Eighty Mile Beach Marine Park

management plan 80
2014 – 2024

Department of Parks and Wildlife

Kimberley Science and Conservation Strategy Parks

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Left Ngarla country. Photo – Steve Bunce

Centre Karajarri artwork – Frederick Shovellor

Right Nyangumarta artwork – Tracey Taylor

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Contents

List of tables

Executive summary

Eighty Mile Beach Marine Park, the 13th marine park in the State, was gazetted on 29 January 2013. It covers an area of approximately 200,000ha and will make a significant contribution to Western Australia's representative system of multiple-use marine parks and reserves. This management plan outlines the management arrangements for Eighty Mile Beach Marine Park, which will conserve the area's marine biodiversity and cultural heritage, and provide a range of opportunities for commercial and recreational use, including nature-based tourism.

Eighty Mile Beach is an extensive stretch of remote and remarkable coastal country located between Port Hedland and Broome, stretching for some 220km from Cape Missiessy to Cape Keraudren. The marine park includes Eighty Mile Beach, Cape Keraudren and the diverse marine environments west of Cape Keraudren to Mulla Mulla Down Creek.

Eighty Mile Beach Marine Park will be jointly managed with traditional owners through the establishment of joint management arrangements. The long-standing connections, rights and interests of traditional owners have been recognised through native title determinations for the lands and waters in and adjacent to Eighty Mile Beach Marine Park for the Karajarri, Nyangumarta and Ngarla people.

The marine park contains vast intertidal sand and mudflats that extend up to 4km wide at low tide and provide a rich source of food for many species. Eighty Mile Beach is one of the world's most important feeding grounds for migratory shorebirds and is a major nesting site for flatback turtles, which are only found in northern Australia. Both are critical components of the Eighty Mile Beach Ramsar site, and the management plan seeks to maintain its ecological character.

The park's social and economic values include nature-based recreation and tourism, and recreational and commercial fishing, which occur within the distinctive seascapes of the marine park and in the adjoining landscape. Eighty Mile Beach Caravan Park, Cape Keraudren Coastal Reserve, Pardoo Station and adjoining areas provide key focus points for visitors to access and enjoy the area.

The management plan outlines the cultural, ecological and social and economic values of the marine park, the seven management programs to be applied, and the management objectives, targets and performance measures that will be used to track progress against the stated objectives over the life of the plan. It is an outcome-based approach that provides a robust framework to support adaptive marine park management.

The key outcomes of this management plan are outlined below.

- The gazettal of a Class A marine park over coastal waters of Eighty Mile Beach, from Mulla Mulla Down Creek in the south to Cape Missiessy at the northern end of Eighty Mile Beach, extending from high water to the limit of Western Australia coastal waters.
- Joint management of the marine park with traditional owners.
- The establishment of a zoning scheme that includes sanctuary (approximately 24 per cent), recreation (approximately 2 per cent), special purpose (approximately 2 per cent) and general use (approximately 72 per cent) zones. This multiple-use approach meets a range of aspirations for biodiversity conservation, cultural heritage protection, recreational and commercial uses, nature appreciation, scientific study and public enjoyment.
- A management framework that provides for the protection and conservation of the area's cultural and heritage value to Aboriginal people, and the first marine park in Western Australia to include special purpose zones (cultural heritage), which provide additional recognition and protection of sites of cultural significance.
- A range of objectives and actions in seven management programs that work to achieve nature conservation, cultural heritage protection and sustainable use.
- A collaborative approach to management, particularly between Joint Management Bodies, the Department of Parks and Wildlife and the Department of Fisheries.
- Prioritised and coordinated research and monitoring programs to support adaptive management, auditing and reporting processes.
- Extensive provision of near-shore fishing opportunities.

1 Introduction

1.1 Marine parks and reserves: special marine places

The State Government is progressively establishing a representative system of multiple-use marine parks and reserves in Western Australia. Marine parks help to conserve marine biodiversity and cultural heritage and provide special places for people to enjoy, appreciate and learn about the spectacular marine life of Western Australia.

In June 2011, the State Government released the Kimberley Science and Conservation Strategy. The centrepiece of the strategy is the Kimberley Wilderness Parks, which will become the State's largest interconnected system of marine and terrestrial reserves, covering more than five million hectares. A key component of this initiative was the commitment to establish four new marine parks at Camden Sound, Eighty Mile Beach, Roebuck Bay and in the north Kimberley. In January 2013, the government announced its intention to create a fifth new Kimberley marine park at Horizontal Falls.

The marine park also contributes to the National Representative System of Marine Protected Areas (NRSMPA). The NRSMPA is being cooperatively developed by government agencies responsible for conservation, protection and management of the marine environment. Development of the NRSMPA helps fulfil Australia's responsibilities and obligations under several international conventions and bilateral agreements, as well as supporting the International Union for the Conservation of Nature's (IUCN) Protected Areas Program.

Under the *Conservation and Land Management Act 1984* (CALM Act), marine parks and reserves are vested in the Marine Parks and Reserves Authority (MPRA). The MPRA has a statutory function under the CALM Act to prepare management plans for marine parks and reserves through the Department of Parks and Wildlife (Parks and Wildlife) and to assess the implementation of management plans.

1.2 Eighty Mile Beach Marine Park

Eighty Mile Beach Marine Park is the second park to be reserved under the Kimberley Wilderness Parks initiative. Lalang-garram / Camden Sound Marine Park was gazetted on 19 June 2012.

The management plan for Eighty Mile Beach Marine Park describes the cultural, ecological, social and economic values of the marine park and its management objectives, strategies, performance measures and targets. The plan facilitates the conservation of these values, to ensure that existing and future pressures are managed within an ecologically sustainable framework, in a culturally appropriate manner, and to provide continued opportunities for social benefits and enjoyment.

The marine park plan also serves to meet the management planning requirements for a portion of the Eighty Mile Beach Ramsar site. The Ramsar site includes all of the intertidal areas of Eighty Mile Beach (the beach section) and Mandora Salt Marsh, a diversity of wetland types located 40km inland. The management plan is consistent with Australia's obligations under the Ramsar Convention and with the Australian Ramsar management principles.

1.3 Coastal and saltwater country

'The Dreaming' is a key concept in connecting Aboriginal people and their environment. Stories, songlines and sites are embedded within the Eighty Mile Beach and Cape Keraudren areas and remain a powerful spiritual force for the Karajarri, Nyangumarta and Ngarla people. Land, sea and Aboriginal culture are interconnected.

The traditional owners[1] of the marine park have lived on and remain connected to the land, plants, spirits and animals of their traditional country since the beginning of time (Yamatji Marlpa Aboriginal Corporation 2010). According to the traditional owners, ancestral beings from 'The Dreaming' created the physical environment:

[1]Traditional owners are Aboriginal people who belong to, have the right to speak for, and have spiritual responsibilities for the care of a certain place or places based on their own laws and customs. Traditional owners may be directly descended from the original inhabitants of the land and may also be the common law holders of native title for the country being discussed.

the land, sea, sand dunes, freshwater springs, rivers and creeks. At the same time, these ancestral beings also created the law, culture and language (Karajarri Traditional Owners *pers. comm.*).

Nyangumarta people regard looking after plants and animals in their coastal and sea country as a priority. The protection of and respect for cultural sites, stories and songlines is also viewed as being very important. Aspirations for their coast and sea country are best summed up by the phrase '*ngalpa warran, ngalpa marrngu*', which translates to 'healthy country, healthy people' (Nyangumarta Traditional Owners *pers. comm.*). The Nyangumarta also hope to increase understanding about their culture and the connection they have with the land and sea.

> *As Nyangumarta people we have a holistic approach to land management. We see protection of our law, culture, language and traditional knowledge as vital for the maintenance of the natural environment. The landscape, plants and animals within our country have been inseparable from our law, culture, language and traditional knowledge since the creation, or* manguny*, time. Nyangumarta people and Nyangumarta country are indivisible.*
>
> Nyangumarta People 2012

The Karajarri worldview also revolves around looking after 'country' as reflected in the Karajarri expression '*palanapayana tukjanu ngurra*', 'everybody looking after country properly' (Karajarri Traditional Owners *pers. comm.*). For Karajarri people 'country' embraces the entirety of their social practices and belief systems. The Karajarri believe that before the time known as *pukarrikarrajanka* (Dreaming time) there was nothing. But with the *pukarrikarrajanka* the *pukarrikarra* (ancestral beings) created the law, culture, language and country and inscribed the country with meaning. The *pukarrikarra* created all of the physical environment and the seasons, for example, the season from April to September, when the *walpurur* (south-easterly winds) summon the salmon. They also created the Karajarri and all of the natural resources which allowed the Karajarri to survive in their country, while entrusting them to look after it (Karajarri Traditional Owners *pers. comm.*).

The traditional owners believe that, since 'The Dreaming', spiritual beings continue to inhabit specific places within their traditional country. For example, the area of the marine park contains spiritually significant water sites for both the Karajarri and Nyangumarta people. Many of these sites are described as being inhabited by *pulany* (spirit snakes). In fact, many traditional owner groups in western and northern Australia identify water sources as "being culturally significant spiritual places, to which individuals have close, personal relationships" (Yu 1999).

Pulany are described by Yu (1999) as water snakes or serpents who reside in permanent water sources, and may also reside in the sea. Many *pulany* sites are in areas where water sites are generally lacking and, as well as being culturally important, are also an important source of water (Yu 1999). The Karajarri believe that *pulany* are present on the land (at permanent water sources) and in the sea, including at sites around the marine park. The creation of the sea by *pukarrikarra* is restricted knowledge which is only revealed in law ceremonies (Karajarri Traditional Owners *pers. comm.*).

Both the Nyangumarta and the Karajarri people regard *pulany* as powerful beings who are to be respected and approached in prescribed ways (Yu 1999). The Karajarri people believe that *pulany* can exhibit human emotions, such as anger, which can be manifested as violent storms, lightning, wild winds and cyclones.

> *All* pulany *have the capacity to smell strangers, that is, people who do not come from that particular country. They also have distinctive personalities. Some are very 'cheeky' – dangerous and unpredictable. Others are docile… Evidence of an active* pulany *is the formation of clouds and the generation of storms with lightning and rain... Angry* pulany *reveal themselves in violent storms, with lightning and wild winds, or they may generate cyclones. Most of all, they can be unpredictable and wilful and therefore extremely dangerous.*
>
> Yu 1999

Pulany can also be upset by some human behaviour such as when people break subsistence laws, which require that they only take enough fish for their basic needs, and sufficient shells for ritual ceremonies (Karajarri Traditional Owners *pers. comm.*). Traditional owners practice water blowing ceremonies to introduce strangers to *pulany* sites.

> *Visitors to Karajarri country need to be aware that sometimes their actions can also unintentionally upset* pulany *who know that they do not belong to the country. Certain culturally sensitive areas are considered dangerous to outsiders and as such access to them is restricted. Traditional owners have an obligation to protect visitors and to ensure that they respect the law, and so visitors should consult with Karajarri people about where they can go and what activities they can undertake. These laws are part of the wider responsibilities put in place by* pukarrikarra *to ensure the health and wellbeing of the country.*
>
> Karajarri Traditional Owners *pers. comm.*

The Nyangumarta People (2012) believe that looking after the *pulany* sites involves:

- passing on knowledge of them to our young people, including relevant songs and stories
- protecting them from harm
- following strict protocols when visiting them, including:
  - being introduced to the spirit of the Nyangumarta language by a Nyangumarta person
  - performing a water blowing ceremony known as *wirripilipini* (blowing the water)
  - behaving in an appropriate manner and not disturbing the spirit.

As well as sites of spiritual significance, there are important sites for other cultural reasons. For example, special sites known as 'increase sites' are located throughout Karajarri country. Adjacent to the marine park there is an increase site for catfish.

"At such sites, rituals are undertaken to ensure that there are abundant numbers of the species and that numbers are renewed" (Karajarri Traditional Owners *pers. comm.*).

Traditional hunting and fishing are important cultural activities for the traditional owners of the marine park. The Ngarla and Nyangumarta groups have identified several traditional fishing and crabbing sites inside the marine park (Ngarla Traditional Owners *pers. comm.*; Nyangumarta Traditional Owners *pers. comm.*). As well as fish, for the Karajarri people, *pinka* (baler shells) are an important sea country resource. They are used to collect and store freshwater from springs, soaks and rock holes located at the numerous camp sites inland from the coast, allowing the Karajarri people to utilise resources from both the land and sea (Karajarri Traditional Owners *pers. comm.*). The Karajarri people describe how baler shells are left near water sources inland from the coast to mark places where water can be found by traditional owners and other Aboriginal people passing through the area (Karajarri Traditional Owners *pers. comm.*).

> *If you go in the desert and you see a baler shell, it means there is water close by.*
>
> Karajarri Traditional Owners *pers. comm*

1.4 Joint management with traditional owners

Eighty Mile Beach Marine Park will be managed in partnership with traditional owners through joint management bodies (JMBs). To enable this to occur, joint management agreements (JMAs), established under the CALM Act, are to be attached to this management plan.

This management plan requires the Chief Executive Officer (CEO) of the department to jointly manage the marine park with the Nyangumarta and Ngarla Traditional Owners in accordance with the JMAs attached to this management plan.

At the time of publication, the Government is negotiating with the Karajarri native title holders for Indigenous land use and joint management arrangements for Karajarri country. It is intended that similar

discussions will also occur for the shared Nyangumarta-Karajarri native title determination area. This management plan can be amended to require the CEO of the department to jointly manage the relevant portions of the marine park with the Karajarri and Nyangumarta-Karajarri Traditional Owners once the relevant JMAs have been finalised. The JMAs would be attached to the amended management plan.

The CALM Act includes a management objective to protect and conserve the value of the land (and waters) in relation to the culture and heritage of Aboriginal people. Both the CALM Act and the *Wildlife Conservation Act 1950* (Wildlife Act) also enable Aboriginal people to continue to carry out customary activities such as fishing and hunting on lands and waters managed by the department, including the marine park. Within the marine park, customary activities such as fishing and hunting should only be conducted on country by recognised traditional owners, or where traditional owners have provided consent to another Aboriginal person or group.

Both the Western Australian Government and the traditional owners of the marine park are committed to the conservation of the values of the area. This management plan and joint management arrangements take into account the values, aspirations and management objectives articulated in a number of traditional owner documents such as Healthy Country plans.

Nyangumarta Traditional Owners overlooking coastal waters of the marine park. Photo – Chris Nutt/Parks and Wildlife

2 Definition of the area

2.1 Marine park location

Eighty Mile Beach Marine Park is located off the north-west coast of Western Australia, between Port Hedland and Broome, about 1,700km north of Perth (Map 1). It covers an area of approximately 200,000ha and extends for nearly 260km along the coast from its south-western end approximately 12km west of Pardoo Creek (at longitude 119°28'18" east), past Cape Keraudren and along Eighty Mile Beach, to its north-eastern end at Cape Missiessy (at latitude 19°02'36" south). The marine park generally extends seaward from the high water mark[2] to the limit of coastal waters of Western Australia and includes the waters, the airspace above those waters, the seabed below those waters, and the subsoil to a depth of 200m below the seabed.

2.2 Native Title and reserve tenure

Traditional owners have determined native title rights and interests based on their strong and ongoing connections to the broader Eighty Mile Beach and Cape Keraudren areas. The Karajarri people's native title determination is located at the northern end of the marine park, the Nyangumarta people's over the middle section of Eighty Mile Beach, and the Ngarla people's in the vicinity of Cape Keraudren. The Karajarri and Nyangumarta people also have a joint native title determination in the northern section of the marine park, over Anna Plains Station (Map 2).

> *As the* pukjarrijarra *(Karajarri ancestral beings) travelled through the country around the marine park area they changed from speaking Nyangumarta to Karajarri and, as they continued north through Karajarri country, they gave names to everything in the sea and on the land. Therefore, traditionally there are a number of places where the Nyangumarta country overlapped with the Karajarri country. In such areas, the Nyangumarta and Karajarri would share rights to resources including access to fishing and freshwater sites, and to camping spots. For these reasons, decision making in the area of the marine park where the language groups overlap requires consultation with both Nyangumarta and Karajarri elders.*
>
> Karajarri Traditional Owners *pers. comm*

This management plan sets the framework for the marine park to extend to the high water mark wherever possible. However, the initial reservation action (on 29 January 2013) was to gazette the marine park boundary seaward of the lowest astronomical tide, pending negotiation of ILUAs with native title holders. Reservation of intertidal areas between the lowest astronomical tide and high water mark as marine park is a 'future act' under the Commonwealth *Native Title Act 1993*.

Intertidal areas represent a significant portion of the Eighty Mile Beach Marine Park. The site is characterised by extensive sand and mudflats, which in turn support many of the ecological values of the marine park. In addition, many marine-related activities such as fishing, reef walking and wildlife viewing occur within the intertidal areas. Accordingly, intertidal areas and related management programs for those areas are included in this management plan to ensure that these values are appropriately protected and managed.

Once Indigenous Land Use Agreements (ILUAs) have been agreed with the native title holders and registered with the National Native Title Tribunal, future reservation actions will reserve the park to high water mark.

Currently, a 40m-wide coastal strip of unallocated Crown land (UCL) extends along most of the boundary of the marine park between the high-water mark and adjacent pastoral leases (Anna Plains, Mandora, Wallal and Pardoo stations) (Map 3). As part of the 2015 Pastoral Lease Renewals project, some areas of pastoral lease abutting this strip of UCL will be excised and resumed by the State Government. These areas have been identified as having coastal conservation values that complement the marine park. It is intended that these areas will be held as UCL with a view to future reservation under the CALM Act as conservation estate managed jointly with traditional owners.

[2] High water mark is the ordinary (mean of) high water mark at spring tides, as defined by the *Land Administration Act 1997*.

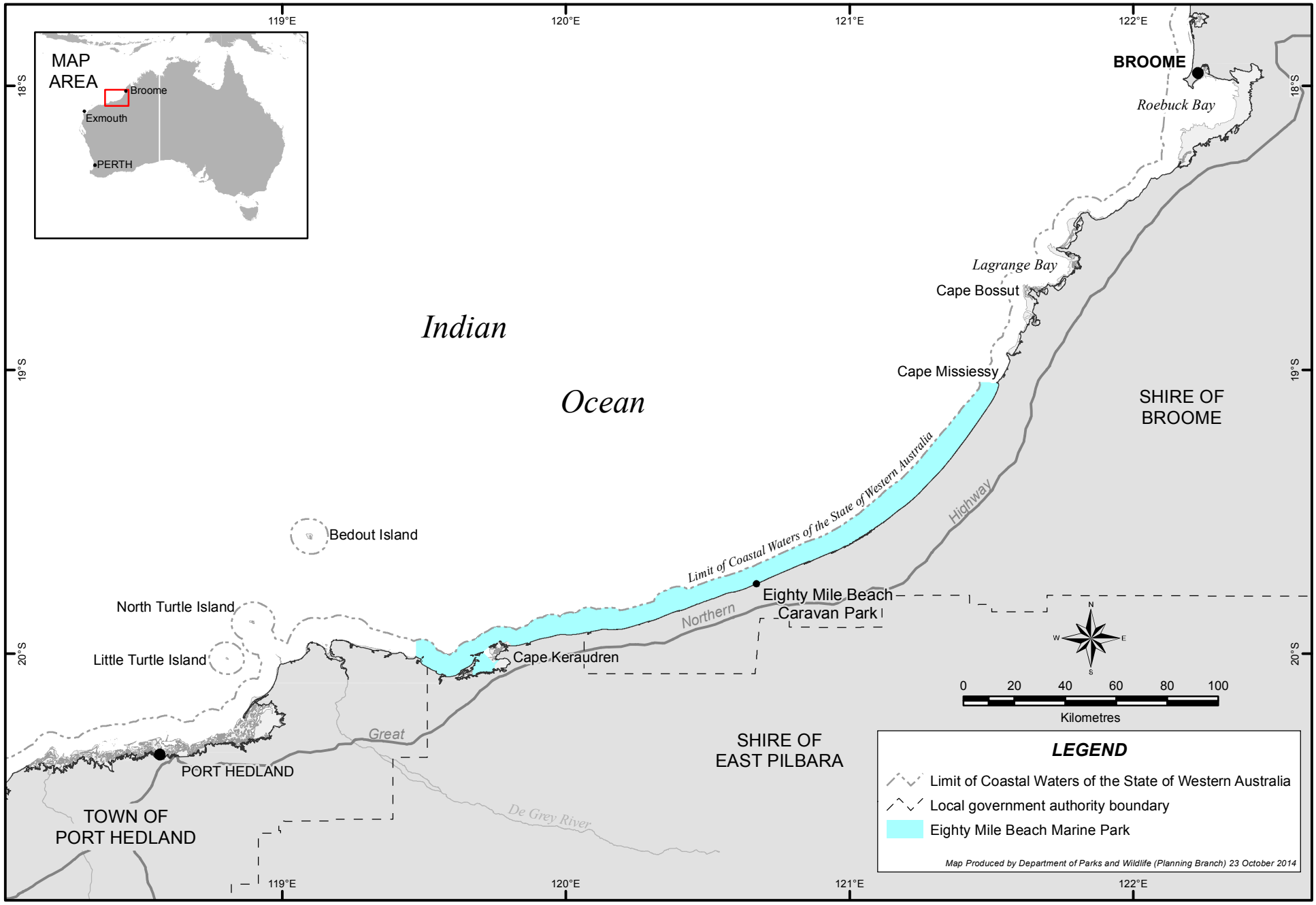
Several other reserves abut the boundaries of the marine park. Reserve 39135 is a recreation reserve vested in the Shire of East Pilbara at Cape Keraudren that extends to the low water mark. Other reserves that were gazetted around the 1900s, primarily for the purposes of watering or resting places for stock, also abut the boundary of the marine park. Some of these terrestrial reserves extend into the intertidal zone, including Reserve 376, a public purposes reserve that overlies some of the Banningarra Creek area; and Reserve 1528, a watering place along Anna Plains Station. These reserves may be considered in the future for relinquishment and eventual incorporation into the marine park.

