject of significant recent research activity but large gaps in our knowledge remain. Based on available knowledge, Australia's marine biodiversity is probably in better condition than that of many other countries. However, despite the combined efforts of Australia's governments, industries, stakeholders and the community, there are significant concerns with decline in some key species and localised impacts on habitats and populations.

Despite limitations in knowledge about marine biodiversity and habitats, their current condition and the pressures affecting them, sufficient evidence exists to conclude that a cumulative decline in marine biodiversity is occurring. The effects of a number of threatening processes are causing declines in habitats, changes in ecosystems and loss of species. The key pressures on marine biodiversity include: climate change, resource use, land-based impacts, introduced marine pest species, and marine pollution.

An overview of the types of pressures impacting on marine biodiversity can be found in the 'Coasts and Oceans' chapter of the 2006 *State of the Environment Report* at www.environment.gov.au/soe/2006/publications/report/coasts.html.

The information collected during the profiling stage will inform an assessment of the pressures on the regional conservation values described in this chapter as well

as options for addressing them. Chapter 6 contains more information about how and when in the process stakeholders' input will be sought to inform the development of the plan.

Box 3.1 Climate change impacts on marine life

The 2006 CSIRO report *Impacts of Climate Change on Australian Marine Life* <www.greenhouse.gov.au/impacts/publications/marinelife.html> provides an overview of the potential impacts of climate change on marine biodiversity and ecosystems.

Climate change is expected to have considerable impacts on marine life and marine ecosystems. There will inevitably be flow-on implications for human societies and economies, particularly those in regional Australia highly dependent on the marine environment and its resources.

Evidence from Australian waters is sparse, mainly due to a lack of historical long-term data collection. Importantly, little modelling has been conducted to predict future changes in Australian marine ecosystems and this remains a critical gap.

Three general findings emerged from this study:

- Firstly, although particular factors such as temperature stand out as prominent drivers of observed changes in Australia's marine flora and fauna, it is the combined effects of multiple climate and oceanographic factors that will shape Australia's marine life in the future;
- Secondly, Australia's marine life is currently affected strongly by non-climate related stressors such as fisheries, coastal runoff and pollution, and the ecological effects of these stressors will serve to reduce ecosystem resilience to climate change. An integrated and adaptive management approach is required to deal with these combined effects; and
- Finally, both monitoring time series data and modelling of climate change impacts in Australia's marine ecosystems are extremely limited at present, and represent crucial components of a strategic national assessment of climate change impacts that can inform development of policy and management strategies.



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Partnership for the Conservation of Migratory Waterbirds and the Sustainable Use of their Habitats in the East Asian Australasian Flyway (Flyway Partnership).

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Map data

Figure 3.1 Key Ecological Features of the North-west Marine Region

Australian Bureau of Statistics (1991): Australia, Populated Places
 Department of the Environment, Water, Heritage and the Arts (2006): Commonwealth Marine Planning Regions
 Department of the Environment, Water, Heritage and the Arts (2006): Integrated Marine and Coastal Regionalisation of Australia v4.0 - Provincial Bioregions
 ESRI Australia Pty Ltd (Canberra) (2001): ARCWORLD Map of the World 1:20 million
 Geoscience Australia (1998): Australia, TOPO-2.5M Topographic Data - Coast and State Borders
 Geoscience Australia (2005): Australian Bathymetry and Topography
 Geoscience Australia (2006): Australian Maritime Boundaries (AMB) v2.0
 Projection: Geographics, Datum: GDA94
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Figure 3.2 Existing Marine Protected Areas in the North-west Marine Region

Australian Bureau of Statistics (1991): Australia, Populated Places
 Department of the Environment, Water, Heritage and the Arts (2006): Commonwealth Marine Planning Regions
 Department of the Environment, Water, Heritage and the Arts (2006): Integrated Marine and Coastal Regionalisation of Australia v4.0 - Provincial Bioregions
 Department of the Environment, Water, Heritage and the Arts (2007): Commonwealth Marine Protected Areas Managed by DEWHA
 ESRI Australia Pty Ltd (Canberra) (2001): ARCWORLD Map of the World 1:20 million
 Geoscience Australia (1998): Australia, TOPO-2.5M Topographic Data - Coast and State Borders
 Geoscience Australia (2005): Australian Bathymetry and Topography

Geoscience Australia (2006): Australian Maritime Boundaries (AMB) v2.0
 Projection: Geographics, Datum: GDA94
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Figure 3.3 Historic Shipwrecks of the North-west Marine Region

Australian Bureau of Statistics (1991): Australia, Populated Places
 Department of the Environment, Water, Heritage and the Arts (2003): Historic Shipwrecks Register Points
 Department of the Environment, Water, Heritage and the Arts (2006): Commonwealth Marine Planning Regions
 Department of the Environment, Water, Heritage and the Arts (2006): Integrated Marine and Coastal Regionalisation of Australia v4.0 - Provincial Bioregions
 Department of the Environment, Water, Heritage and the Arts (2007): Commonwealth Marine Protected Areas Managed by DEWHA
 ESRI Australia Pty Ltd (Canberra) (2001): ARCWORLD Map of the World 1:20 million
 Geoscience Australia (1998): Australia, TOPO-2.5M Topographic Data - Coast and State Borders
 Geoscience Australia (2005): Australian Bathymetry and Topography
 Geoscience Australia (2006): Australian Maritime Boundaries (AMB) v2.0
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Barrel sponge (*Xestospongia testudinaria*) in 70 m of water off Mermaid Reef, Rowley Shoals. Photo: CSIRO.