2.3 Security of tenure

Eighty Mile Beach Marine Park is a Class A reserve, which means that any changes to the boundaries of the park require the tabling of a reservation order in both Houses of Parliament. Class A reservation provides the highest security of tenure.

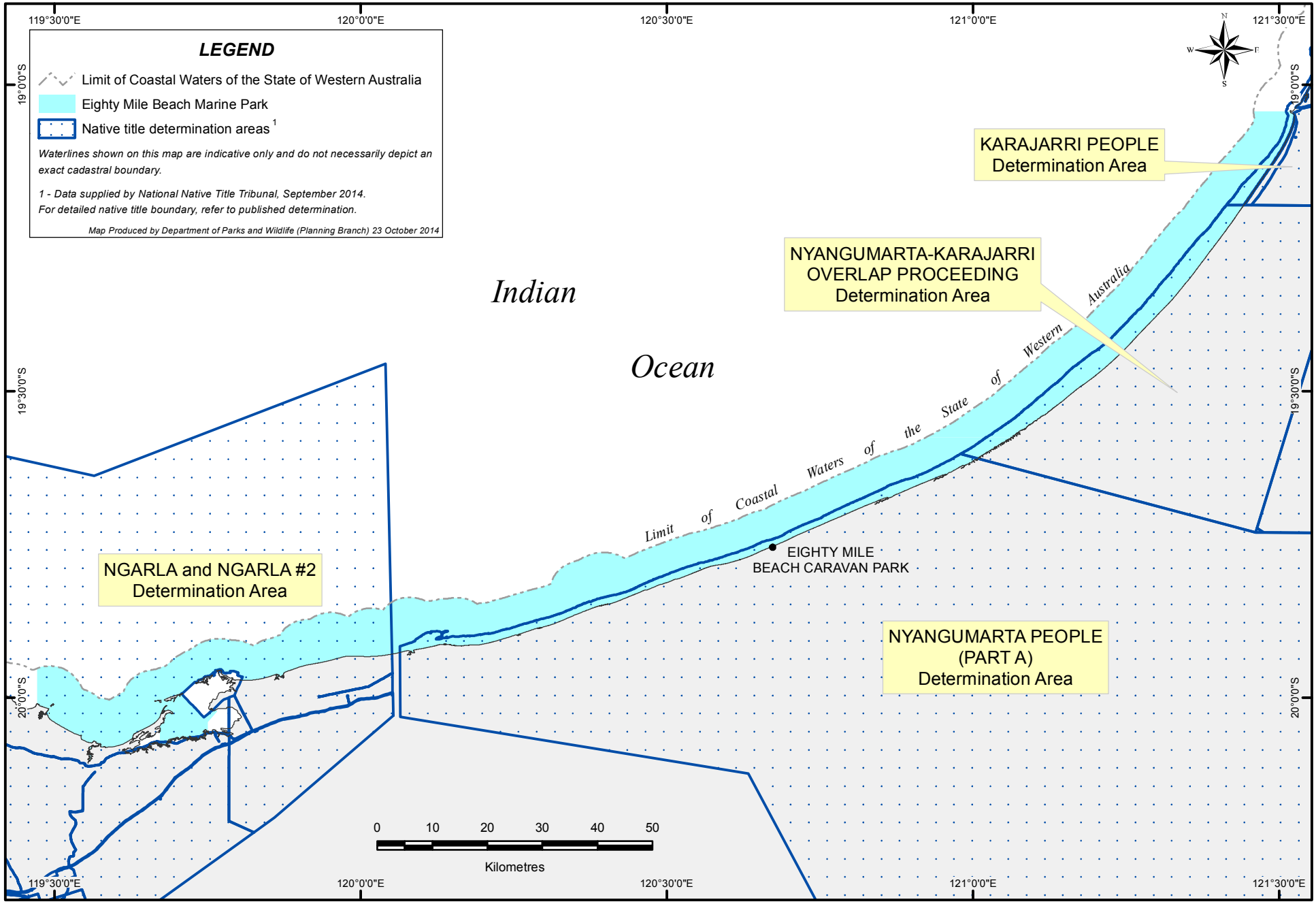
By contrast, the zoning scheme and management plan can be amended through a formal public consultation process and do not require Parliamentary consideration. This allows for adaptive management to be applied where necessary. Any substantial change to the management plan requires a statutory three-month public comment period and approvals from the Minister for Environment, Minister for Fisheries and Minister for Mines and Petroleum.

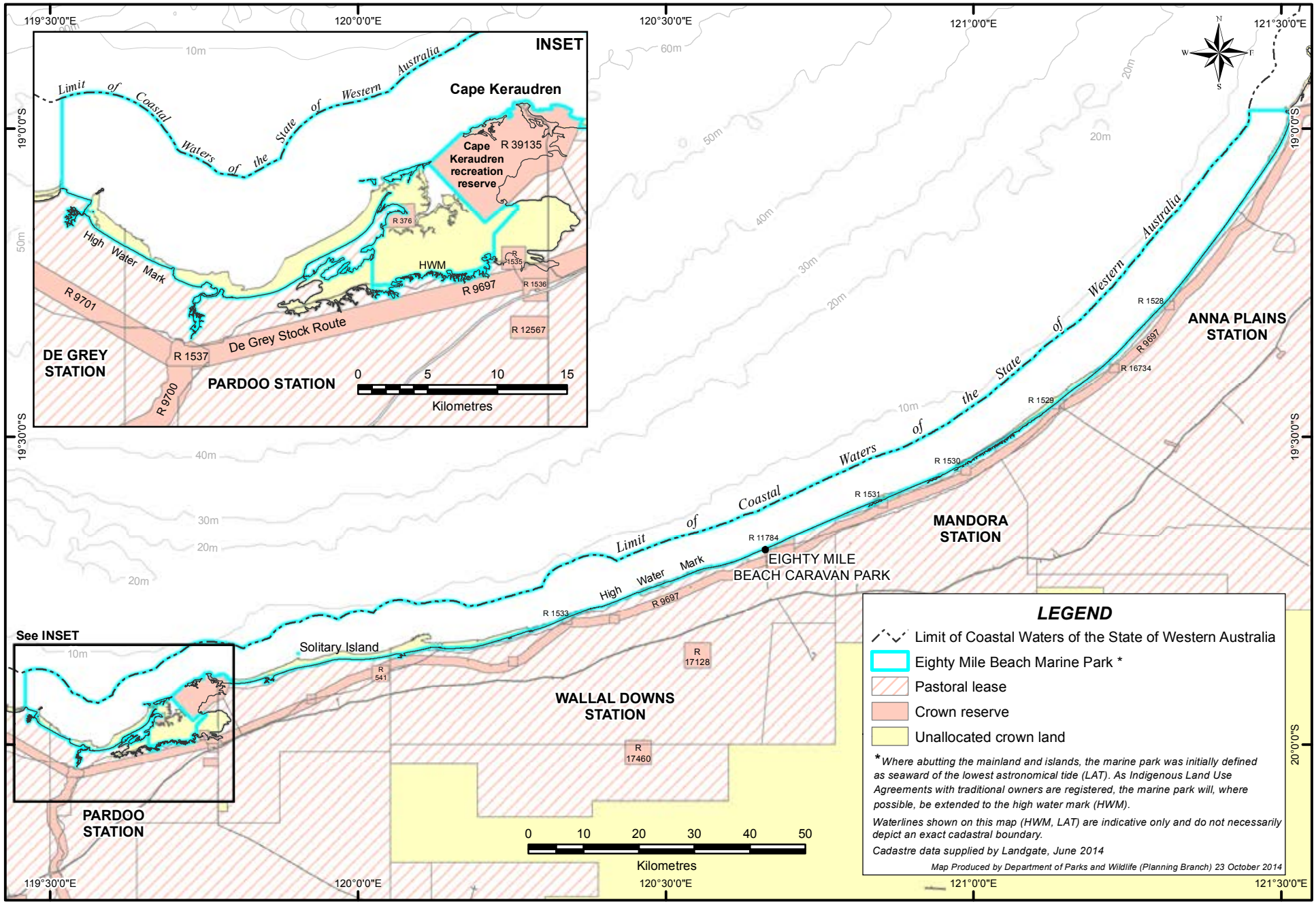
Cape Keraudren. Photo – Steve Bunce



Map 1: Locality of Eighty Mile Beach Marine Park.

Map 2: Native title determination areas within and adjacent to Eighty Mile Beach Marine Park.





Map 3: Tenure within and adjacent to Eighty Mile Beach Marine Park.

3 Regional perspective and values

3.1 Bioregional setting

The guide to Integrated Marine and Coastal Regionalisation of Australia (IMCRA Version 4.0) provides a biological regionalisation for all Australian marine waters (Commonwealth of Australia 2006). The IMCRA classifies Australia's coast and marine environment into 60 distinct marine biogeographical units, termed bioregions. Each bioregion represents broad physical and biological differences in the coast and marine environment across Australia. National guidelines recommend that the IMCRA bioregions should be used as a basis for marine protected area reserve design, with one or more examples of conservation features (e.g. habitats, ecosystems) found in each bioregion represented in highly protected zones (University of Queensland 2009).

Under the IMCRA classification scheme, the marine park encompasses all of the State waters within the Eighty Mile Beach meso-scale bioregion, and overlaps with the north-east corner of the Pilbara Nearshore meso-scale bioregion in the south-west corner of the marine park. The Eighty Mile Beach bioregion stretches from Cape Missiessy to Cape Keraudren. The Pilbara Nearshore bioregion is relatively shallow, covering the nearshore area from Cape Keraudren to North West Cape.

At the time of publication, Western Australia had 16 CALM Act marine reserves consisting of 13 marine parks, two marine management areas and one marine nature reserve across 10 of the State's 19 marine bioregions. The establishment of the Eighty Mile Beach Marine Park, along with other marine parks in the Kimberley region announced under the Kimberley Science and Conservation Strategy provides a significant contribution to the State's representative system of marine parks and reserves.

3.2 Climate and oceanography

The marine park is on the most arid coast in Australia and is one of only five arid coasts in the world (V & C Semeniuk Research Group 2000). Average annual rainfall is low (approximately 370mm), with a significant variation between years, as well as the period when the bulk of the rain falls. Temperatures range from warm to hot year round and, on average, evaporation greatly exceeds rainfall.

Winds are strongest in the summer months and are predominantly north-westerly, while winter winds are generally weak and variable. Tropical cyclones often impact the region, most commonly during the wet season (December to April), bringing strong winds and increased rainfall (Bureau of Meteorology 2010). This can have dramatic effects on the ecology of the site.

The nearshore waters of the marine park are generally turbid due to the strong tidal flows and episodic river runoff in the region, particularly during cyclone events. The waters further offshore tend to be clearer. The tides at Eighty Mile Beach are semi-diurnal and have a range of about 6m, although maximum spring tides can exceed 10m. Water temperatures range from 30°C to 32°C in summer and from 18°C to 21°C in winter (Bureau of Meteorology 2010).

Oceanographic conditions offshore from Eighty Mile Beach are driven by the presence of southward flowing ocean currents that drive warm, low salinity water into the region. The Leeuwin Current, driven by the Indonesian throughflow, has the most influence on the region, however, this is somewhat reduced due to the width of the North West Shelf (Condie *et al.* 2006; Hutchins 2004).

3.3 Geology and geomorphology

Eighty Mile Beach is situated in the southern part of the Canning Basin, which consists of Cretaceous sedimentary rocks that formed during a time when a large area of north-west Australia was under the sea. Over the geologic time scale there have been fluctuations in mean sea level, with the most recent occurring around 10,000 years ago when the coastal plain existed as a shallow sea (Watkins *et al.* 1997). Sea levels remained high for about the next 2,000 years, during which time fine carbonate sediments

began to be deposited in the most protected embayments along the coast (Semeniuk 2008). The retreat of the sea level and its recent relative stability has enabled sand dunes to build up along the shoreline.

Eighty Mile Beach is characterised by extensive intertidal sand and mudflats, comprised of marine-derived carbonate mud and sediments of terrigenous (from the erosion of rocks on land) and marine shell origin (Semeniuk 2008). Wave and tidal action supply voluminous amounts of fine carbonate sediment to the flats. Pearson *et al.* (2005) speculated on the differences between the northern and southern parts of the beach, suggesting that the extensive flats in the north had a dampening effect on wave action, leading to a lower energy environment and increased deposition of fine materials. This may in part explain why higher numbers of shorebirds have been recorded at the northern end of the beach.

An abrupt change in coastal geomorphology occurs in the south-west along Eighty Mile Beach and past Cape Keraudren to the western boundary of the marine park. This area is characterised by rocky shores with narrow sandy beaches, small tidal creeks such as Pardoo Creek and Mulla Mulla Down Creek, and mangrove-lined muddy bays. Pardoo Creek, a northern distributary of the De Grey River delta demarcates the Canning coast with the Pilbara coast (Semeniuk 2008).

3.4 Ecology

Marine biota of the Pilbara and lower-west Kimberley regions comprise a subset of tropical species of the Indo-West Pacific, with high levels of endemism. Knowledge of the presence and distribution of flora and fauna and their associated habitat types within the marine park is incomplete and based on a small number of surveys and research projects. The scientific understanding of the park's ecology is likely to increase significantly over the life of the management plan.

As well as being unique and important in their own right, the intertidal sand and mudflat communities of Eighty Mile Beach are extremely important for other species and ecosystems in and around the marine park. The flats have a high diversity of infauna living within the substrate and are covered with a surface film of microscopic algae and cyanobacteria (microphytobenthos). Studies of the tidal flats of Roebuck Bay to the north of Eighty Mile Beach indicate that microphytobenthos form the basis of food webs for a large variety of organisms, ranging from benthic invertebrates to shorebirds and fish (Bennelongia 2009).

Most other ecological communities are restricted to the south-west corner of the park, in the vicinity of Cape Keraudren and extending to the western boundary. Macroalgae and seagrass communities provide food and habitat for a range of species, including dugongs. A small number of coral reef communities occur in the intertidal and subtidal areas of the park, and mangroves play an important ecological role in creeks and bays between Cape Keraudren and Mulla Mulla Down Creek.

The marine park is an important area for marine wildlife, supporting waterbirds, turtles, dugongs, dolphins, sawfish and other fish. Eighty Mile Beach is one of the world's most important feeding grounds for migratory shorebirds and waders and is listed under the Ramsar Convention (Appendix III). It is part of the East Asian-Australasian Flyway and is the primary staging area for shorebirds from Asia, Alaska and Siberia. The park supports a significant nesting population of flatback turtles (*Natator depressus*), which are endemic to northern Australia. Its coastal waters provide critical habitat for a number of shark and ray species at varying life stages.

3.5 Social and economic setting

Remote seascapes and abundant marine wildlife are the major attractions for visitors to the area, supporting several tourism ventures. Eighty Mile Beach is a popular stopover and holiday destination for travellers between Broome and Port Hedland, with most visitors arriving during the dry season (May to October). The coastline has impressive panoramic vistas and is popular for recreational fishing, camping, four-wheel driving, beachcombing and wildlife viewing.

Recreational fishing is largely centred around accessible areas along the coast, such as Eighty Mile Beach Caravan Park and Cape Keraudren. Recreational fishing is predominantly shore-based, targeting a variety of species including barramundi, salmon and mud crabs. Many other fish and invertebrate species are caught.

Coastal and offshore waters of the Pilbara and Kimberley regions provide valuable fishing and pearling grounds for a range of commercially targeted species. One of the most important areas for the collection of wild pearl oysters (*Pinctada maxima*) occurs in coastal waters within, but mostly adjacent to the marine park. A number of commercial fisheries may operate in the marine park, although given the large size of their licence areas, effort of most fisheries is not likely to be significant in the park.

The regional economy is dominated by the mining and petroleum industries, which have grown at a considerable rate. Some areas in and adjacent to the marine park are of interest to the mining industry, with exploration leases covering much of the coastal region. An increasing number of vessels in the region support offshore activities, although shipping is not a major activity in the park.

3.6 Marine park values

The cultural, ecological, social and economic values of the marine park are listed below. More detailed information is provided in Sections 6-8.

Summary of cultural values

- **Aboriginal culture and heritage**: Traditional owners maintain connection to their traditional coastal and sea country through identity and place, family networks, spiritual practice and resource gathering. Native title rights and interests have been recognised over the intertidal areas of the marine park.

Summary of ecological values

- **Geomorphology:** Eighty Mile Beach is a unique and exceptional feature, which contrasts with a distinctly different seabed and coastal topography in the south-west corner of the marine park.
- **Water and sediment quality:** Water and sediment quality is likely to be high and is essential to maintain healthy marine ecosystems.
- **Intertidal sand and mudflat communities:** Intertidal sand and mudflat communities are primary producers with an abundance and diversity of invertebrate life, providing a valuable food source for waterbirds and other fauna.
- **Subtidal filter-feeding communities:** A diverse range of subtidal filter-feeding communities, with a high diversity of invertebrate species.
- **Macroalgal and seagrass communities:** Macroalgal and seagrass communities are important primary producers that provide habitat and refuge areas for fish and invertebrates.
- **Coral reef communities:** Intertidal and subtidal reef systems support a high diversity of hard corals.
- **Mangrove communities and saltmarshes:** Mangrove communities and adjacent saltmarshes provide nutrients to the surrounding waters and habitat for fish and invertebrates.
- **Waterbirds, including migratory species:** Many nationally and internationally important shorebirds and waders are found in the marine park.
- **Marine turtles:** Flatback turtles are endemic to northern Australia and nest at Eighty Mile Beach.
- **Marine mammals:** Dugongs and several whale and dolphin species inhabit or migrate through the marine park.
- **Invertebrates:** A highly diverse marine invertebrate fauna provides an important food source for a variety of animals, including birds, fish and turtles, along with recreational and commercial fishing opportunities.
- **Scalefish:** A diversity of fish species provide recreational and commercial fishing opportunities.
- **Sharks and rays:** A diversity of sharks and rays, including several protected species, are found in the park.

Summary of social and economic values

- **European heritage:** The region has a history of European contact associated with exploration, pastoralism, commercial fishing and the Second World War. Relics in the marine park include a plane wreck and shipwrecks.
- **Remote seascapes:** Remote areas with natural beaches, rocky shores, sand and mudflats and mangroves, with visible and abundant wildlife.
- **Nature-based tourism:** A generally undisturbed natural environment offering a variety of nature-based attractions and opportunities.

Thousands of migratory shorebirds on Eighty Mile Beach. Photo – Jan van der Kam

- **Recreational fishing:** A range of quality recreational fishing opportunities targeting fish, crabs and other invertebrates.
- **Commercial fishing:** A number of commercial fisheries are licensed to operate within the marine park, including an important pearl oyster fishery.
- **Resources and associated industries:** The Pilbara and Kimberley regions contain important mineral, oil and gas resources.
- **Research and monitoring opportunities:** The relatively undisturbed nature and variety of habitats and communities, combined with a range of human uses, provide unique research and monitoring opportunities.

4 Vision and strategic objectives

4.1 Vision

Vision for Eighty Mile Beach Marine Park

A jointly managed protected place for marine turtles, shorebirds and other wildlife to breed and thrive, and where Aboriginal culture and heritage is recognised and conserved – a place of shared use between traditional owners and other visitors.

4.2 Strategic objectives

A set of overarching strategic objectives has been adopted for Western Australia's marine parks and reserves:

- **Conservation** – Maintain and enhance marine biodiversity and ecological integrity (key ecosystem structure and function).
- **Aboriginal culture** – Provide for the protection and conservation of the value of the area in relation to the culture and heritage of Aboriginal people.
- **Science and education** – Encourage and promote the use of a scientific approach to management and communicate understanding through education.
- **Public participation** – Encourage and promote community involvement in, and support for, marine parks and reserves.
- **Recreational uses** – Provide equitable and sustainable opportunities for recreational use and enjoyment, where appropriate.
- **Commercial uses** – Provide equitable and sustainable opportunities for commercial use and benefits, where appropriate.

The strategic objectives cannot be achieved in isolation from other statutory and non-statutory management measures both within and external to the marine park. Thus the management plan should be viewed as part of a complementary suite of management mechanisms, including adjacent marine, coastal and terrestrial conservation reserves, Indigenous protected areas, fisheries management, wildlife protection, industry regulation, pollution control, environmental impact assessment, maritime transport and safety measures, and community cooperation and participation.

Karajarri children enjoying time on country. Photo – Karajarri Traditional Lands Association

5 Management programs

The vision, strategic objectives, management targets and management objectives of the marine park are to be delivered by implementing overarching strategies within seven management programs, as well as specific strategies listed against each cultural, ecological, social or economic value detailed in Sections 6-8. Management is delivered through the following programs:

- management frameworks (including effective joint management and marine park zoning)
- education and interpretation
- public participation
- patrol and enforcement
- visitor infrastructure and management intervention
- research
- monitoring.

Management strategies aim to support the achievement of the management objectives and the management targets of the park. The department and the JMBs have the primary responsibility for coordinating and implementing the management strategies listed in the summary tables (Sections 5-8). Where other agencies or bodies will contribute to the implementation of a strategy, they are listed in brackets at the end of the strategy. If they will take the lead role with implementation of the strategy, they are listed in bold.

Management strategies within the management plan are prioritised as high (**H**), medium (**M**) or low (**L**) to indicate their relative importance. Management strategies considered to be critical to achieving a management objective are presented as 'high – key management strategies' (**H-KMS**). The operational schedule for these management programs is available at www.dpaw.wa.gov.au/parks/management/final-plans/approved-management-plans.

5.1 Management frameworks

The application of management frameworks is essential to ensure effective long-term management of Eighty Mile Beach Marine Park. These frameworks consist of the legal, financial, human resource and administrative activities required to establish and maintain a marine park. They also include the provisions necessary to enable joint management, collaborative operational plans, establishment of a zoning scheme and activities not covered by the other management programs.

5.1.1 Joint management arrangements

The marine park will be jointly managed by the department and traditional owners of the park. Parks and Wildlife policy No. 87 *Aboriginal Joint Management* provides direction on involving Aboriginal people in the management of CALM Act lands and waters.

Joint management will be given effect under the CALM Act through section 56A JMAs developed in partnership between traditional owners and the State. Joint management of the marine park with the Nyangumarta and Ngarla Traditional Owners will formally commence upon execution of the JMAs attached to this management plan, which will be signed as soon as practicable following approval of the plan. Once JMAs have been finalised with the Karajarri and Nyangumarta-Karajarri Traditional Owners, the management plan can be amended to require the CEO of the department to jointly manage the marine park with these groups, and the relevant JMAs will be signed and attached.

The JMAs will establish JMBs to manage the park in accordance with the agreements and the CALM Act. The JMBs will oversee the management of the marine park, make management decisions and provide strategic input into how management strategies are implemented, as well as strategically monitor the implementation of the management plan. Operational responsibility will be coordinated by the department's West Kimberley District Office, under the guidance of the JMBs. Further information on the operation of the JMBs is specified in the JMAs attached to this plan.

Management of the marine park will be supported by relevant State Government agencies and the community. The department's Planning Branch also has a strategic supporting role in assisting JMBs and district offices in the management of marine parks and reserves and development of education programs. A number of other specialist branches provide support, direction and assistance in relation to such areas as wildlife management, licensing and research and monitoring.

5.1.2 Collaborative operational plans

A Memorandum of Understanding (MoU) has been developed between the Minister for the Environment and the Minister for Fisheries to establish principles of cooperation and integration between Parks and Wildlife and the Department of Fisheries (DoF) in the management of the State's marine parks and reserves. Collaborative operational plans will be developed to ensure efficient and effective delivery of a range of programs where there is shared agency responsibility or mutual interest including education, patrol and enforcement, and research and monitoring.

As much of the coastline is accessed through private land, Parks and Wildlife and its joint management partners will also need to work collaboratively with adjacent land managers (e.g. Shire of East Pilbara, pastoralists and caravan park owners) to ensure an appropriate level of access is maintained and that management arrangements are complementary.

5.1.3 Development proposals

Proposed developments, including exploration activities likely to have a significant effect on the environment, are referred to the Environmental Protection Authority (EPA) and may be subject to the environmental impact assessment requirements of the *Environmental Protection Act 1986* (EP Act). Any environmental impact assessments for proposed developments within or in the vicinity of marine parks will generally be referred to the department and the MPRA for advice. The relevant JMBs will also provide advice in relation to development proposals as appropriate.

During the life of this management plan there may be proposals for the installation and construction of infrastructure associated with the petroleum and mineral industries, pearling, tourism operations or public recreation. These could be major developments such as pipelines, or minor works such as the installation of moorings or navigation markers. The nature of the development will determine the appropriate level of assessment. Proposals will be assessed in terms of potential impacts on the marine park's cultural, ecological, social and economic values and whether they are consistent with the targets of the marine park.

In relation to petroleum development, there are agreed assessment procedures and protocols that are set out in a MoU between the EPA and the Department of Mines and Petroleum (DMP). The MPRA has endorsed the approach outlined in the MoU. The MPRA and the JMBs will be informed of all proposals submitted in the marine park, although existing EPA and DMP processes remain the primary mechanism for environmental assessment and advice to government in relation to approvals. There will not be a duplicated approvals process undertaken by the MPRA and JMBs for petroleum operations. It should be noted that under this arrangement, the MPRA, Parks and Wildlife and JMBs would still provide input and advice to the EPA on proposals when requested.

Certain industrial premises with the potential to cause emissions and discharges to air, land or water are prescribed under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations). The EP Act requires a works approval to be obtained before constructing a prescribed premises, and ongoing emissions are managed through a licence. The Department of Environmental Regulation (DER) administers this part of the EP Act.

5.1.4 Marine park zoning

The implementation of an appropriate zoning scheme is an important strategy for both the conservation of marine biodiversity and the management of human use in marine parks. Marine park zoning assists in separating conflicting uses and provides for specific activities such as for commercial and recreational activities, scientific study and nature appreciation. The zoning scheme also offers the opportunity to increase recognition and protection of culturally significant areas.

Section 13B of the CALM Act requires marine parks to be zoned as one or a combination of specific management zones (sanctuary, recreation, special purpose or general use zones), which are formally established as classified areas under Section 62 of the CALM Act.

Sanctuary zones are 'look but don't take' areas managed solely for nature conservation and low impact recreation and tourism. They provide the highest level of protection for vulnerable or specially protected species and protect representative habitats and communities from human disturbance. Passive recreational

activities, which do not compromise the ecological values, are permitted but extractive activities are not. Low impact commercial tourism operations (e.g. wildlife watching tours) are permitted where they do not conflict with other uses. Sanctuary zones provide sites for scientists to monitor relatively undisturbed marine ecosystems, which they can compare to areas where extractive activities are permitted and/or where environmental impacts may be occurring.

Special purpose zones are managed for a particular conservation purpose and/or priority use, such as the protection of cultural heritage, a seasonal event (e.g. wildlife breeding or whale watching) or a particular type of activity (e.g. pearling). Uses that are incompatible with the specified conservation purpose are not permitted.

Recreation zones provide for conservation and compatible recreational activities, including wildlife viewing and recreational fishing. Commercial fishing, pearling, aquaculture and petroleum development are not permitted in these zones.

General use zones are areas in a marine park where activities, such as sustainable commercial and recreational fishing, aquaculture, pearling and petroleum exploration and production, are permitted where it is considered that they do not compromise the cultural and ecological values of the marine park.

The zoning scheme was designed to:

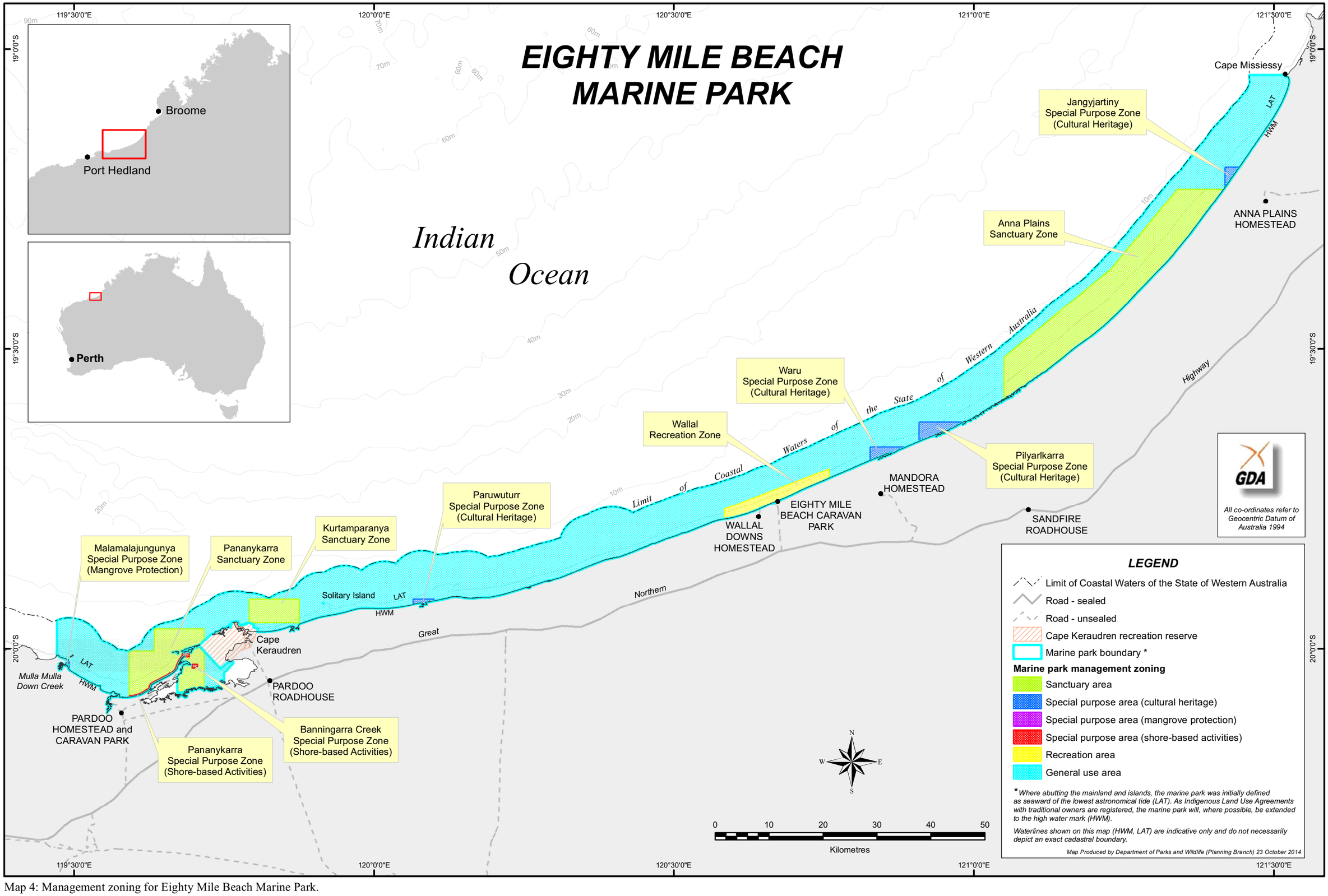
- include a system of comprehensive, adequate and representative 'no-take' or sanctuary areas for marine biodiversity conservation and ecological 'insurance' through increased resilience against natural and human disturbances
- recognise and protect Aboriginal culture and heritage values
- provide areas relatively free of human impact for research and monitoring, nature appreciation and education
- apply the precautionary principle in selecting the location, size or number of sanctuary zones
- where possible, position zones to minimise impacts on existing social and economic values
- maximise community support, which is critical to achieving the plan's strategic objectives
- be easy for the public to understand and comply with any restrictions.

5.1.5 Zones and permitted activities

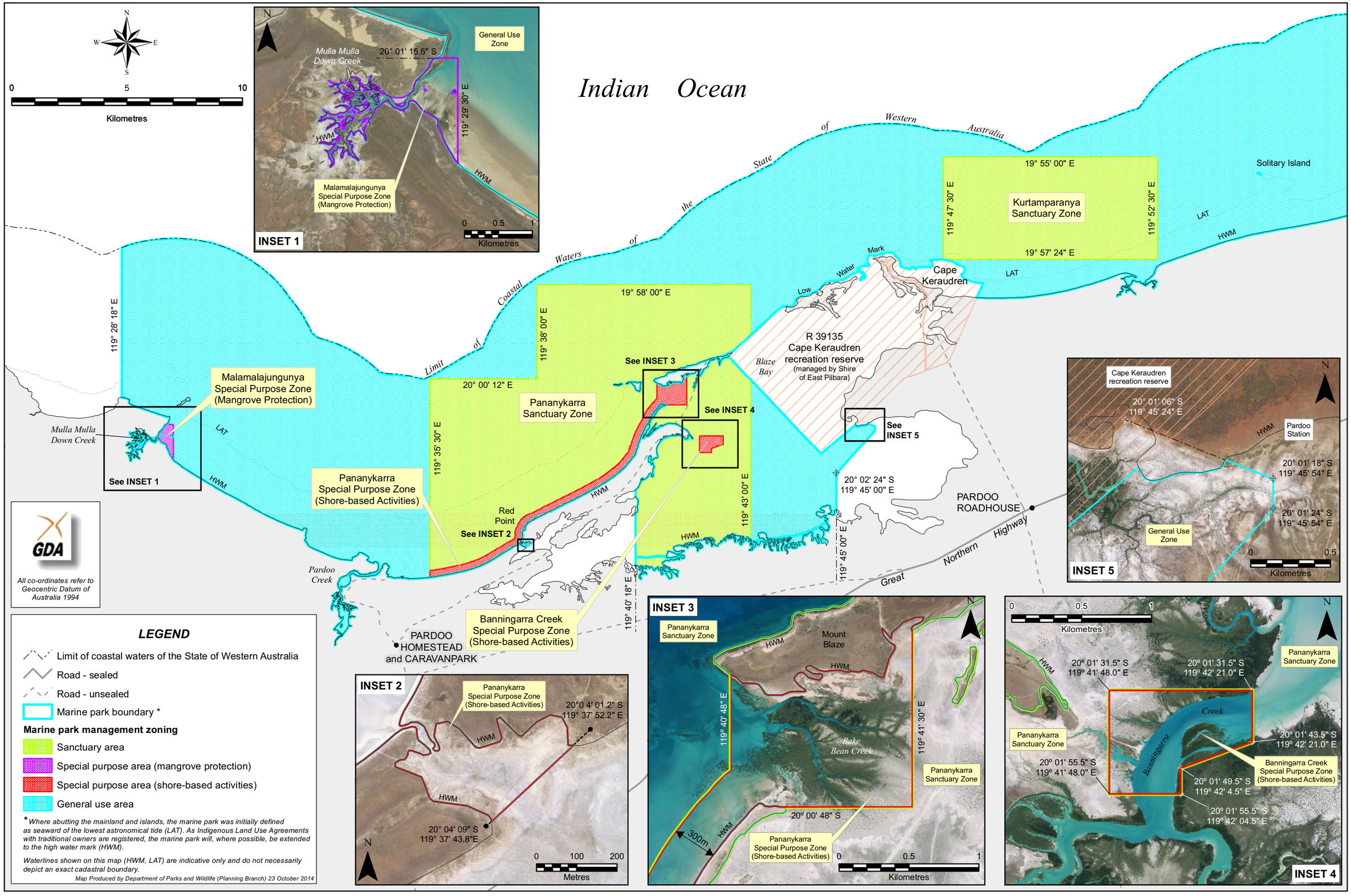
The zoning scheme for Eighty Mile Beach Marine Park is shown in Maps 4-7. The marine park includes six zone types as described in Tables 1-6.

The activities permitted in each zone are outlined in Table 7. Many of the listed activities are also regulated under complementary legislation and regulations, and some activities require licences or permits.

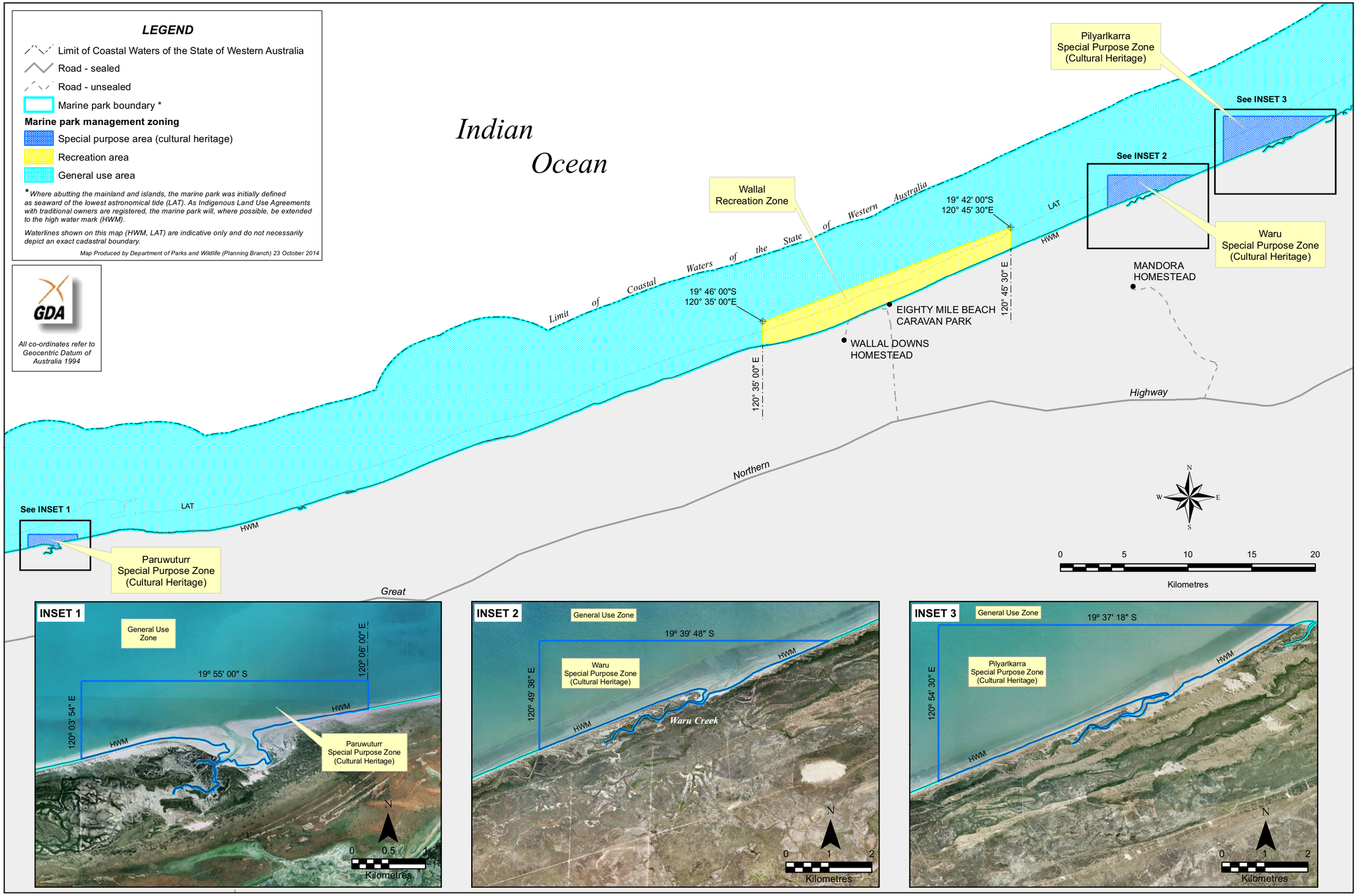
Shells on Eighty Mile Beach. Photo – Kate Fitzgerald/Parks and Wildlife



Map 4: Management zoning for Eighty Mile Beach Marine Park.



Map 5: Management zoning for Eighty Mile Beach Marine Park - west (Mulla Mulla Down Creek to Cape Keraudren).



Map 6: Management zoning for Eighty Mile Beach Marine Park - central (Eighty Mile Beach Caravan Park and surrounding area).

Map 7: Management zoning for Eighty Mile Beach Marine Park - east (Anna Plains area).

LEGEND

- Limit of Coastal Waters of the State of Western Australia
- Road - sealed
- Road - unsealed
- Marine park boundary *

Marine park management zoning

- Sanctuary area
- Special purpose area (cultural heritage)
- General use area

*Where abutting the mainland and islands, the marine park was initially defined as seaward of the lowest astronomical tide (LAT). As Indigenous Land Use Agreements with traditional owners are registered, the marine park will, where possible, be extended to the high water mark (HWM).

Waterlines shown on this map (HWM, LAT) are indicative only and do not necessarily depict an exact cadastral boundary.

Map Produced by Department of Parks and Wildlife (Planning Branch) 23 October 2014

GDA

All co-ordinates refer to Geocentric Datum of Australia 1994

Indian Ocean

Limit of Coastal Waters of the State of Western Australia

Cape Jaubert

Cape Missiessy

19° 02' 36" S

LAT

HWM

See INSET

Jangyjartiny Special Purpose Zone (Cultural Heritage)

19° 14' 00" S
121° 20' 18" E

19° 14' 00" S

ANNA PLAINS HOMESTEAD

19° 22' 00.803" S
121° 13' 37.880" E

Anna Plains Sanctuary Zone

Highway

N
W
E
S

0 5 10 15 20 25
Kilometres

19° 30' 48" S
121° 03' 00" E

121° 03' 00" E

LAT

HWM

Northern

Great

SANDFIRE ROADHOUSE

INSET

19° 11' 48" S

HWM

General Use Zone

121° 25' 06" S

Jangyjartiny Special Purpose Zone (Cultural Heritage)

19° 14' 00" S

Anna Plains Sanctuary Zone

HWM

N

0 1 2
Kilometres

Table 1: Sanctuary zone description

Anna Plains Sanctuary Zone	
Approximate area	33,540ha
Location and values	Anna Plains Sanctuary Zone includes representative areas of the intertidal sand and mudflat communities of Eighty Mile Beach and subtidal waters that encompass areas of sand, mud and sparse filter-feeding communities. This area's rich diversity of invertebrate and fish fauna provides a valuable food source for larger fish, sharks and rays, as well as migratory shorebirds. This zone also encompasses significant flatback turtle use and nesting. Anna Plains Sanctuary Zone lies within the native title determination area held jointly by the Nyangumarta and Karajarri people. It also has European maritime heritage value, with a historic plane wreck. The zone encompasses the most important area for migratory shorebirds but avoids the primary area for recreational fishing and commercial harvesting of pearl oysters, specimen shells and hermit crabs.
Kurtamparanya Sanctuary Zone	
Approximate area	3,870ha
Location and values	The Kurtamparanya Sanctuary Zone is located at Cape Keraudren. The area within and around this zone is of high cultural significance to the Ngarla Traditional Owners, and Kurtamparanya is the Ngarla name for an area which incorporates part of the Cape Keraudren Shire Reserve (Ngarla People 2012). The zone protects a reef area inhabited by diverse coral and filter-feeding communities, and mixed macroalgal and seagrass communities. It is likely that coral reef communities do not occur in areas north-east of this zone within the marine park, as these are predominantly sand and mudflat environments. In the offshore areas of this zone near the extent of State waters, bare sand and seagrass areas exist in some of the deepest waters in the park. The boundaries have been placed to encompass the coral, macroalgal and seagrass communities of the reef while avoiding the primary areas for recreational and commercial fishing.
Pananykarra Sanctuary Zone	
Approximate area	11,370ha
Location and values	Pananykarra Sanctuary Zone, adjacent to Pardoo Station and west of Cape Keraudren in the south-western end of the marine park, has high cultural significance to the Ngarla Traditional Owners. Pananykarra is the Ngarla name for the area which encompasses the sanctuary zone (Ngarla People 2012). The zone includes representative examples of seagrass, macroalgal, filter-feeding and coral reef communities, and intertidal rocky shore, sand, mudflat, mangrove and saltmarsh areas. The seagrass communities are an important source of food for dugongs, which are regularly seen in relatively large aggregations in the shallow embayment west of Mount Blaze. Macroalgal, filter-feeding and coral reef communities are important feeding habitat for marine turtles, and large turtle aggregations have been reported in the waters of this zone. The area supports a high diversity of invertebrates and fish (including sharks and rays), which use the nursery habitat afforded by mangroves and seagrasses. The boundaries have been placed to provide representation of the conservation values in this area while avoiding the primary area for recreational fishing and mud-crabbing further to the east.
Approximate total area of sanctuary zones	48,780ha (approximately 24.4 per cent of the park)

Table 2: Special purpose zone (cultural heritage) description

Paruwuturr Special Purpose Zone (Cultural Heritage)	
Approximate area	280ha
Waru Special Purpose Zone (Cultural Heritage)	
Approximate area	820ha
Pilyarlkarra Special Purpose Zone (Cultural Heritage)	
Approximate area	1510ha
Jangyjartiny Special Purpose Zone (Cultural Heritage)	
Approximate area	480ha
Location and values	Four special purpose zones (cultural heritage) are located along Eighty Mile Beach. Paruwuturr, Waru and Pilyarlkarra are located in Nyangumarta country, with Jangyjartiny located in the native title determination area jointly held by the Nyangumarta and Karajarri Traditional Owners. These areas provide for the recognition and protection of sites of high cultural significance to the traditional owners. The Nyangumarta people have identified three of the special purpose cultural heritage sites as being inhabited by *pulany*, while the fourth is associated with the creation of both Nyangumarta and Karajarri country. They provide a focus for increased education and interpretive information about traditional owner connection to country and culturally significant areas. This will help ensure that visitors respect these areas and behave in a culturally appropriate manner.
Approximate total area of special purpose zones (cultural heritage)	3,090ha (approximately 1.5 per cent of the park)

A culturally significant site for the Nyangumarta Traditional Owners. Photo – Matt Fossey/Parks and Wildlife

Table 3: Special purpose zone (mangrove protection) description

Malamalajungunya Special Purpose Zone (Mangrove Protection)	
Location and values	Malamalajungunya Special Purpose Zone (Mangrove Protection) is located at Mulla Mulla Down Creek and is of high cultural significance to the Ngarla people. Mulla Mulla is the English interpretation of the Ngarla name for the creek (Ngarla People 2012). The zone includes mangrove and saltmarsh communities representative of the Pilbara coast. The zone includes the waters at the mouth of Mulla Mulla Down Creek, and extends into the mangrove-lined creek system and adjacent saltmarshes that are inundated only on very high tides. Mangrove communities provide important habitat and refuge areas for a variety of species, which in turn support recreational fishing and wildlife viewing. The zone provides improved protection for mangroves, saltmarshes and species inhabiting these areas, while allowing for compatible recreational uses. Recreational activities that impact on mangrove communities, such as boat launching and shore-based fishing are not permitted, as they are considered incompatible with the purpose of the zone. The need for vehicle access restrictions in this zone will be investigated during management plan implementation.
Approximate total area	100ha (approximately 0.05 per cent of the park)

Table 4: Special purpose zone (shore-based activities) description

Pananykarra Special Purpose Zone (Shore-based Activities)	
Approximate area	500ha
Location and values	Pananykarra Special Purpose Zone (Shore-based Activities) is adjacent to the Pananykarra Sanctuary Zone and extends along the beach and intertidal zone from approximately 2km east of Pardoo Creek to the northern side of Bake Bean Creek. The zone encompasses the mangrove-lined embayments of Bake Bean Creek. The area is highly significant to the Ngarla Traditional Owners (Ngarla People 2012). The primary purpose of this zone is to provide an opportunity for shore-based recreational and commercial activities where these activities are compatible with the maintenance of marine park values. The zone conserves sandy beaches and intertidal sand and mudflats and the communities they support. Boat-based recreational and commercial fishing are not permitted. The zone boundaries have been placed to encompass the primary area for shore-based activities adjacent to Pardoo Station.
Banningarra Creek Special Purpose Zone (Shore-based Activities)	
Approximate area	60ha
Location and values	Banningarra Creek Special Purpose Zone (Shore-based Activities) is located along a small section of Banningarra Creek within the Pananykarra Sanctuary Zone. The primary purpose of the zone is to provide for shore-based fishing accessed from Pardoo Station and the boundaries have been placed accordingly. The zone contributes to the conservation of representative examples of mangrove communities and other habitats.
Approximate total area of special purpose zones (shore-based activities)	560ha (approximately 0.3 per cent of the park)

Table 5: Recreation zone description

Wallal Recreation Zone	
Location and values	Wallal Recreation Zone extends for approximately 10km north and south of the Eighty Mile Beach Caravan Park beach access point. The zone includes intertidal sand and mudflat communities and an important section of the Eighty Mile Beach flatback turtle rookery. The area is an important holiday destination with a large proportion of visitors staying from several weeks to several months at the caravan park. The primary purpose of this zone is to allow appropriate opportunity for recreational activities, while providing protection for nesting turtles, turtle hatchlings, waterbirds and their habitats. Popular recreational activities here include nature appreciation, recreational fishing, collecting (subject to DoF regulations) and four-wheel driving. Some of these activities have the potential to directly impact upon marine turtles and waterbirds and may require additional management strategies (refer to Sections 7.8 and 7.9). Commercial collection of specimen shells and hermit crabs is not permitted within this zone. However, operators will still be able to collect specimen shells and hermit crabs further along the beach in the adjacent general use zone, using the primary vehicle access point at Eighty Mile Beach Caravan Park.
Approximate total area	3,980ha (approximately 2 per cent of the park)

Table 6: General use zone description

General Use Zone	
Location and values	All areas in the marine park not included in sanctuary, recreation or special purpose zones will be zoned as general use. Areas of general use zone provide for biodiversity conservation and a range of recreational and commercial activities.
Approximate total area	143,520ha (approximately 71.8 per cent of the park)

Ngangumarta Traditional Owners. Photo – Chris Nutt/Parks and Wildlife

Table 7: Activities permitted in each zone of Eighty Mile Beach Marine Park

Activity	Sanctuary Zone	Recreation Zone	Special Purpose Zone (Mangrove Protection)	Special Purpose Zone (Shore-based Activities)	Special Purpose Zone (Cultural Heritage) [g]	General Use Zone
COMMERCIAL						
Pearling	No	No	No	No	Yes	Yes
Commercial fishing	No	No	No	No	Yes	Yes
Commercial specimen shell, marine aquarium and land hermit crab collecting	No	No	No	Yes [e]	Yes	Yes
Aquaculture	No	No	No	No	Assess	Yes
Mineral and petroleum exploration	Assess [a]	Assess [a]	Assess [a]	Assess [a]	Assess [a]	Assess
Mineral and petroleum development	No	No	No	No	No	Assess
Pipelines	No	No	No	No	No	Assess
Dredging and dredge spoil dumping	No	No	No	No	No	Assess
Charter operators – fishing	No	Yes	Yes	Yes [e]	Yes	Yes
Charter operators – non-extractive (e.g. wildlife viewing) [b]	Yes	Yes	Yes	Yes	Yes	Yes
CUSTOMARY ACTIVITIES						
Customary activities (e.g. hunting and fishing) [c]	Yes	Yes	Yes	Yes	Yes	Yes
RECREATIONAL						
Boating (motorised and non-motorised) [d]	Yes	Yes	Yes	Yes	Yes	Yes

Activity	Sanctuary Zone	Recreation Zone	Special Purpose Zone (Mangrove Protection)	Special Purpose Zone (Shore-based Activities)	Special Purpose Zone (Cultural Heritage) [g]	General Use Zone
RECREATIONAL, CONTINUED						
Shore-based recreational fishing	No	Yes	No	Yes	Yes	Yes
Boat-based recreational fishing	No	Yes	Yes	No	Yes	Yes
Recreational specimen shell collecting (dead or alive)	No	Yes	No	Yes [e]	Yes	Yes
Recreational coral and 'live' rock collecting	No	No	No	No	No	No
Wildlife viewing [b]	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle access [b]	Yes	Yes	Yes	Yes	Yes	Yes
Boat launching	Yes	Yes	No	Yes	Yes	Yes
OTHER						
Marine infrastructure (e.g. groynes, jetties, etc)	Assess	Assess	Assess	Assess	Assess	Assess
Navigation aids	Yes	Yes	Yes	Yes	Yes	Yes
Research	Yes	Yes	Yes	Yes	Yes	Yes
Anchoring (other than emergency anchoring) [f]	Yes	Yes	Yes	Yes	Yes	Yes

KEY:

a. Exploratory drilling for petroleum or geothermal energy resources is not permitted in this zone.

b. Temporal and spatial restrictions may apply, for example, during key turtle nesting and hatching seasons, migratory shorebird feeding times or to protect vulnerable habitats if required e.g. mangroves in Special Purpose Zone (Mangrove Protection). Restrictions may also apply for some vehicle types.

c. Customary take is confined to traditional owners, subject to the rights and interests provided by the *Native Title Act 1993* and/or Indigenous Land Use Agreements (ILUAs), or where traditional owners have provided consent to another Aboriginal person or group.

d. Speed limits or other restrictions may be implemented in some areas for some vessels where conservation concerns arise (e.g. dugong aggregation areas).

e. Only shore-based collection/fishing is permitted in this zone.

f. Specific sites where anchoring is either permitted or restricted may be developed through a mooring and anchoring plan.

g. Commercial users of the marine park should be aware and respectful of the objectives of this zone when planning or conducting commercial activities. Consultation should occur with the relevant Aboriginal Prescribed Body Corporate when planning new activities or developments.

Assess Proposal will be assessed by appropriate agencies in accordance with relevant legislation and in the context of the objectives and targets in this management plan.

Management frameworks: objectives, strategies and targets

Management objective	To ensure the marine park has appropriate legal, administrative, financial and human resource frameworks in place so that it is jointly managed with traditional owners and in a collaborative setting with other agencies.
Overarching management strategies	1. The CEO of the department will jointly manage relevant portions of the marine park with the Nyangumarta and Ngarla Traditional Owners in accordance with the JMAs attached to this management plan (**H-KMS**). 2. Implement all other legal provisions necessary to establish and jointly manage the marine park, including reservation of intertidal areas within the marine park; gazettal of appropriate notices and orders under the CALM Act, Wildlife Act and *Fish Resources Management Act 1994* (FRM Act) [DoF] (**H-KMS**). 3. Develop and implement joint collaborative operational plans with DoF **(H-KMS).** 4. Ensure that the assessment of and setting of conditions for new developments and operations are consistent with the management objectives and targets for the marine park's values [MPRA, EPA, DoF, DER, DMP, Department of Transport (DoT), Local Government Authorities (LGAs), Tourism WA)] (**H-KMS**). 5. Ensure that relevant international conservation agreements and related obligations are considered during the development and implementation of management arrangements (**H**). 6. Establish a program to train and mentor new traditional owner rangers and support the Karajarri Ranger group [relevant Aboriginal Corporations] (**H**). 7. Develop and implement a monitoring and evaluation framework to assess joint management effectiveness for the marine park (i.e. how joint management arrangements work for the department and traditional owners and whether the arrangements themselves are functioning effectively) [relevant Aboriginal Corporations] (**H**). 8. Collaborate with and provide advice to agencies, stakeholders and adjacent land managers, where necessary, to ensure the protection of marine park values and complementary management of adjacent reserves (**H**). 9. Ensure that proponents of development proposals or activities with the potential to impact on the marine park's values conduct appropriate compliance monitoring [MPRA, EPA, DER] (**H**). 10. Ensure that appropriate licences and permits are provided where necessary [DoF] (**H**). 11. Ensure the provision of information to the MPRA for audit processes [DoF] (**H**). 12. Pursue relinquishment and incorporation of existing reserves that extend into the intertidal area, into the marine park as appropriate (**M**). 13. Pursue external funding opportunities to implement strategies in the management plan (**M**).
Target	Implementation of management strategies within agreed timeframes (see *Management programs operational schedule*).

5.2 Education and interpretation

Education and interpretation will increase public awareness and understanding of conservation and management issues in the marine park, and the marine environment in general. Increased understanding helps to develop a sense of community stewardship and hence lead to better protection and management of the park's values.

The education and interpretation program needs to target various sectors and audiences.

Education and interpretation program: objectives, strategies and targets

Management objective	To enhance community understanding and appreciation of the marine park's values, and therefore support for management.
Overarching management strategies	1. Develop and implement an integrated education and interpretation program that communicates: a. the importance of the marine park's values [DoF] (**H-KMS**) b. the purposes of management zones and regulations [DoF] (**H-KMS**) c. appropriate behaviour to reduce human impacts and ensure public safety [DoF] (**H-KMS**). 2. Obtain guidance and input from traditional owners to develop and implement the program, including recommendations on culturally appropriate behaviour in the marine park [relevant Aboriginal Corporations] (**H-KMS**). 3. Prepare educational and interpretive signage and materials for the marine park [DoF] (**H**). 4. Distribute the resulting material to marine park users, including commercial operators and the local tourism industry (**H**).
Targets	1. Implementation of management strategies within agreed timeframes (see *Management programs operational schedule*). 2. Ninety per cent of visitors are aware of the existence of the marine park, its values and the management restrictions that apply within three years of the release of the management plan.

5.3 Public participation

Public participation can help to foster and sustain community support that is critical for effective implementation of the management plan. A number of opportunities already exist in the marine park for public participation in conservation activities such as shorebird and turtle monitoring. Parks and Wildlife will encourage and facilitate ongoing community participation in the management of the park through a variety of engagement mechanisms. The department will also engage with a range of other community and stakeholder organisations during the implementation of the management plan.

Public participation program: objectives, strategies and targets

Management objective	To encourage and facilitate ongoing community participation in the management of the marine park.
Overarching management strategies	1. Develop and implement a public participation program for the marine park, which encourages community involvement in management through a range of opportunities including in education, research and monitoring (**H-KMS**). 2. Establish and maintain records of public participation (**M**).
Targets	1. Implementation of management strategies within agreed timeframes (see *Management programs operational schedule*). 2. Annual increase in the level of public participation in the management of the marine park in the first five years following release of the management plan.

5.4 Patrol and enforcement

While most users comply with management regulations when they understand why such controls have been implemented, it remains important to monitor the level of compliance and take action to stop inappropriate or illegal behaviour. To achieve this, an appropriate level of 'field' presence by Parks and Wildlife, traditional owner rangers (employed directly by the department or contracted) and DoF will be necessary in the marine park. However, because of the remoteness and size of the marine park, it is necessary that users of the area play both self-regulatory and peer surveillance roles.

Patrol and enforcement program: objectives, strategies and targets

Management objective	To maximise public compliance with regulations, permitted uses and other management arrangements within the marine park.
Overarching management strategies	1. Develop and implement a patrol and enforcement program to ensure compliance with zoning restrictions, permitted uses, regulations, licences and permits [DoF] (**H-KMS**). 2. Facilitate cross-authorisation of enforcement officers as appropriate [DoF] (**H-KMS**). 3. Install zone markers and signage for compliance purposes [DoF] (**H**). 4. Encourage voluntary compliance and peer enforcement of regulations [DoF] (**H**). 5. Establish and maintain records of compliance and related issues for management assessment [DoF] (**M**).
Target	Implementation of management strategies within agreed timeframes (see *Management programs operational schedule*).

5.5 Management intervention and visitor infrastructure

'Intervention' comprises direct management strategies required to achieve conservation and sustainable use outcomes. These can be either proactive (preventative) or reactive (restorative) and include provision of visitor facilities to reduce site disturbance and environmental impacts, rehabilitation of degraded areas and risk management.

5.5.1 Visitor risk

Visitor risk management is a focus for the department within the marine park. Through their laws and customs, traditional owners also have a responsibility for the safety of visitors to their country. The remote nature of the marine park, combined with the large intertidal areas, strong tides and winds, and the risk of tropical cyclones, pose a risk to visitors who may be inexperienced in, or unprepared for, such conditions.

As visitation to the park is likely to increase over the life of the management plan, periodic visitor risk assessments will be undertaken to identify potential hazards, and measures implemented to minimise these. Risks to visitors are managed under the framework of the department's policy No. 53 *Visitor Risk Management.* In regard to navigation risks, the installation and maintenance of navigation aids and other boating safety measures in all State waters is the responsibility of DoT.

5.5.2 Culturally appropriate visitation

There are a variety of mechanisms to ensure visitation to the marine park is culturally appropriate, including managing access to and behaviour at culturally important sites, the development of education and interpretive information and via conditions set on commercial tour operator licences.

Where cultural information is available, marine park users should be aware of and respect relevant cultural laws and protocols. For example, in Karajarri culture, taking shells from the beach is not

permitted, except in special cases such as ceremonial purposes. Whilst shell collecting is permitted in most areas of the marine park, users are strongly encouraged not to take shells from the beach, particularly in Karajarri country.

> *It is part of our cultural protocol not to be taking shells…shells are home to hermit crabs and other animals…we don't want people to take shells, it is a cultural place too.*
>
> Karajarri Traditional Owners *pers. comm.*

The Nyangumarta people have also expressed concerns about culturally inappropriate visitation, particularly to *pulany* sites where there may be consequences for the safety of visitors, as well as culturally and spiritually for Nyangumarta Traditional Owners.

5.5.3 Mooring and anchoring

Public moorings within the marine park are managed by the department, while private moorings are licensed and managed by DoT. If not installed and maintained correctly, moorings may cause irreversible damage to seabed habitat.

No mooring or anchoring restrictions currently exist in the marine park. If required, a mooring and anchoring plan will be developed that will identify areas in the marine park where anchoring and mooring is acceptable from an environmental, cultural, equity and safety perspective, and the capacities of these areas.

5.5.4 Vehicle access

Vehicle access will be provided in all marine park zones, including along the beach and existing coastal access points. Temporal and spatial restrictions may be implemented to protect the cultural and ecological values of the marine park (e.g. during flatback turtle nesting and hatching seasons and migratory shorebird feeding times). Management mechanisms will be explored to restrict vehicles from entering vulnerable habitats (e.g. mangroves). Information on vehicle access will be provided by marine park managers during management plan implementation.

Karajarri Rangers at Cape Missiessy. Photo – Karajarri Traditional Lands Association

Management intervention and visitor infrastructure program: objectives, strategies and targets

Management objectives	1. To minimise visitor risk, where possible, within the marine park. 2. To identify and address existing and potential human impacts on the values of the marine park. 3. To provide facilities to enhance visitor enjoyment of, and minimise impacts on, marine park values. 4. To ensure that the impacts of development proposals are adequately assessed.
Overarching management strategies	1. Undertake periodic assessments of visitor risks in the marine park and implement measures to reduce or remove identified visitor risks (**H-KMS**). 2. Identify areas of existing or potential human impacts and implement measures to address these impacts, where appropriate (**H-KMS**). 3. In liaison with user groups, provide high-quality visitor facilities where appropriate to enhance visitor enjoyment of, and reduce impacts to marine park values (**H-KMS**). 4. Investigate and implement mechanisms to restrict vehicle access as necessary e.g. in special purpose zone (mangrove protection) [DoT, LGAs, relevant land managers] (**H**). 5. Undertake routine inspections and maintenance of Parks and Wildlife managed infrastructure in the marine park, particularly zone markers and signage (**M**). 6. Establish and maintain records of human use within the marine park (**M**). 7. Ensure that marine park values are included in predictive models and response plans for oil spills to assist in managing any significant pollution event that occurs [DoT] (**M**). 8. Investigate the need for, and prepare and implement as required, a mooring and anchoring management plan for the marine park [DoT] (**L**).
Target	Implementation of management strategies within agreed timeframes (see *Management programs operational schedule*).

5.6 Research

Developing an understanding of the cultural, ecological, social and economic values of the marine park is critical to effective management. A comprehensive marine research program underpins this understanding and provides information necessary to protect cultural and ecological values and sustainably manage social and economic values. Much of this information does not currently exist for Eighty Mile Beach Marine Park or the Ramsar site, so research programs will be designed to fill key knowledge gaps, including establishing a better understanding of the natural state of key values and the processes supporting them. Given the lack of baseline information for most values, research will be a strong focus in the early years of implementing the management plan.

The department's Marine Science Program is primarily responsible for facilitating research in the State's marine parks and reserves to provide information necessary to support appropriate management. Parks and Wildlife will work with the relevant JMBs to ensure that traditional ecological knowledge[3] is incorporated in the development of collaborative research plans and to further identify and better understand the cultural values of the park. Successful integration requires an understanding that traditional knowledge is part of a fundamentally different worldview with its associated values, institutions and management systems. New research partnerships between scientists and traditional owners require the development of protocols relating to the culturally appropriate use of information shared by traditional owners.

[3] Traditional knowledge refers to the long-standing information, wisdom, traditions and practices of traditional owners. Traditional knowledge does not separate 'secular' or 'rational' knowledge from spiritual knowledge, intuitions and wisdom (Higgins-Zogib *et al.* 2010).

Departmental policy No. 78 *Science Policy* provides a framework for science activities undertaken by or on behalf of the department. External organisations must obtain a licence from the department to conduct research in the marine park. An exemption may also be required through DoF if any research being undertaken contravenes the FRM Act.

A range of organisations have roles in promoting and undertaking research in the marine park, including government agencies, educational and scientific institutions, non-government organisations and the community. Where required, specific research strategies are detailed for the cultural, ecological, social and economic values in Sections 6–8. Research and monitoring is also identified as an important social value of the marine park and is discussed further in Section 8.7.

Research program: objectives, strategies and targets

Management objectives	1. To obtain an appropriate understanding of the biodiversity, key ecological processes, cultural values and social issues in the marine park. 2. To promote cultural, ecological and social research that improves knowledge and understanding of the marine park and provides practical and operational advice for management.
Overarching management strategies	1. Prepare and progressively implement a coordinated and prioritised marine research program with a focus on: a. defining condition, pressure and response indicators and metrics (i.e. performance measures) to support the monitoring program [DoF] (**H-KMS**) b. establishing baselines for marine park values [DoF] (**H-KMS**) c. addressing knowledge gaps for values identified as key performance indicators (KPIs), reflecting the highest conservation and management priorities [DoF] (**H-KMS**) d. integrating traditional knowledge with contemporary science programs, where appropriate [DoF] (**H**) e. examining how tidal amplitude influences the distribution and movement patterns of marine species [DoF] (**M**). 2. Facilitate knowledge transfer and uptake of research program outcomes to marine park management, planning and policy (**H-KMS**). 3. Ensure that all research projects undertaken by or on behalf of Parks and Wildlife comply with the department's policy No. 78 *Science Policy* and associated guidelines (**H**). 4. Facilitate the transfer of information from research in the marine park by external organisations to Parks and Wildlife, JMBs, MPRA and the relevant Aboriginal Corporations through research licence conditions (**H**). 5. In consultation with traditional owners, develop and implement protocols to ensure that any research undertaken in the marine park is culturally appropriate, information shared by traditional owners is used in a culturally appropriate manner and that research findings are reported back to traditional owners. Research partnerships between research scientists and traditional owners should be accompanied by a research agreement (**H**). 6. Develop and maintain records of all research that has occurred within, or is relevant to, the marine park and its values (**M**).
Targets	1. Implementation of management strategies within agreed timeframes (see *Management programs operational schedule*). 2. Establishment of baselines for specific ecological values within agreed timeframes (see *Management programs operational schedule*).

5.7 Monitoring

Long-term monitoring of the condition of the marine environment, and the pressures that impact on that condition, is essential to evaluate management effectiveness and inform adaptive management. Monitoring enables the early detection of impacts and provides the trigger for corrective management action before marine park values become significantly degraded. Where changes have occurred and remediation measures have been implemented, a monitoring program should also determine the rate of recovery of an affected area or value.

Parks and Wildlife is progressively implementing a systematic monitoring program across Western Australia's marine parks and reserves (Western Australian Marine Monitoring Program) to improve understanding of management effectiveness, and to inform future management. Monitoring will focus on determining trends in key cultural, ecological and social values (i.e. KPIs) within a 'condition-pressure-management response' framework that measures the health of values against defined targets. Where required, short-term management targets may need to be developed to reflect meaningful interim steps in achieving the longer-term targets and objectives.

Detecting human-induced changes requires an understanding of 'natural' benchmarks and this information will be gathered through strategic monitoring and research. Complicating this are the effects of climate change, which will continue for the foreseeable future. Climate change will compound the impacts of other pressures in ways that may be difficult to predict, track and manage (Department of Climate Change 2009). In the past, climate change has not been considered in the management of the State's marine parks and reserves, as the impacts were not deemed manageable within a marine park context. However, monitoring has an increasingly important role in helping to understand how climate stressors may affect marine park values, and how to increase the resilience of ecosystems, habitats and dependent species to climate change.

Where necessary, the department's Marine Science Program will help determine appropriate performance measures, or surrogates, to monitor the values of the marine park to measure whether the objectives of the management plan are being achieved. The monitoring program will be carried out in partnership with Parks and Wildlife's regional and district staff and traditional owners, and in close collaboration with DoF for fisheries-related values. External providers, such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australian Institute of Marine Science (AIMS), universities, non-government organisations, industry and community groups will be encouraged to assist in the Western Australian Marine Monitoring Program's monitoring, evaluation and reporting activities.

Karajarri Rangers conduct monitoring at Eighty Mile Beach. Photo – Karajarri Traditional Lands Association

Monitoring program: objectives, strategies and targets

Management objective	To monitor the marine park values within a 'condition-pressure-management response' framework, to provide a basis to assess, adapt and improve management.
Overarching management strategies	1. Develop and implement a coordinated and prioritised monitoring program for the marine park that: a. assesses the nature, level and potential impacts of human activities on marine park values [DoF] (**H-KMS**) b. assesses the effectiveness of the zoning scheme, with a focus on KPIs [DoF] (**H-KMS**) c. meets Parks and Wildlife and MPRA audit requirements [DoF] (**H-KMS**) d. uses traditional knowledge and, where possible, provides capacity-building opportunities for traditional owners [DoF] (**H**). 2. Ensure feedback of monitoring results into marine park management, planning and policy (**H-KMS**). 3. Ensure all monitoring activities undertaken by or on behalf of Parks and Wildlife comply with the department's policy No. 78 *Science Policy* and associated guidelines (**H**). 4. Facilitate the transfer of information from monitoring in the marine park by external organisations to Parks and Wildlife, JMBs, MPRA and the relevant Aboriginal Corporations as part of research licence conditions (**H**). 5. Ensure the monitoring program can detect changes in the ecological character of the beach section of the Ramsar site [DoF] (**H**). 6. Consider the impacts and implications of climate change when developing and implementing the monitoring program (**M**).
Target	Implementation of management strategies within agreed timeframes (see *Management programs operational schedule*).

6 Management of cultural values

In many places where Indigenous people have interacted with natural land and seascapes over long periods of time, biodiversity and culture are closely entwined. For Aboriginal people the phrase 'caring for country' means a deep spiritual attachment to the land and sea, to creation beings, plants and animals, to the source of rules for living and to stories, songs and art. The role of Western Australia's marine parks and reserves in protecting culture is reflected in recent legislative changes.

Following the description about traditional owner connections to country in Section 1.3, this section outlines how Aboriginal cultural and heritage values will be managed as part of the marine park. Some aspects of cultural values, such as the use of traditional knowledge, are covered in the overarching strategies in Section 5. Parks and Wildlife policy No. 86 *Aboriginal Customary Activities* provides a framework for decision making in relation to recognising activities undertaken by Aboriginal people for customary purposes, and in the application of relevant regulations.

6.1 Aboriginal culture and heritage (KPI)

Traditional owners maintain connection to their traditional coastal and sea country through identity and place, family networks, spiritual practice and resource gathering. Native title rights and interests have been recognised over the intertidal areas of the marine park.

The majority of traditional owners of Eighty Mile Beach Marine Park live in towns and communities such as Port Hedland, Bidyadanga and Broome. However, they retain social, spiritual and cultural bonds with their traditional land and sea country, and individuals and families have strong ties to particular sites, which are regularly visited. Reefs, coastal creeks, mangroves and intertidal flats in and adjacent to the marine park are particularly important for resource usage. Fish traps and shell middens along the coast show the historical importance of saltwater resources (Karajarri Traditional Lands Association, KTLA 2014). Traditional knowledge of marine resources is underpinned by seasonal calendars and the life cycles of individual species (Willing 2014). Customary use of the area includes camping, nature appreciation, fishing and other harvesting activities. Limited hunting of turtle (predominantly collection of turtle eggs) also occurs.

Under traditional law, traditional owners are responsible for and obliged to protect, preserve and manage areas, sites and objects of significance associated with their country, and the traditional knowledge pertaining to them. These responsibilities and obligations are of continuing importance, particularly with respect to teaching traditional cultural and ecological knowledge to younger generations. Developed over millennia, this knowledge is held by elders and passed down through stories and song, ceremonies, being on country and through everyday life. All Aboriginal sites, registered or otherwise, are protected under the *Aboriginal Heritage Act 1972*. The Department of Aboriginal Affairs (DAA) has responsibility for managing these sites.

Existing and potential pressures include recreational and commercial fishing, mining and exploration, unmanaged and inappropriate visitation to culturally significant sites, pest animals, unsustainable indigenous harvest and the lack of transfer of cultural and ecological knowledge to the next generation (KTLA 2014). These threaten Aboriginal culture and heritage values both within and beyond the boundaries of the park. Commercial fishing and overfishing through recreation are regarded as major pressures by the Karajarri people (KTLA *pers. comm.*).

Four special purpose zones (cultural heritage) are included in the marine park zoning scheme to provide increased recognition and protection of culturally significant sites along Eighty Mile Beach. Traditional owners, through established JMBs, will oversee the implementation of management strategies to provide further understanding and protection of Aboriginal culture and heritage within the marine park. These will include management arrangements for culturally appropriate visitation to *pulany* and other important sites. Joint management arrangements recognise the values, aspirations and management objectives articulated in other traditional owner documents such as Healthy Country plans (e.g. *Karajarri Healthy Country Plan 2013-2023*) and offer the potential to utilise traditional knowledge in park management.

Summary of management arrangements for Aboriginal culture and heritage (KPI)

Requirements	• Recognition of traditional owner connection to country, including spiritual and cultural values and customary use. • Recognition of and support for customary rights and interests of traditional owners. • Access for customary activities, including fishing, hunting and gathering and use of significant sites. • Protection of Aboriginal heritage sites and cultural knowledge. • Recognition of the responsibility of traditional owners, as native title holders, for looking after country.
Management objectives	1. To ensure that Aboriginal culture and heritage values in the marine park are protected and conserved. 2. To raise awareness and understanding of Aboriginal connections with the marine environment, where culturally appropriate.
Specific management strategies	1. Develop a shared understanding and appreciation of the significance of the area and species to traditional owner groups [relevant Aboriginal Corporations] (**H-KMS**). 2. Identify Aboriginal heritage sites in the marine park through cultural heritage mapping or other means as appropriate [DAA, relevant Aboriginal Corporations] (**H-KMS**). 3. Develop a cultural awareness training program, to be delivered by relevant JMBs for government employees and/or contractors working on the ground or in park management (**H**). 4. Ensure visitors are aware of cultural laws and protocols regarding visitor risk and safety (**H**). 5. Control access to sites that traditional owners consider unsuitable for visitation (**H**). 6. Assess the nature and level of impacts on Aboriginal culture and heritage values in the marine park, and take action to address these impacts as appropriate (**M**). 7. Consider and support the concept of cultural interpretive sites and cultural tourism opportunities in the park, within available resources [Western Australian Indigenous Tourism Operators Council (WAITOC)] (**M**). 8. Where relevant, support traditional owners to manage sustainable take of marine fauna (e.g. turtles, dugongs, sharks, rays) for cultural purposes [DoF] (**M**).
Performance measures	To be developed.
Targets (KPI)	1. To be developed within two years of the release of the management plan. 2. Aboriginal cultural targets, in relation to other marine park values, will be developed across values identified as a priority by traditional owners.

7 Management of ecological values

Ecological values are combinations of the physical, chemical and biological characteristics of an area. Ecological values of the marine park are significant in terms of their biodiversity and ecosystem integrity role. Some ecological values are culturally significant and others have social or economic significance. Set out below is information on specific ecological values, and management objectives, strategies and targets for these values. These complement the overarching management strategies in Section 5.

Several of the marine park's ecological values are also critical components and processes for the Eighty Mile Beach Ramsar site. These are the features of the Ramsar site (features which, if they were to be significantly altered, would result in changes to the functioning of the wetland system). The critical components and processes (Hale and Butcher 2009) guide the management strategies outlined below, as Ramsar sites should be managed to maintain and improve their ecological character.

7.1 Geomorphology

Eighty Mile Beach is a unique and exceptional feature, which contrasts with a distinctly different seabed and coastal topography in the south-west corner of the marine park.

Eighty Mile Beach is an almost continuous curving beach with associated low sand dunes. The beach is approximately 220km long, more than 100m wide on average, and adjoins extensive tidal flats up to several kilometres wide. The intertidal sand and mudflats are comprised of marine-derived carbonate mud and sediments of terrigenous (from the erosion of rocks on land) and marine shell origin (Semeniuk 2008). Waves and tides supply voluminous amounts of fine carbonate sediment, supporting diverse, abundant and productive benthic and infauna communities. In turn, these ecological communities are a productive food source for shorebirds, fish and invertebrate predators. Geomorphology is also a critical component and process of the Ramsar site (Hale and Butcher 2009).

In contrast with Eighty Mile Beach, Cape Keraudren, Blaze Bay and Pardoo Creek in the south-west corner of the park are characterised by rocky shores, small tidal creeks and mangrove-lined muddy bays. Saltmarsh flats occur further inland behind the mangroves (Stevens *et al.* 2008; Department of Conservation and Land Management 1994).

The geomorphology of the marine park is likely to be in a natural state. There may be some localised areas of impact around Cape Keraudren, due to recreational use on coastal landforms and adjacent to mangrove areas. Cattle grazing has also led to some erosion of the primary dunes, which lie directly adjacent to the park but within the Ramsar site. In recent years, the department and traditional owners have fenced off Eighty Mile Beach to exclude cattle.

It will be important to continue to work with adjacent land managers to manage access and use across susceptible geomorphic features.

Summary of management arrangements for geomorphology

Current status	The geomorphology of the marine park is thought to be in a natural state, however, there may be some localised disturbances.
Existing and potential pressures	• Degradation from recreational use (e.g. vehicles, boat launching, camping) of coastal landforms. • Changes to geomorphology from nearshore and onshore developments and activities (e.g. installation of jetties). • Climate change impacts from rising sea levels and increased severity of tropical cyclones and storms.
Current major pressures	None identified.

Management objectives	1. To ensure that coastal landforms are not significantly altered by human activities in the marine park. 2. To ensure that seabed structural complexity and geomorphic processes are not significantly altered by human activities in the marine park.		
Specific management strategies	1. Liaise with coastal land managers to ensure effective management of access to and use of coastal landforms in the marine park (**H**). 2. Monitor the condition of coastal landforms and seabed structural complexity in the marine park, and take remedial action if human activities are impacting these features (**H**). 3. Undertake research to better understand coastal geomorphic processes and drivers such as sediment transport and the impact of cyclonic activity (**M**). 4. Support the installation of fencing along the landward boundary of the marine park to exclude cattle, in liaison with the manager of Pardoo Station (**M**).		
Performance measures	1. Area of coastal degradation. 2. Area of seabed disturbance.	**Desired trends**	1. Constant or negative. 2. Constant or positive.
Short-term targets	To be developed as required.		
Long-term targets	1. No change in coastal landform structure as a result of human activity in the marine park, except for approved development sites. 2. No change in seabed structural complexity or geomorphic processes as a result of human activity in the marine park.		

7.2 Water and sediment quality

Water and sediment quality is likely to be high and is essential to maintain healthy marine ecosystems.

Oceanographic processes, including currents, winds, wave action and tidal flow, influence the water and sediment quality by impacting on transport, dispersal and mixing of sediments, biota and pollutants. The relative lack of human population and development in the marine park, combined with strong oceanic mixing and circulation, means that water and sediments are likely to be of high quality. Despite the large tidal range, the coastal waters of Eighty Mile Beach are relatively clear due to the small amount of river run-off compared with adjacent bioregions.

Freshwater seeps occur along Eighty Mile Beach and may play an important ecological role for a variety of species and communities, particularly those found in the intertidal areas. Many of these areas also have cultural significance to traditional owners.

The *National Water Quality Management Strategy* provides a nationally consistent approach for water quality management (ANZECC & ARMCANZ 2000). In Western Australia a *State Water Quality Management Strategy* was developed to guide implementation at the state level (Government of Western Australia 2004). The EPA has drafted an *Environmental Assessment Guideline for Protecting the Quality of Western Australia's Marine Environment* (EPA, in prep.).

Development and infrastructure proposals that have the potential to significantly affect water quality are subject to assessment and/or regulation under the EP Act. Through the assessment process the Minister for Environment may set conditions with respect to water quality which are regulated by the Office of the Environmental Protection Authority.

Shipping is an important regional activity, however, it is not a major activity in the park. The risk of oil spills in offshore waters could pose a risk to marine park values. Sewage discharge from vessels has potential to increase nutrient levels and affect water quality. Sewage should not be discharged in sanctuary or recreation zones (and within a 500m buffer of these zones) or within 500m of the coastline (DoT 2009). Sewage discharge from vessels using approved treatment systems is permitted over all remaining waters of the marine park.

Management will focus on determining baselines from which changes in water and sediment quality can be measured. Management will be consistent with the framework in the EPA's *Environmental Assessment Guideline for Protecting the Quality of Western Australia's Marine Environment* (in prep.) and the *Australian and New Zealand Guidelines for Freshwater and Marine Water Quality* (ANZECC & ARMCANZ 2000a).

Summary of management arrangements for water and sediment quality

Current status	The water and sediment quality of the marine park is likely to be high.		
Existing and potential pressures	• Marine debris. • Sewage discharge, oil spills, introduction of marine pests and pollutants from vessels if shipping activity increases in the area. • Changes in hydrological regime or groundwater flow from extraction associated with onshore developments and activities.		
Current major pressures	None identified.		
Management objective	To ensure the water and sediment quality is not significantly impacted by human activities in the marine park.		
Specific management strategies	1. Undertake research to: a. develop an appropriate understanding of the background water quality, variability, circulation and mixing in the marine park (**H**) b. develop an appropriate understanding of the background sediment quality and variability within the marine park (**H**) c. better understand the groundwater regime and freshwater seeps, and their ecological significance (**M**). 2. Monitor the condition of water and sediment quality in the marine park, and take remedial action if human activities are impacting this value **(H)**. 3. Map the areas of the marine park that are highly sensitive to oil and chemical spills and ensure that this information is accessible to the State Marine Oil Pollution Coordination Group (**M**).		
Performance measures	1. To be developed.	**Desired trends**	1. To be developed.
Short-term targets	To be developed as required.		
Long-term target	No change in water or sediment quality beyond natural background$^{\Omega}$ levels as a result of human activity in the marine park, except for designated areas where a different level of acceptable change is approved by the appropriate government regulatory authority.		

Ω Background conditions are determined from an appropriate unimpacted reference site, as per the environmental quality framework referred to in the *Australian and New Zealand Guidelines for Freshwater and Marine Water Quality* (ANZECC & ARMCANZ 2000a).

7.3 Intertidal sand and mudflat communities (KPI)

Intertidal sand and mudflat communities are primary producers with an abundance and diversity of invertebrate life, providing a valuable food source for waterbirds and other fauna.

The intertidal sand and mudflat communities of the marine park support a high diversity of fauna (particularly molluscs) that live within or on the surface of the flats. Although typically bare of vegetation, these areas are colonised by assemblages of microorganisms, which play a crucial role in primary production and nutrient cycling (regarded as critical processes of the Ramsar site, Hale and Butcher 2009). Invertebrates that live on the surface of the sand or mud, and burrow into the substrate, regularly turn over and oxygenate the sediment. The abundance of invertebrate life found on intertidal sand and mudflats provides a valuable food source for larger fish and other organisms which swim over the area at high tide, and for resident and migratory shorebirds.

The large tidal range of Eighty Mile Beach results in an intertidal zone that can be up to 4km wide and comprise about 60,000ha of sand and mud. A 1999 survey of benthic invertebrate fauna, conducted along 80km of the intertidal zone at the northern end of the beach, identified 112 different species, subspecies and varieties. Forty of these taxa were not found in similar surveys of Roebuck Bay to the north, highlighting the distinctiveness of intertidal sand and mudflat communities between areas along the coast (Lavaleye *et al.* 2005).

Intertidal sand and mudflat flora and fauna are protected under the Wildlife Act and FRM Act. Development proposals that may impact on intertidal sand and mudflat communities may be subject to an environmental impact assessment in accordance with the EP Act.

The intertidal sand and mudflat communities of the marine park are likely to be generally undisturbed[4]. There are currently no major pressures within the park, however, there are some localised disturbances where recreational fishing and shell collecting, commercial hermit crab collecting, trampling and compaction from vehicles occur.

Management will focus on increasing the knowledge of intertidal sand and mudflat communities and their relationship to other marine park values, and on understanding the impacts of human activities. Education will also be an important management activity.

Flame fiddler crabs (*Uca flammula*). Photo – Dave and Fiona Harvey/Naturalist Volunteers

[4] Throughout this management plan, 'undisturbed' means that the ecosystem functioning and integrity is considered to be intact and has not been disrupted by human pressures.

Summary of management arrangements for intertidal sand and mudflat communities (KPI)

Current status	The current status of intertidal sand and mudflat communities is little known, but communities are likely to be generally undisturbed.		
Existing and potential pressures	• Sediment compaction from vehicles, people and livestock. • Direct (e.g. removal of individuals) and indirect (e.g. changes to community structure) impacts from recreational and commercial fishing. • Sewage discharge, oil spills, introduction of marine pests and pollutants from vessels if shipping activity increases in the area. • Changes in hydrological regime or groundwater flow from extraction associated with onshore developments and activities. • Climate change impacts such as greater heat stress, sea level rise and increased turbidity due to more severe cyclones and storms.		
Current major pressures	None identified.		
Management objective	To ensure that intertidal sand and mudflat communities are not significantly impacted by human activities in the marine park.		
Specific management strategies	1. Undertake research to characterise the floral and faunal diversity, abundance and natural variability of intertidal sand and mudflat communities (**H-KMS**). 2. Monitor the condition of intertidal sand and mudflat communities in the marine park, and take remedial action if human activities are impacting these communities (**H**). 3. Educate users about the ecological significance of intertidal sand and mudflat communities and impacts that some activities can have upon them (**M**).		
Performance measures	1. Diversity at an appropriate taxonomic level. 2. Abundance of indicator species.	**Desired trends**	1. Constant. 2. Constant or positive.
Short-term targets	To be developed as required.		
Long-term target (KPI)	No loss of intertidal sand and mudflat community diversity or abundance of indicator species[Ø] as a result of human activity in the marine park.		

Ø In this context a loss or change in abundance excludes those of a minor or transient nature.

7.4 Subtidal filter-feeding communities

A diverse range of subtidal filter-feeding communities, with a high diversity of invertebrate species.

Filter-feeding communities within the subtidal zone provide important habitat structure and food for many species. They are found on both hard and soft substrates, and include a high diversity of sponges, soft corals (such as gorgonians and sea whips), sea squirts and cnidarians. Soft sediment filter-feeding communities also have a high diversity of burrowing invertebrate fauna.

The filter-feeding communities in the subtidal zone of Eighty Mile Beach are little known, however, habitat surveys at the southern end of the marine park near Cape Keraudren found well developed filter-feeding communities on hard substrates, including reef inundated with sand (Zuideveld *et al.,* 2010). These communities were often associated with macroalgal and seagrass communities, and it is likely that they provide important foraging habitat for flatback turtles. Coastal waters south of the marine park between Onslow and Cape Keraudren were sampled by Hooper *et al.* (2002) and found 344 species of sponges in 129 genera, of which 127 (37 per cent) were endemic.

Subtidal filter-feeding communities are protected under the Wildlife Act and FRM Act. Development proposals that may impact on filter-feeding communities are subject to an environmental impact assessment by the EPA in accordance with the EP Act.

Filter-feeding communities in subtidal areas of the marine park are likely to be generally undisturbed.

Management will focus on increasing knowledge and understanding of soft sediment filter-feeding communities in the marine park.

Summary of management arrangements for subtidal filter-feeding communities

Current status	The current status of subtidal filter-feeding communities in the marine park is little known, but communities are likely to be generally undisturbed.		
Existing and potential pressures	• Direct (e.g. removal of individuals) and indirect (e.g. changes to community structure) impacts from recreational and commercial fishing. • Sewage discharge, oil spills, introduction of marine pests and pollutants from vessels if shipping activity increases in the area. • Climate change increasing the severity and frequency of warming events and the severity of tropical cyclones.		
Current major pressures	None identified.		
Management objective	To ensure that subtidal filter-feeding communities are not significantly impacted by human activities in the marine park.		
Specific management strategies	1. Undertake research to characterise the diversity, abundance, spatial extent and natural variability of subtidal filter-feeding communities within the marine park and their contribution to the ecosystem (**H**). 2. Monitor the condition of subtidal filter-feeding communities in the marine park, and take remedial action if human activities are impacting these communities (**M**).		
Performance measures	1. Diversity at an appropriate taxonomic level. 2. Abundance of indicator species.	**Desired trends**	1. Constant. 2. Constant or positive.
Short-term targets	To be developed as required.		
Long-term target	No loss of subtidal filter-feeding community diversity or abundance of indicator species[Ø] as a result of human activity in the marine park.		

Ø In this context a loss or change in abundance excludes those of a minor or transient nature.

7.5 Macroalgal and seagrass communities

Macroalgal and seagrass communities are important primary producers that provide habitat and refuge areas for fish and invertebrates.

Macroalgae and seagrasses are important components of shallow tropical marine environments, providing energy and nutrients for detrital grazing food webs, and food for other species. These communities enhance the habitat value of benthic habitats by increasing structural diversity and stabilising soft substrates. They vary seasonally in response to water temperature, day length, reproductive cycles, physical disturbance and regrowth (Fulton *et al.* 2006; Kirkman 1997).

Seagrasses are widespread along the Pilbara and lower-west Kimberley coast, particularly *Halophila ovalis* (Walker and Prince 1987; Wells *et al.* 1995). Brown algae are the most abundant group of

macroalgae in the region, with *Sargassum*, *Dictyopteris* and *Padina* the dominant genera. The most common green alga is *Halimeda*, while prominent red algal species include crustose corallines, non-corallines and algal turf (Pendoley and Fitzpatrick 1999; Wells *et al.* 1995).

The intertidal and subtidal zones of Eighty Mile Beach are largely unvegetated, however, macroalgal and seagrass communities are found in the south-west corner of the park. Seagrass meadows in this area support dugongs, which are regularly seen here.

Macroalgae and seagrasses are protected under the Wildlife Act and FRM Act. Development proposals that may impact on these communities are subject to an environmental impact assessment by the EPA in accordance with the EP Act.

No current major pressures on macroalgal and seagrass communities in the marine park have been identified and these communities are likely to be in a generally undisturbed condition. Management will focus on improving knowledge of macroalgae and seagrasses in the marine park.

Summary of management arrangements for macroalgal and seagrass communities

Current status	The current status of macroalgal and seagrass communities in the marine park is little known, but communities are likely to be generally undisturbed.		
Existing and potential pressures	• Physical disturbance from vessel activity (e.g. anchoring, propeller scour). • Direct (e.g. removal of individuals) and indirect (e.g. changes to community structure) impacts from recreational and commercial fishing. • Sewage discharge, oil spills, introduction of marine pests and pollutants from vessels if shipping activity increases in the area. • Climate change impacts from warming temperatures and more severe cyclones and storms.		
Current major pressures	None identified.		
Management objective	To ensure that macroalgal and seagrass communities are not significantly impacted by human activities in the marine park.		
Specific management strategies	1. Undertake research to characterise the diversity, composition, density, spatial extent and natural variability of macroalgal and seagrass communities in the marine park (**H**). 2. Monitor the condition of macroalgal and seagrass communities in the marine park, and take remedial action if human activities are impacting these communities (**M**).		
Performance measures	To be developed.	**Desired trends**	To be developed.
Short-term targets	To be developed as required.		
Long-term targets	To be developed.		

7.6 Coral reef communities

Intertidal and subtidal reef systems support a high diversity of hard corals.

Coral reefs are important primary producers and provide food and habitat for a wide variety of marine life, including sponges, sea stars, sea urchins, crustaceans, molluscs, gastropods, worms and fish. They protect coastlines from wave erosion and are important for nature-based tourism, research and education.

The Pilbara and Kimberley regions are home to a diverse and distinct range of hard corals. However, there are relatively few well-developed coral communities in the Eighty Mile Beach meso-scale bioregion (Department of Environment and Conservation 2009a). This represents a significant delineation between the Pilbara and north Kimberley coral communities (Gilmour *et al.* 2006).

A small number of coral communities are found at the southern end of the marine park near Cape Keraudren and in sparse areas on the outer edge of the intertidal mudflats (Davidson *et al.* 2008; Department of Conservation and Land Management 1994).

Some inhabitants of coral reef communities, such as fish, molluscs, ornamental aquarium fish and juvenile corals, are targeted by recreational and commercial fishers. DoF is responsible for managing the recreational and commercial take of coral in Western Australia. Corals can only be legally collected in the marine park by commercial fishers who hold a Marine Aquarium Managed Fishery licence with an endorsement to take corals. Recreational fishers are not permitted to take live or dead coral anywhere in Western Australia.

Development proposals that may impact on corals are subject to an environmental impact assessment by the EPA, with advice from DoF and the department in accordance with the EP Act.

There are some localised disturbances to intertidal coral reef communities around Cape Keraudren where fishing, reef walking and collecting (commercially for coral and recreationally for species inhabiting coral reefs) occur.

Management will focus on gaining an increased understanding of corals in the marine park, including their diversity, spatial extent and natural variability.

Summary of management arrangements for coral reef communities

Current status	The current status of coral reef communities in the marine park is unknown, although some localised disturbances do exist.		
Existing and potential pressures	• Physical disturbance from reef walking, recreational collecting of non-coralline species, commercial coral collecting and anchoring. • Direct (e.g. removal of individuals) and indirect (e.g. changes to community structure) impacts from recreational and commercial fishing. • Sewage discharge, oil spills, introduction of marine pests and pollutants from vessels if shipping activity increases in the area. • Climate change impacts including increased severity and frequency of warming events, ocean acidification and increasing cyclone and storm intensities.		
Current major pressures	None identified.		
Management objective	To ensure that coral reef communities are not significantly impacted by human activities in the marine park.		
Specific management strategies	1. Undertake research to characterise the diversity, cover, spatial extent, community composition and natural variability of coral reefs within the marine park (**H**). 2. Monitor the condition of coral reef communities in the marine park, and take remedial action if human activities are impacting these communities [DoF] (**M**).		
Performance measures	1. Species diversity. 2. Live coral cover. 3. Community composition.	**Desired trends**	1. Constant. 2. Constant. 3. Constant.
Short-term targets	To be developed as required.		
Long-term targets	1. No loss of species diversity or live coral cover[Ø] as a result of human activity in the marine park. 2. No change in community composition[Ø] as a result of human activity in the marine park.		

Ø In this context a loss or change in live coral cover or community composition excludes those of a minor or transient nature.

7.7 Mangrove communities and saltmarshes (KPI)

Mangrove communities and adjacent saltmarshes provide nutrients to the surrounding waters and habitat for fish and invertebrates.

Mangrove communities are important primary producers of ecological and economic importance. They help to stabilise coasts and control erosion by trapping and binding sediment, and provide habitat and refuge areas for a variety of fish, invertebrates and birds. Mangroves are also important for cultural heritage and education.

Saltmarshes and saltpans generally occur on wide pans that are infrequently inundated by very high tides. Little is known of the ecological role of these habitats in tropical Australia, however, it is likely that they deliver nutrients to coastal waters, and that some fish and invertebrates use these areas when inundated (Connolly and Lee 2007). Further investigation is needed to better understand the importance of these areas and to determine if there are any local pressures.

There are significant mangrove communities in the south-west corner of the marine park, in creeks and bays between Cape Keraudren and Mulla Mulla Down Creek. Mangroves are virtually non-existent along Eighty Mile Beach, except for a few small tidal creeks near Mandora that contain two stands of white mangrove (*Avicennia marina*) (Lane 2003; Semeniuk 1997) and in the north at Cape Missiessy. The Pilbara mangrove communities are of national and international significance, as they are the largest single unit of relatively undisturbed tropical arid zone mangrove in the world (Semeniuk 1997).

Mangroves and saltmarshes are protected under the Wildlife Act and native vegetation clearing provisions of the EP Act. Development proposals that may impact on mangroves and saltmarshes are subject to an environmental impact assessment by the EPA in accordance with the EP Act.

A number of identified pressures, including four-wheel driving, boat launching and fishing have resulted

Mangrove communities west of Cape Keraudren. Photo – Steve Bunce

in localised disturbances to mangroves and saltmarshes in the marine park. These disturbances occur in the vicinity of Cape Keraudren, Blaze Bay and Mulla Mulla Down Creek.

Management will focus on implementing a zoning scheme to provide additional protection to some mangrove areas and on establishing appropriate baselines. Improved understanding of the ecological role of saltmarsh areas is also a priority.

Summary of management arrangements for mangrove communities and saltmarshes (KPI)

Current status	The current status of mangrove communities and saltmarshes in the marine park is unknown, although some localised disturbances do exist.		
Existing and potential pressures	• Physical disturbance from vehicles, trampling by livestock, recreational fishing and crabbing. • Direct (e.g. removal of individuals) and indirect (e.g. changes to community structure) impacts from recreational and commercial fishing. • Sewage discharge, oil spills, introduction of marine pests and pollutants from vessels if shipping activity increases in the area. • Climate change impacts such as rising sea level, warming of air and sea temperatures, alteration of rainfall patterns and more intense cyclones and storms.		
Current major pressures	None identified.		
Management objective	To ensure that mangrove communities and saltmarshes are not significantly impacted by human activities in the marine park.		
Specific management strategies	1. Undertake research to develop a more comprehensive understanding of the diversity, spatial extent, canopy cover and natural variability of mangrove communities and saltmarshes in the marine park, and the ecological role of saltmarshes (**H-KMS**). 2. Identify disturbed areas of mangroves and saltmarshes in the marine park and assess whether regeneration is likely to occur naturally or whether active restoration efforts are required (**H**). 3. Monitor the condition of mangrove communities and saltmarshes in the marine park, and take remedial action if human activities are impacting these communities (**H**). 4. In liaison with traditional owners, adjacent land managers and users of the marine park, investigate the need for and implement as appropriate, a vehicle closure of Malamalajungunya Special Purpose Zone (Mangrove Protection) [DoT, Shire of East Pilbara, adjacent land managers] (**M**).		
Performance measures	1. Species diversity. 2. Spatial extent. 3. Canopy cover.	**Desired trends**	1. Constant. 2. Constant or positive. 3. Constant or positive.
Short-term targets	To be developed as required.		
Long-term targets (KPI)	1. No loss of mangrove species diversity, spatial extent[Ø] or canopy cover[Ø] as a result of human activity in the marine park. 2. No loss of saltmarsh species diversity, spatial extent[Ø] or canopy cover[Ø] as a result of human activity in the marine park.		

Ø In this context a loss or change in spatial extent or canopy cover excludes those of a minor or transient nature.

7.8 Waterbirds, including migratory species (KPI)

Many nationally and internationally important shorebirds and waders are found in the marine park.

Eighty Mile Beach supports a high diversity and abundance of waterbirds. Ninety-seven species have been recorded, including 42 species listed under international migratory agreements (Hale and Butcher 2009). Eighty Mile Beach provides important nesting and refuge sites, with the intertidal sand and mudflats providing food such as worms, bivalves and other invertebrates. As well as being of great ecological significance, waterbird communities are a popular attraction for visitors to the area. Migratory species have been observed along the entire length of the beach. Many of these feed almost exclusively on the intertidal flats while others use the beach for roosting but feed on adjacent inland areas.

The waterbirds of Eighty Mile Beach are nationally and internationally significant, and recognised as a critical component of the Ramsar site (Hale and Butcher 2009). Eighty Mile Beach is one of the most important sites in the world for migratory shorebirds and one of the most significant non-breeding areas within the East Asian-Australasian Flyway (Bamford *et al.* 2008; Pearson *et al.* 2005; Rogers *et al.* 2009; Rogers *et al.* 2011; Watkins *et al.* 1997). Birds in the Flyway migrate from breeding grounds in north-east Asia and Alaska to non-breeding grounds in Australia and New Zealand. Intertidal flats provide important staging and feeding areas, particularly on southward migration routes, between August and November (Pearson *et al.* 2005). Also, many migratory species on the Kimberley coast have delayed maturity, and after arriving at Eighty Mile Beach remain there for one to three years before they first attempt to migrate north (Rogers *et al.* 2011).

The highest numbers of many of the most abundant species occur in the northern third of the beach, particularly the stretch south of the Anna Plains beach access road (Rogers *et al.* 2009). However, different species congregate on different areas of the beach. Due to the great length of the beach, there have only been three total ground counts of shorebirds in the non-breeding season: October 1998 (465,890), November 2001 (472,418) and December 2008 (311,638) (Rogers *et al.* 2009). These counts represent the highest number of shorebirds for any site in Australia and among the highest counts for the Flyway. For the December 2008 complete count, the most abundant species were the great knot (128,600), bar-tailed godwit (51,100), red-necked stint (28,200), red knot (23,100) and greater sand plover (22,700) (Rogers *et al.* 2009).

All birds in Western Australia are fully protected under the Wildlife Act. Many of the waterbirds within the marine park are covered by bilateral agreements with China (China–Australia Migratory Bird Agreement, CAMBA), Japan (Japan–Australia Migratory Bird Agreement, JAMBA) and Korea (Republic of Korea–Australia Migratory Bird Agreement, RoKAMBA) so Australia has an international obligation to protect these species. Sixty-four species recorded on Eighty Mile Beach are listed as threatened or migratory under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), with 42 of these also listed under international migratory bird agreements (Hale and Butcher 2009).

Recent surveys of Eighty Mile Beach found that migratory shorebird numbers had declined. Specifically, the summer counts of three shorebird species (in the northern part of the beach) were approaching or had reached the threshold limits of acceptable change for the Ramsar site[5] (Bennelongia 2010; Fuller and Wilson 2010; Hale and Butcher 2009). The declines were not considered to be related to human activities at the beach but reflected reduced Flyway-wide populations. The most likely cause was habitat loss in the staging areas used for migration, in particular the tidal flats of the Yellow Sea (Rogers *et al.* 2009).

There are no current major pressures on waterbirds in the marine park, although there are some pressures that have the potential to affect bird populations. Physical disturbance from recreational vehicles, aircraft and people can cause resident birds to fly away from nests, leaving them exposed to predators. Taking flight can also cost shorebirds energy and reduce feeding opportunity, which may impact on their ability to put on enough weight to migrate successfully.

Management will focus on managing human activities that may impact on waterbirds, through vehicle restrictions and education programs and establishing an adequate monitoring program. It is critical to maintain waterbird habitat in an undisturbed condition, including the infaunal intertidal communities on which the birds depend. Management will involve continued collaboration with appropriate bodies and support for international shorebird conservation initiatives.

[5]'Limits of acceptable change' is the terminology used under the Ramsar Convention to set limits on how much key aspects of the ecology of the site can change without risking the ecological character.

Summary of management arrangements for waterbirds, including migratory species (KPI)

Current status	Waterbird diversity in the marine park is considered to be stable. Waterbird abundance still meets the relevant Ramsar listing criterion, although the numbers of at least three key migratory shorebird species have declined below the limits of acceptable change.		
Existing and potential pressures	• Disturbance to feeding, roosting and nesting activity by people, vehicles, vessels, low flying aircraft and livestock. • Loss or degradation of critical habitat (e.g. coastal vegetation, intertidal sand and mudflats). • Entanglement in and ingestion of marine debris. • Predation by feral species (e.g. foxes, cats). • Climate change impacts including increased temperatures and increased intensity of storm and cyclone events.		
Current major pressures	None identified locally. Loss of habitat in the staging areas used for migration elsewhere is considered a major pressure facing migratory shorebirds that visit the marine park in the non-breeding season.		
Management objective	To ensure that waterbirds that inhabit or migrate through the marine park are not significantly impacted by human activities or feral predators in the marine park.		
Specific management strategies	1. Work with the appropriate expert bodies (e.g. the Wetlands and Waterbirds Taskforce, the Global Flyway Network and the Australasian Wader Studies Group) to develop and implement a waterbird monitoring program that meets national and international reporting requirements (**H-KMS**). 2. Ensure that management of migratory shorebirds in the marine park supports relevant international agreements (e.g. JAMBA, CAMBA, RoKAMBA, Ramsar Convention, Convention on the Conservation of Migratory Species of Wild Animals (CMS) and contributes to other relevant instruments (e.g. *Asia-Pacific Migratory Waterbird Conservation Strategy 2001-2005* and *Draft Wildlife Conservation Plan for Migratory Shorebirds 2014*) (**H**). 3. Educate users about nationally and internationally significant waterbird populations, the impacts that some human activities can have upon them and the external pressures affecting migratory shorebirds (**H**). 4. In liaison with traditional owners, adjacent land managers and users of the marine park, investigate the need for and implement as appropriate, a seasonal vehicle closure of the northern part of Eighty Mile Beach from Cape Missiessy to Mandora Creek to protect waterbirds [DoT, Shire of Broome, adjacent land managers] (**M**). 5. Investigate sister site arrangements and other collaborative opportunities across the Flyway through the East Asian-Australasian Flyway Partnership to enhance conservation outcomes for migratory shorebirds (**M**).		
Performance measures	1. Survival rate of migratory shorebirds. 2. Disturbance levels (number of alarm flights).	**Desired trends**	1. Constant or positive. 2. Negative.
Short-term targets	To be developed as required.		
Long-term targets (KPI)	1. No decline in survival rate of migratory shorebirds as a result of human activity in the marine park. 2. No significant disturbance of roosting shorebirds as a result of human activity in the marine park.		

7.9 Marine turtles (KPI)

Flatback turtles are endemic to northern Australia and nest at Eighty Mile Beach.

Flatback turtles are the only species of sea turtle known to nest on Eighty Mile Beach, with peak nesting from November to December and peak hatching from January to March. Other marine turtle species may frequent the waters of the marine park, including green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), loggerhead (*Caretta caretta*), olive ridley (*Lepidochelys olivacea*) and leatherback (*Dermochelys coriacea*) turtles. Turtles are a critical component of the Ramsar site (Hale and Butcher 2009).

Research indicates that the flatback population at Eighty Mile Beach may be part of a different genetic stock to populations further west (Barrow Island and Mundabullangana) and north along the Kimberley coast (Pittard 2010). Flatback turtles prefer to nest on low energy beaches bounded by a broad shallow intertidal zone. They also favour soft-bottom habitat for foraging and inter-nesting (Limpus 2004; Pendoley 2005). Flatback turtles are unique in that they do not have a pelagic life stage and remain within Australian continental shelf waters. These all highlight the significance of the marine park for nesting, inter-nesting and foraging flatback turtles.

Watching turtles nest is popular in some parts of the region, making marine turtles potentially economically significant to the nature-based tourism industry. These activities must be carefully managed to minimise impacts on nesting turtles.

All marine turtles are protected under the Wildlife Act and the EPBC Act and recognised under international conservation agreements. The department encourages people to abide by a turtle watcher's code of conduct.

No current major pressures on turtles have been identified within the marine park, however, they are susceptible to habitat degradation, disturbance from human interaction and activities, disturbance or predation by feral species and climate change factors. Disturbance from recreational users is limited somewhat, as peak times for nesting and hatching coincide with the low season for visitation.

Management will focus on human activities that may impact on nesting turtles and turtle hatchlings. Strategies will include working with adjacent land managers to build upon existing measures to manage seasonal access and use of vehicles on beaches, education programs to improve interaction, and research.

Nesting flatback turtle. Photo – Dave and Fiona Harvey/Naturalist Volunteers

Summary of management arrangements for marine turtles (KPI)

Current status	While the current status of turtle populations in the marine park requires further investigation, the results of a flipper tagging program at nearby Mundabullangana (Cowrie Beach) suggests the flatback nesting population is stable (Pendoley *et al.* in prep.).		
Existing and potential pressures	• Disturbance from human interaction (e.g. vehicles, boat strike). • Degradation of nesting habitat from recreational use. • Predation of nests and hatchlings by feral species (e.g. foxes, cats). • Unsustainable customary hunting and egg collection. • Entanglement in and ingestion of marine debris. • Disease (e.g. fibropapillomatosis). • Climate change impacts from rising sea level and increased cyclone severity may increase the risk of tidal inundation of nests. Higher temperatures could affect reproductive processes and food resources.		
Current major pressures	None identified.		
Management objective	To ensure that marine turtles are not significantly impacted by human activities or feral predators in the marine park.		
Specific management strategies	1. Undertake research to better understand the location and significance of critical areas and nesting beaches for marine turtles in the marine park (**H-KMS**). 2. Ensure that management of marine turtles in the marine park supports relevant international and regional agreements (e.g. CMS and MoU on the Conservation and Management of Marine Turtles and their Habitats of Indian Ocean and South-East Asia) and contributes to other relevant instruments (e.g. *Draft Western Australian Marine Turtle Strategic Conservation Plan*) (**H**). 3. Monitor the condition of marine turtles in the marine park, and take remedial action if human activities or feral predators are impacting these species (**H**). 4. Work with the managers of Eighty Mile Beach Caravan Park and Cape Keraudren Reserve, and adjacent pastoralists, to ensure marine park users are aware of, and comply with, Parks and Wildlife's Turtle Watcher's Code of Conduct (**H**). 5. In liaison with traditional owners, adjacent land managers and users of the marine park, investigate the need for and implement as appropriate, a seasonal vehicle closure in key turtle rookery areas at Eighty Mile Beach and Cape Keraudren during the flatback turtle nesting and hatching season (November to March) [DoT, LGAs, adjacent land managers] (**M**). 6. Evaluate the effectiveness of turtle monitoring efforts in the marine park and implement a revised/modified turtle monitoring program as required (**M**).		
Performance measures	1. Abundance of nesting turtles. 2. Reproductive success. 3. Disturbance levels (number of false crawls, nests disturbed by human activities or feral animals).	**Desired trends**	1. Constant or positive. 2. Constant or positive. 3. Negative.
Short-term targets	To be developed as required.		
Long-term targets (KPI)	1. No loss of abundance of nesting turtles or breeding success as a result of human activity or feral predation in the marine park. 2. No significant disturbance of nesting turtles as a result of human activity or feral predation in the marine park.		

7.10 Marine mammals

Dugongs and several whale and dolphin species inhabit or migrate through the marine park.

Dugongs occur throughout the subtropical and tropical Indo-West Pacific, with most of the population distributed across northern Australia. More than 2,000 individuals inhabit the Pilbara region from Locker Point, south of Onslow, to the De Grey River mouth, near the southern end of the marine park (Prince *et al.* 2001). Dugongs commonly aggregate in protected shallow bays and mangrove channels. They feed primarily on *Halophila* seagrass and migrate depending on food source availability. Dugongs are regularly sighted in the shallow water embayments at the southern end of the marine park in relatively large aggregations (S. Bunce *pers. comm.*) and it is likely that they migrate between coastal waters of the Pilbara and Kimberley regions through the park (D. Holley *pers. comm.*).

Current knowledge of the distribution, migratory habits and regional and local importance of the marine park for whales and dolphins is limited. Due to the area's large tidal range, it is unlikely that some of the larger whale species would pass through the northern parts of the park (Jenner *et al.* 2001). However, there have been a number of unconfirmed sightings and reports of humpback whales (*Megaptera novaeangliae*), including mother-calf pairs, close to the beach and cliffs at Cape Keraudren and in waters west of Mount Blaze. A 2009 satellite tracking study of south-bound female humpback whales with calves revealed the migratory corridor of tagged whales was centred approximately 15km offshore of Eighty Mile Beach (Double *et al.* 2010).

Several smaller cetacean species, including the Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), Australian snubfin dolphin (*Orcaella heinsohni*) and the Indo-Pacific humpback dolphin[6] (*Sousa chinensis*) are likely to occur in the marine park (S. Allen *pers. comm.*). These species have been sighted and recorded further along the adjacent coastline to the west and east of the marine park, but further investigation is required to confirm the distribution of the species in the park and the significance of the areas and habitats they use.

All marine mammals are protected under the Wildlife Act and EPBC Act and recognised under international conservation agreements.

There are no major pressures on marine mammals within the marine park. Existing or potential pressures on dugongs, whales and dolphins include debris, human interaction and habitat loss and degradation. Customary hunting of dugongs occurs in some parts of the Pilbara and Kimberley but is believed to be infrequent within the marine park.

Management will focus on improving knowledge of marine mammals that are found in the park, their distribution, abundance and use of the area.

Summary of management arrangements for marine mammals

Current status	The current status of marine mammals in the marine park is little known, but populations are likely to be generally undisturbed.
Existing and potential pressures	• Disturbance from human interaction (e.g. boat strike, noise). • Loss or degradation of critical habitat (e.g. seagrass). • Entanglement in and ingestion of marine debris. • Disease. • Unsustainable customary take. • Climate change impacts may alter movement patterns. Impacts on seagrasses (e.g. from warming events and increased intensity of cyclones) would have flow-on effects for dugong populations.
Current major pressures	None identified.
Management objectives	To ensure that marine mammals that inhabit or migrate through the marine park are not significantly impacted by human activities in the marine park.

[6] Current research is considering the Australian populations of the Indo-Pacific humpback dolphin to be a separate species, *S. sahulensis* (Jefferson and Rosenbaum 2014).

Specific management strategies	1. Undertake research on marine mammal abundance, distribution, natural variability (spatial and temporal patterns) and habitat requirements in the marine park (**H**). 2. Ensure that management of marine mammals in the marine park supports relevant international agreements (e.g. CMS and MoU on the Conservation and Management of Dugongs and their Habitats throughout their Range) (**H**). 3. Monitor the condition of marine mammals in the marine park, and take remedial action if human activities are impacting these species (**M**).		
Performance measures	1. Dugong abundance. 2. Cetacean diversity. 3. Cetacean abundance.	**Desired trends**	1. Constant or positive. 2. Constant. 3. Constant or positive.
Short-term targets	To be developed as required.		
Long-term targets	1. No loss of dugong abundance or change in distribution as a result of human activity in the marine park. 2. No loss of cetacean diversity or abundance as a result of human activity in the marine park.		

7.11 Invertebrates

A highly diverse marine invertebrate fauna provides an important food source for a variety of animals including birds, fish and turtles, along with recreational and commercial fishing opportunities.

The marine park is likely to have a high diversity and abundance of marine invertebrates, which can be attributed to the range of habitats throughout the area. They are a food source for fish, birds and turtles, while several invertebrate species, including prawns, crabs, squid, octopus, oysters, rock lobsters, sea cucumbers and hermit crabs, are targeted by recreational and commercial fishers in the region. Invertebrates are a critical component of the Eighty Mile Beach Ramsar site (Hale and Butcher 2009).

DoF is responsible for managing the recreational, commercial and customary take of invertebrate species under the FRM Act, and managing pearling in Western Australia under the *Pearling Act 1990*. See sections 8.4 and 8.5 for further details on fishing and pearling activities in the area.

The status of invertebrate populations in the marine park is little known. However, recreational and commercial fishing may be impacting on local populations of invertebrates, near Eighty Mile Beach Caravan Park and Cape Keraudren, where recreational fishing for octopus, clams, oysters, squid and shells occurs, as well as commercial collection of shells and hermit crabs.

Management needs to consider the viability of populations of targeted invertebrate species in order to maintain marine park values. Species for which extraction is considered appropriate will be managed by DoF, in accordance with ecologically sustainable development principles. A key strategy is undertaking research to increase knowledge and understanding of invertebrate fauna in the marine park.

Summary of management arrangements for invertebrates

Current status	The current status of invertebrate populations in the marine park is unknown. Populations of non-targeted invertebrate species are likely to be generally undisturbed, although anecdotal evidence indicates abundance of some targeted species may be declining in high-use locations.
Existing and potential pressures	• Recreational and commercial fishing, including targeted fishing (e.g. prawns, crabs, squid, octopus, lobster, oysters), live shell collecting (e.g. specimen shells and hermit crabs), bait collection, bycatch and local depletion of some targeted species. • Degradation of critical habitat as a result of human activities (e.g. reef walking). • Entanglement in and ingestion of marine debris. • Climate change impacts such as changes in the intensity of cyclones and storms.

Current major pressures	None identified.		
Management objectives	1. To maintain non-targeted invertebrate species in a generally undisturbed condition. 2. To manage targeted invertebrate species for ecological sustainability.		
Specific management strategies	1. Undertake research to characterise the diversity, abundance, natural variability, distribution and habitat requirements of invertebrates within the marine park and to understand the ecological role of targeted invertebrate species and the consequences of their removal [DoF] (**H**). 2. Monitor the condition of invertebrates susceptible to localised depletion in the marine park, and take remedial action if human activities are impacting these species [**DoF**] (**H**). 3. Educate users about invertebrate populations within the marine park and relevant fisheries regulations that apply [DoF] (**M**).		
Performance measures	1. Species composition. 2. Abundance of indicator species.	**Desired trends**	1. Constant. 2. Constant or positive.
Short-term targets	To be developed as required.		
Long-term targets	1. Invertebrate species composition and abundance of indicator species in sanctuary zones to be at natural levels[Ø]. 2. Management targets for invertebrates in other zones to be determined in consultation with DoF, in its role as the lead agency for managing fisheries.		

Ø 'Natural' in this context refers to the species composition and abundance that would occur in areas that are undisturbed and/or unexploited by human activities.

7.12 Scalefish (KPI)

A diversity of fish species in the park provide recreational and commercial fishing opportunities.

The marine park supports a diverse range of predominantly tropical fish species. A 2000-02 fish survey across the north-west coast recorded 352 species, from 194 genera, in 82 families from reef and soft substrate habitats in water depths of 5-30m (Travers *et al.* 2003). Fish assemblages changed markedly depending on habitat and substrate type, but overall the most common families were Carangidae (trevally/queenfish), Serranidae (cods), Bothidae (flounders), Lutjanidae (snappers) and Tetraodontidae (puffers). Fish are a critical component of the Ramsar site (Hale and Butcher 2009).

Many fish species are targeted by commercial and recreational fishers. Under the FRM Act, DoF is responsible for managing recreational, commercial and customary fishing. Fish stocks are managed through a range of tools, including size and bag limits, gear restrictions, licences and closed seasons.

The status of scalefish populations in the marine park is largely unknown. There are reports of localised impacts to targeted fish stocks around the Cape Keraudren area, however, no data is available to confirm this.

The management of targeted fish species needs to consider the viability of the populations of these species in the context of maintaining marine park values. Species for which extraction is considered appropriate will be managed by DoF, in accordance with its Ecosystem-Based Fisheries Management program. A key management strategy is to educate park users about the impacts of human activities on fish stocks in the marine park.

Summary of management arrangements for scalefish (KPI)

Current status	Little is known about the current status of scalefish populations in the marine park. Populations of non-targeted species are likely to be generally undisturbed, although anecdotal evidence indicates abundance of some targeted species may be declining in high-use locations.		
Existing and potential pressures	• Recreational and commercial fishing, including incidental catch, bycatch and local depletion of some targeted species. • Loss and degradation of critical habitat (i.e. nursery areas, aggregation areas). • Entanglement in and ingestion of marine debris. • Climate change impacts may affect habitat and food availability.		
Current major pressures	None identified.		
Management objectives	1. To maintain non-targeted scalefish species in a generally undisturbed condition. 2. To manage targeted scalefish species for ecological sustainability.		
Specific management strategies	1. Undertake research to characterise scalefish diversity, abundance, natural variability, movement patterns and critical habitats within the marine park and to understand the ecological role of targeted scalefish species and the consequences of their removal [DoF] (**H-KMS**). 2. Monitor the condition of scalefish susceptible to localised depletion in the marine park, and take remedial action if human activities are impacting these species [**DoF**] (**H**). 3. Educate users about scalefish within the marine park and relevant fisheries regulations that apply [DoF] (**M**).		
Performance measures	1. Species composition. 2. Abundance of indicator species.	**Desired trends**	1. Constant. 2. Constant or positive.
Short-term target	To be developed as required.		
Long-term targets (KPI)	1. Scalefish species composition and abundance of indicator species in sanctuary zones to be at natural levels[Ø]. 2. Management targets for scalefish in other zones to be determined in consultation with DoF, in its role as the lead agency for managing fisheries.		

Ø 'Natural' in this context refers to the species composition and abundance that would occur in areas that are undisturbed and/or unexploited by human activities.

7.13 Sharks and rays

A diversity of sharks and rays, including several protected species, are found in the park.

The shark and ray populations of the inshore waters of the marine park are dominated by whaler sharks, including pigeye shark (*Carcharhinus amboinensis*), nervous shark (*C. cautus*), graceful shark (*C. amblyrhynchoides*), blacktip shark (*C. tilstoni*), spinner shark (*C. brevipinna*), hardnose shark (*C. macloti*) and lemon shark (*Negaprion acutidens*), as well as hammerheads (Family Sphyrnidae), stingrays (Family Dasyatidae) and shovelnose rays (Family Rhinobatidae). Four of the world's five sawfish species also occur in the area (*Pristis clavata, P. pristis, P. zijsron* and *Anoxypristis cuspidata*), probably representing some of the last relatively healthy sawfish populations in the world (Harrison and Dulvy 2014; Stevens et al. 2008). Small juvenile animals have comprised a significant portion of the shark and ray catch along Eighty Mile Beach (noting that these animals may have been specifically targeted by fishers), highlighting the potential value of the nearshore subtidal and intertidal waters as nursery areas for many of these species (Stevens *et al.* 2008; Salini *et al.* 2007).

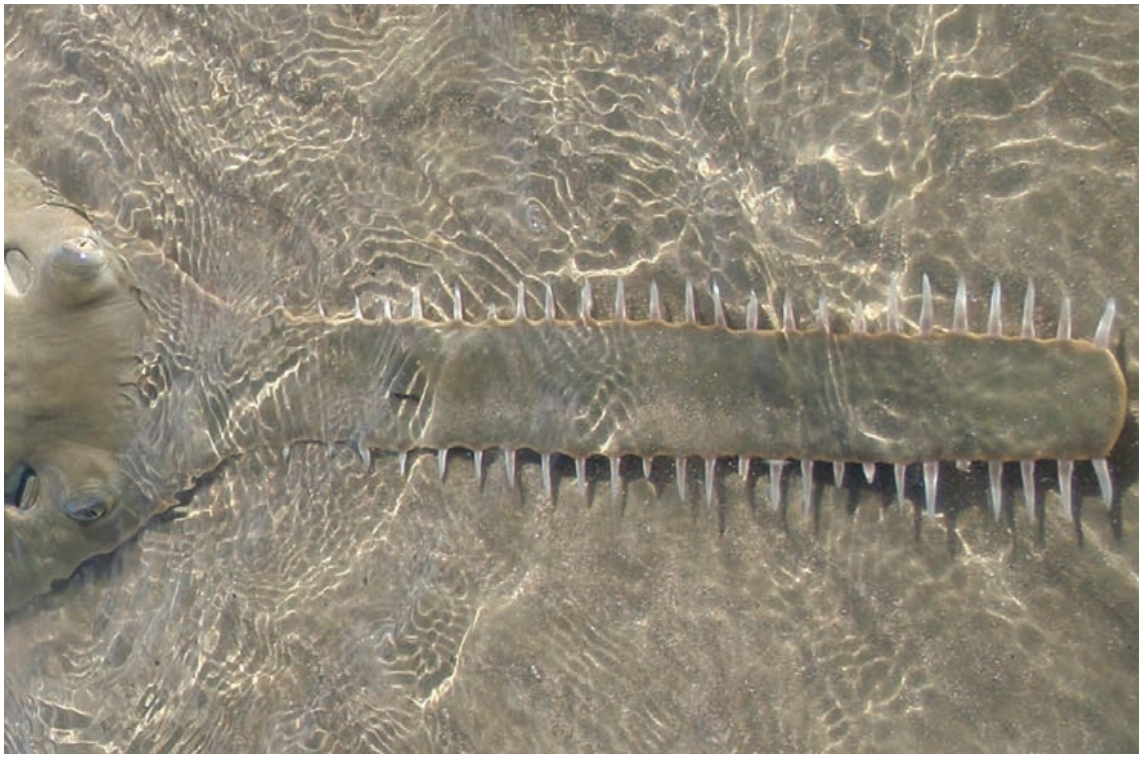
Sharks and rays were previously taken by commercial gillnetters operating along Eighty Mile Beach and by commercial longliners operating in the northern shark fishery further offshore (McAuley *et al.* 2005). The western portion of this fishery (which includes the marine park) was indefinitely closed to commercial shark fishing in 2005 to protect the breeding stock of sandbar sharks (*C. plumbeus*). Due to the mobility of some species, continued shark fishing in adjacent areas may still be influencing the abundance of shark and ray species in the marine park. Limited take of sharks and rays may still occur in the park as part of the Northern Demersal Scalefish Managed Fishery (two sharks per trip limit), but is likely to be significantly less than previous levels. Some sharks and rays can be taken by recreational fishers.

DoF continues to monitor the status of commercial shark stocks in the Pilbara and Kimberley regions through ongoing fishery-independent research surveys, biological research and stock assessments for key commercial species. This is in response to risk assessments undertaken by DoF showing that stock levels for some sharks in the region are unacceptable or have a high level of uncertainty (McAuley 2010).

Nine shark and ray species found in the marine park are protected under State and/or Commonwealth legislation. Sawfish are totally protected under the FRM Act with dwarf, green and largetooth (previously known as freshwater) sawfish also listed as vulnerable under the EPBC Act. They are particularly vulnerable to all types of net fishing as the saw-like rostra is easily entangled.

With the removal of commercial gillnetting from Eighty Mile Beach, and the closure of part of the northern shark fishery, human pressures on shark and ray populations within the marine park have been reduced. However, a low level of interaction with other commercial and recreational fishers may still occur.

DoF will manage shark and ray species for which extraction is considered appropriate, in accordance with its Ecosystem-Based Fisheries Management approach and marine park management arrangements. For other sharks and rays, developing a better understanding of the critical habitats used in the marine park and their significance requires further investigation.



Threatened green sawfish. Photo – Stirling Peverell

Summary of management arrangements for sharks and rays

Current status	The current status of shark and ray populations in the marine park is little known, but populations are likely to be stable or increasing.		
Existing and potential pressures	• Recreational and commercial fishing, including illegal, unregulated and unreported shark catches and incidental mortality. • Loss and degradation of critical habitat (e.g. nursery areas, aggregation areas). • Entanglement in and ingestion of marine debris. • Unsustainable customary take.		
Current major pressures	None identified.		
Management objectives	1. To ensure non-targeted shark and ray species are not significantly impacted by human activities in the marine park. 2. To manage targeted shark and ray species for ecological sustainability.		
Specific management strategies	1. Undertake research to characterise shark and ray diversity, abundance, natural variability and critical habitats within the marine park [DoF] (**H**). 2. Ensure that management of sharks and rays in the marine park supports relevant international agreements and conservation initiatives (e.g. CMS and *Sawfish: A Global Strategy for Conservation*) and contributes to other relevant instruments (e.g. *National Plan of Action for the Conservation and Management of Sharks 2012 Shark-plan 2* and *Draft Recovery Plan for Sawfish and River Sharks 2014*) [DoF] (**H**). 3. Monitor the condition of sharks and rays in the marine park, and take remedial action if human activities are impacting these species [**DoF**] (**M**). 4. Educate users about the marine park's sharks and rays (with a focus on threatened, endangered and high-risk species) and the relevant fisheries regulations that apply [DoF] (**M**). 5. Develop and implement a program with traditional owners to promote the conservation of sawfish in the marine park [DoF] (**M**).		
Performance measures	1. Species composition. 2. Abundance of indicator species.	**Desired trends**	1. Constant. 2. Constant or positive.
Short-term targets	To be developed as required.		
Long-term targets	1. Shark and ray species composition and abundance of indicator species in sanctuary zones to be at natural levels[Ø]. 2. Management targets for sharks and rays in other zones to be determined in consultation with DoF, in its role as the lead agency for managing fisheries.		

Ø 'Natural' in this context refers to the species composition and abundance that would occur in areas that are undisturbed and/or unexploited by human activities.

8 Management of social and economic values

Marine parks are created to provide for the conservation and restoration of the natural environment, the protection of indigenous flora and fauna and the preservation of any feature of cultural, archaeological, historic or scientific interest. They also provide opportunities for nature-based recreation, tourism and commercial uses where they are consistent with management targets set for cultural and ecological values. Outlined below is information on specific social and economic objectives, strategies and targets. These complement the overarching management strategy in Section 5.

Management of use and visitation in the marine park is guided by the zoning scheme and permitted uses (Section 5.1.3), the management objectives, strategies and targets, and the provisions of the CALM Act, Wildlife Act and other legislation relating to marine management. Departmental policy No. 18 *Recreation, Tourism and Visitor Services* provides specific guidance for recreation, tourism and visitor services within CALM Act reserves.

8.1 European heritage

The region has a history of European contact associated with exploration, pastoralism, commercial fishing and the Second World War. Relics in the marine park include a plane wreck and shipwrecks.

In 1699, William Dampier conducted an investigation of the Western Australian coast aboard the *Roebuck*. The French first explored the area in 1803 and Cape Keraudren was named by naturalist Francois Peron. The first British settlers along the north-west coast arrived in 1863 (Brown and Geytenbeek 2003). Pastoralism was the first major industry in the area, with sheep stations being established on the nearby De Grey River. This was followed by the establishment of small ports and service centres along the coast (Scadding 2008), and the establishment and development of the pearl shell industry in Broome by the turn of the century (Department of Education and Training 2008). Commercial fishing also had an important early influence on the economic geography of the area (Department of Environment, Water, Heritage and the Arts 2008).

A historic plane wreck, the *Dornier Do-24 X-36* lies within the Anna Plains Sanctuary Zone. The plane, carrying passengers escaping from Batavia (modern Jakarta, Indonesia) during the Second World War, was forced to land on Eighty Mile Beach in early 1942 due to lack of fuel (Western Australian Museum 2012). The wreck is protected under the *Heritage of Western Australia Act 1990.* Under this Act, all development proposals regarding places on the State Register of Heritage Places must be referred to the Heritage Council of Western Australia for advice. The Western Australian Museum assists in managing such submerged sites.

Two pearl luggers were wrecked on Eighty Mile Beach in the 1890s. They have been covered by sand over the years, but are sometimes exposed after cyclones. Pre-1900 shipwrecks are protected under the *Maritime Archaeology Act 1973* and all shipwrecks over 75 years old are protected under the Commonwealth *Historic Shipwrecks Act 1976*. The WA Museum is responsible for managing these wrecks.

There are remnants of the end of the rabbit proof fence, and a wall used as a lookout post in the Second World War, immediately adjacent to the marine park at Cape Keraudren.

> *On August 30, 1922, a scientific expedition arrived on Eighty Mile Beach adjacent to the Wallal Downs pastoral station. The expedition is scientifically renowned for photographing the solar eclipse of September 21, 1922, which provided important evidence to help prove Einstein's Theory of Relativity. The expedition, involving five teams from international universities and observatories, arrived at Eighty Mile Beach by the eighty-ton schooner* Gwendolen. *As there was no port, the heavy but delicate scientific equipment needed to be rowed ashore from the ship, then transported by donkey teams to the field site over a mile from the beach.*
>
> Jeffery *et al*. 1989

The main management issues regarding European heritage in the marine park are potential human impacts on important sites (e.g. debris, physical disturbance).

Summary of management arrangements for European heritage

Requirements	Protection of European heritage and historic sites.
Management objective	To ensure that European heritage sites are not significantly impacted by human activities in the marine park.
Specific management strategies	1. Determine and maintain appropriate levels of access to European heritage sites within the marine park [WA Museum] (**M**). 2. Provide information to enhance visitor enjoyment of, and reduce impacts on, European heritage sites [WA Museum] (**M**).
Reporting	To be developed.
Target	Preserve European heritage sites in the marine park.

8.2 Remote seascapes (KPI)

Remote areas with natural beaches, rocky shores, sand and mudflats and mangroves with visible and abundant wildlife.

The marine park has remote seascapes that offer a wilderness experience to visitors. There are panoramic vistas of unspoilt reefs, rocky shores, intertidal flats, mangroves and white sandy beaches with abundant wildlife. Eighty Mile Beach is the longest beach in Western Australia, extending for more than 200km. The community can enjoy these attributes from the beach, from vantage points along the coast, or from the window of a plane or a vessel. They provide commercial value to the tourism industry as a significant drawcard for tourists.

Any degradation of remote seascapes in the marine park would have the potential to impact on other values, including Aboriginal culture and heritage, tourism and coastal use, and sites valued for remote recreational fishing experiences. Inappropriate structures along the coastline and in surrounding waters, including the development of roads and facilities that promote visitation, could potentially impact on remote seascape values. Coastal developments and maritime infrastructure projects must be planned with careful consideration of this value. An additional concern is the management of marine and coastal debris. A CSIRO study found Eighty Mile Beach to be the cleanest in Western Australia but, despite being remote, it still suffers from contamination (Hardesty *et al.* 2014). Litter also impacts wildlife directly through entanglement and ingestion, and indirectly through chemical effects.

Management of the park's remote seascapes will concentrate on identifying and protecting areas of high seascape value. Developments and activities that have the potential to impact on remote seascapes should be suitably assessed and, where possible, designed to avoid or minimise such impacts.

The marine park offers spectacular remote seascapes. Photo – Matt Fossey/Parks and Wildlife

Summary of management arrangements for remote seascapes (KPI)

Requirements	• High quality environment (e.g. minimal debris, high water quality, undeveloped marine and coastal areas). • Undisturbed coastal and marine vistas. • Sensitively designed and located coastal and marine infrastructure.		
Management objective	To ensure areas with high seascape quality are not impacted by visual intrusions or human activities in or adjacent to the marine park.		
Specific management strategies	1. Identify, map and characterise important remote seascapes in the marine park (**H-KMS**). 2. Ensure site planning and development proposals for recreational and commercial activities are consistent with maintaining the remote seascapes of the marine park [LGAs, adjacent land managers] (**H**). 3. Support and contribute to efforts to minimise the amount of debris in the marine park (**M**).		
Performance measures	Marine and coastal debris at selected monitoring sites.	**Reporting**	To be developed.
Target (KPI)	Preserve areas of remote seascape value in the marine park.		

8.3 Nature-based tourism

A generally undisturbed natural environment offering a variety of nature-based attractions and opportunities.

The marine park offers a range of attractions and opportunities for nature-based tourism and recreation. Its natural rugged beauty and abundant wildlife provide a valuable experience for visitors who enjoy the natural environment. Activities include camping, four-wheel driving, fishing, boating and wildlife appreciation.

Eighty Mile Beach Caravan Park is an important holiday destination and popular stopover for travellers along the Eighty Mile Beach coast. The area immediately in front of the caravan park is well known for beach fishing, four-wheel driving and wildlife viewing. Vehicle access to this high-use area has been regulated by the owners, especially during the turtle nesting season. Near the southern extent of the marine park, Cape Keraudren provides another caravan and camping destination and high-use recreational area, with fishing and wildlife viewing the main activities. Cape Keraudren Coastal Reserve abuts the marine park and is managed by the Shire of East Pilbara. Pardoo Station Stay, west of Cape Keraudren, also offers accommodation and camping facilities, allowing visitors to access the marine park between Pardoo Creek and Mount Blaze.

The CALM regulations require commercial businesses operating within marine parks and reserves to hold a commercial operations licence, issued by the department. Commercial licences are granted where the activity is of a transient nature or involves no permanent infrastructure within the marine park. Most commercial licences are related to tourism. Licences to interact with marine wildlife are issued to commercial operators by the department under the *Wildlife Conservation Regulations 1970* and strict conditions apply.

The department's *Tour Operator Handbook - Marine* provides specific information for commercial businesses operating in a marine park or reserve. Wildlife viewing is controlled by a code of conduct, which includes minimum approach distances, maximum boat speeds and restrictions on use of lights in the vicinity of wildlife. In addition, DoF manages charter fishing activities through a system of fishing tour operator licences.

Management will focus on providing quality nature-based tourism opportunities, while maintaining the park's cultural and ecological values.

Summary of management arrangements for nature-based tourism

Requirements	• High water quality. • High aesthetic quality of the environment (e.g. minimal debris, undeveloped marine and coastal areas). • Equitable access to natural values of the marine park. • Provision of areas free of human impacts for nature appreciation.		
Management objectives	1. To ensure nature-based tourism is managed in a manner consistent with maintaining the marine park's values. 2. To maintain the values of the marine park that are important to the tourism industry.		
Specific management strategies	1. License all commercial tour operators within the marine park with appropriate conditions (**H-KMS**). 2. Ensure commercial tour operators are aware of the zoning scheme and any restrictions that may apply to their operations in the marine park (**H-KMS**). 3. Ensure the granting and renewal of commercial tour licences is consistent with the permitted use table, management targets and wildlife conservation notices (**H**). 4. Develop codes of practice for nature-based tourism operations in the marine park consistent with the park's objectives, targets and performance measures [Tourism WA] (**M**).		
Performance measures	1. Site-based use (%). 2. Visitor satisfaction (e.g. expectations, experience).	**Reporting**	To be developed.
Targets	1. Implementation of management strategies within agreed timeframes. 2. Targets for the performance measures above to be developed.		

8.4 Recreational fishing

A range of quality recreational fishing opportunities targeting fish, crabs and other invertebrates.

Recreational fishing has experienced significant growth in the Pilbara and Kimberley regions, driven by an increase in visitors and an increased regional workforce (Fletcher and Santoro 2013). Effort is largely concentrated around major settlements outside the marine park (e.g. Port Hedland, Broome), however, Pardoo Station, Cape Keraudren and parts of Eighty Mile Beach are popular recreational fishing areas. Recreational fishing is a key attraction for visitors to the marine park.

Recreational fishing in the park is predominantly shore-based, targeting barramundi, threadfin salmon, blue nose salmon, mulloway, whiting and bream. Mud crabs are targeted in mangrove creeks.

Recreational fishing in the marine park is managed by DoF within an Ecosystem-Based Fisheries Management approach and in accordance with the marine park management plan. Management tools include bag and size limits, gear restrictions, seasonal restrictions and licensing requirements. Some species, such as potato cod, hump-headed Maori wrasse and all species of sawfish, are totally protected in all State coastal waters including the marine park. In 2013, new recreational fishing rules outlined in DoF's *Recreational Fishing Guide 2013* came into effect across the State. Traditional seasonal calendars also provide guidance on recreational fishing opportunities, such as what, when and where particular species should be caught or harvested (Willing 2014; Nyangumarta Traditional Owners *pers. comm.*).

Concerns of localised depletion of some recreationally targeted species, including fish and invertebrates around popular fishing areas, have been raised by some stakeholders. In the context of widely distributed marine species, localised depletion may not be a significant risk to fish stocks, however, it has the potential to impact on the recreational experience of people visiting the park. Further investigation is required to determine if localised depletion is affecting marine park values and what strategies can be employed to address the issue.

Summary of management arrangements for recreational fishing

Requirements	• High water quality. • Maintenance of critical habitats for recreationally targeted fish species. • Maintenance of recreationally targeted fish stocks. • Equitable access to fishing areas within the marine park.		
Management objectives	1. To maintain the ecological values of the marine park that support recreational fishing. 2. To ensure that recreational fishing in the marine park is managed in a manner consistent with maintaining the marine park's values.		
Specific management strategies	1. Ensure recreational fishers are aware of the zoning scheme and any restrictions that may apply to their activities in the marine park [DoF] (**H-KMS**). 2. Undertake research to identify recreationally targeted species and to investigate whether there are localised depletions of recreationally targeted species, or risk of depletions in the marine park, and address identified issues as appropriate [DoF] (**H**). 3. Monitor recreational fishing catch and effort within the marine park and report the results to Parks and Wildlife and the MPRA for the annual and periodic reviews of the implementation of the management plan [**DoF**, MPRA] (**H**). 4. As part of the education and interpretation program, communicate and promote traditional seasonal calendars for recreational fishing within the marine park [DoF] (**M**).		
Performance measures	1. Site-based use (%). 2. Visitor satisfaction (e.g. expectations, experience).	**Reporting**	To be developed.
Targets	1. Implementation of management strategies within agreed timeframes. 2. Targets for the performance measures above to be developed.		

Recreational fisher at Eighty Mile Beach. Photo - Colin Ingram

8.5 Commercial fishing

A number of commercial fisheries are licensed to operate within the marine park, including an important pearl oyster fishery.

Commercial fishing is an important and economically significant industry in the Pilbara and Kimberley regions. A range of species are targeted using a variety of methods, including traps, lines, nets and hand collection.

Coastal waters within and adjacent to the marine park have been identified as one of the most important zones for the collection of pearl oysters from the wild. According to the Pearl Producers Association (PPA), Eighty Mile Beach is the last sustainable, commercially viable pearl oyster fishery in the world, with the fishing grounds providing the most efficient and cost effective supply of wildstock *P. maxima* pearl oysters (PPA 2012). The Western Australia Pearl Oyster Fishery harvests some pearl oysters by hand during drift dives in the northern portion of the marine park, but most of the harvesting is likely to occur further offshore. There are no pearl leases within the marine park.

> *Long before the arrival of Europeans, Aboriginal people along the west Kimberley coast collected the large pearl shell for use in rituals and ceremonies. It is the most widely distributed item in Aboriginal Australia, traded across two-thirds of the continent.*
>
> Department of Sustainability, Environment, Water, Population and Communities 2013

Other commercial fisheries that may operate within the marine park are listed below (Fletcher and Santoro 2013; N. Sarginson *pers. comm.*).

- Pilbara Line Fishery – permitted to fish using lines. Generally target emperors, snapper and cod. Likely to be some effort in the marine park.
- Northern Demersal Scalefish Fishery – permitted to fish using lines. Generally target emperors, snapper and cod. Likely to be some effort in the marine park.
- Mackerel Managed Fishery – line fishery targeting Spanish mackerel (*Scomberomorus commerson*) and grey mackerel (*S. semifasciatus*). Minimal effort in the marine park.
- Broome Prawn Managed Fishery – fishery boundary overlaps the marine park but trawling is not permitted under the Broome Prawn Management Plan.
- Nickol Bay Prawn Managed Fishery – fishery boundary overlaps the southern end of the marine park, but no records of catch within the marine park.
- Marine Aquarium Fish Managed Fishery – fishers are permitted to take a range of species, including fish (including pipefish), coral, live rock, algae, seagrass and invertebrates. Likely to be a small amount of effort in the marine park.
- Specimen Shell Managed Fishery – collection of individual shells for display, collection, cataloguing, classification and sale. Likely to be some effort in the marine park.
- Beche-de-mer Fishery – may be a small amount of effort in the marine park. A specific closure excludes fishers from collecting within five nautical miles of Cape Keraudren.
- Pilbara Developing Crab Fishery – DoF has granted fishing exemptions to explore the commercial viability of harvesting blue swimmer crabs (*Portunus pelagicus*) in the region. The fishery boundary overlaps the southern end of the marine park, but there are no records of catch within the marine park.
- Land Hermit Crab Fishery – five authorisations to collect land hermit crabs in Western Australia have been granted, with significant effort occurring in the marine park.

Commercial fishing and pearling in the marine park is managed by DoF under the FRM Act and *Pearling Act 1990* within an Ecosystem-Based Fisheries Management framework and consistent with the arrangements specified in the marine park management plan. A range of management strategies are used, including limitations on fishing gear, closed areas, limits to the number of licences issued and monitoring of catch and stock levels. Other management strategies include the use of bycatch reduction devices to minimise the impacts of commercial fishing on non-target species. Where marine park zoning arrangements are claimed to reduce the commercial value of a fishing licence, the licence holders may be

eligible for compensation under the *Fishing and Related Industries Compensation (Marine Reserves) Act 1997*. DoF is responsible for administering this Act and the compensation process.

The management of commercially targeted species needs to consider the viability of the populations of these species in the context of maintaining marine park values. Fisheries management scales are rarely reconciled with the spatial scales of marine parks and, as a result, populations of some species in a reserve could become locally depleted even though the fishery is being managed on a sustainable basis at the broader scale. To overcome this potential problem, monitoring is required to assess the appropriateness of commercial and/or recreational extraction of these species and whether specific species should be protected in all or part of the marine park.

The primary role of management in relation to commercial fishing and pearling in the marine park is, in liaison with DoF, to ensure that activities in the park are sustainable and to maintain the natural values (e.g. high water and sediment quality) on which the fisheries depend.

Summary of management arrangements of commercial fishing

Requirements	• High water quality. • Maintenance of critical habitats for commercially targeted fish species. • Maintenance of commercially targeted fish stocks. • Equitable access to fishing areas within the marine park, where consistent with the objectives of the marine park.
Management objectives	1. To maintain the ecological values of the marine park that support commercial fishing. 2. To ensure that commercial fishing in the marine park is managed in a manner consistent with maintaining the marine park's values.
Specific management strategies	1. Ensure commercial fishers are aware of the zoning scheme and any restrictions that may apply to their operations in the marine park [DoF] (**H-KMS**). 2. Monitor commercial fishing catch and effort within the marine park and report the results to Parks and Wildlife, JMBs and the MPRA for the annual and periodic reviews of the implementation of the management plan [**DoF**] (**H**). 3. Consult with Parks and Wildlife, JMBs and the MPRA in regard to the status of fisheries and any changes to management arrangements for commercial fisheries that operate within the marine park [**DoF**] (**M**).
Reporting	To be developed.
Target	Implementation of management strategies within agreed timeframes.

8.6 Resources and associated industries

The Pilbara and Kimberley regions contain important mineral, oil and gas resources.

Some areas in and adjacent to the marine park are of interest to the mining industry, with exploration leases covering much of the coastal region. Few sites in the vicinity of the park are currently of interest to the petroleum industry.

While shipping is not a major activity within the marine park due to the shallow water depths, there are increasing numbers of vessels in the region supporting offshore activities. The closest major ports to the marine park are Port Hedland and Broome. Port Hedland serves the mineral-rich eastern Pilbara area and has the largest bulk minerals export port in the world. At the time of writing no future ports (major or minor) were planned within the park.

Mineral, petroleum and industrial operations are managed by DMP under the *Mining Act 1978;* the *Petroleum and Geothermal Energy Resources Act 1967*; the *Petroleum Pipelines Act 1969*; the *Petroleum (Submerged Lands) Act 1982;* the *Petroleum Act 1967;* and the EPA under the EP Act. Where the operation is prescribed in Schedule 1 of the EP Regulations a works approval and/or licence may be

required from DER. Environmental risks associated with shipping and ports are managed through a range of state, national and international agreements and legislation. DoT and Department of Planning are responsible for the planning and development of coastal infrastructure, while port authorities are autonomous bodies operating under the *Port Authorities Act 1999* (Department of Environment, Water, Heritage and the Arts 2008). Mandatory ballast water management requirements were introduced in 2001 to reduce the risk of introduced marine pests (Department of Agriculture 2011).

Where exploration permits are located within an existing CALM Act marine reserve, surface exploration activities will require assessment under the EP Act. Also, under section 15A of the *Petroleum and Geothermal Energy Resources Act 1967* and section 18A of the *Petroleum (Submerged Lands) Act 1982*, entry into a marine reserve requires the Minister for Mines and Petroleum's approval and that Minister must consult with the Minister for Environment.

Exploration activities, other than exploration drilling in sanctuary zones, are permitted within CALM Act marine reserves subject to assessment under the EP Act. Exploration for petroleum and mineral resources below sanctuary zones (i.e. at 200m or greater depth below the seabed) can be achieved by directional drilling from sites adjacent to a sanctuary zone.

In the event that petroleum titles have been granted, and provided the operator has met the requirements specified in the *Petroleum and Geothermal Energy Resources Act 1967*, the operator will have the right to a production title and be eligible to commence production under strict conditions.

Increases in industrial and shipping operations associated with the growth of the resources sector have the potential to impact on values of the marine park. The primary role of management will be to ensure that marine park values are not impacted by any mineral, petroleum and industrial activities, in liaison with DMP and the EPA.

Summary of management arrangements for resources and associated industries

Requirements	• Equitable access to the marine park for current and proposed activities within appropriate areas.
Management objective	To ensure that industry and associated activities in and adjacent to the marine park are managed in a manner consistent with maintaining the park's values.
Specific management strategy	Provide formal advice to the EPA, DMP, DoT, DER and the Commonwealth Department of Environment in relation to the environmental assessment of proposed industrial developments in and adjacent to the marine park [MPRA] (**H**).
Reporting	To be developed.
Target	Implementation of management strategies within agreed timeframes.

8.7 Research and monitoring opportunities

The relatively undisturbed nature and variety of habitats and communities, combined with a range of human uses, provide unique research and monitoring opportunities.

The marine park is a valuable area for scientific research and time-series monitoring. A small number of ecological values have been relatively well studied, particularly waterbirds. However, this is not the case for most other marine park values. It is expected that the amount of scientific research and monitoring in the area will increase following the creation of the park. The recording of tangible and intangible traditional knowledge, traditional owner understanding of the marine and coastal environment, and the location of sites of cultural significance provide ongoing research opportunities.

All research and monitoring within the marine park requires the appropriate permits, approvals and/or exemptions issued under the CALM Act, Wildlife Act, FRM Act, EPBC Act or the *Animal Welfare Act 2002*, as relevant to the specific proposal.

Most scientific programs have relatively benign sampling methods, however, the combined effect of many projects has the potential to impact on the cultural and ecological values of the marine park. Conflicts with other human activities can also be an issue for management as research and monitoring have specific access requirements such as access to representative areas free of major human influences for 'scientific reference sites' and areas covering the range of major human activities for 'impact sites'.

Counting shorebirds at Eighty Mile Beach. Photo – Liz Rosenberg

Summary of management arrangements for research and monitoring opportunities

Requirements	• Equitable access to the marine park for cultural, ecological and social research and monitoring. • Access to representative sites in areas free of human impacts for scientific reference sites and in areas with human activities for impact reference sites.
Management objectives	1. To provide access and opportunities for scientific research and monitoring in the marine park. 2. To ensure the values of the marine park upon which research and monitoring depend are not diminished as a result of human activities in the marine park.
Specific management strategies	1. See overarching management strategies in Sections 5.6 and 5.7. 2. Identify and communicate high priority research and monitoring projects to appropriate external organisations and funding bodies (**H**). 3. Facilitate research and monitoring by appropriate external organisations by providing financial and logistical assistance, where possible (**H**).
Reporting	To be developed.
Target	Implementation of management strategies within agreed timeframes.

9 Auditing and reviews

Progress in implementing the management plan and in assessing management effectiveness will be reviewed periodically through a formal process. Management targets of selected key cultural, ecological, social and economic values are used as KPIs of management effectiveness. These reflect both the conservation priorities and the management imperatives of the MPRA, Parks and Wildlife, traditional owners and the community. The KPI values for the marine park and their associated performance measures and management targets are listed in Table 8. The achievement of management targets in the table may be influenced by activities outside the marine park. Therefore reviews will need to consider external pressures that may influence management outcomes in the park.

Table 8: KPI values, performance measures and management targets for Eighty Mile Beach Marine Park

KPI value	Performance measures	Targets
Aboriginal culture and heritage	To be developed.	1. To be developed within two years of the release of the management plan. 2. Aboriginal cultural targets, in relation to other marine park values, will be developed across values identified as a priority by traditional owners.
Intertidal sand and mudflat communities	1. Diversity at an appropriate taxonomic level. 2. Abundance of indicator species.	1. No loss of intertidal sand and mudflat community diversity or abundance of indicator species as a result of human activity in the marine park.
Mangrove communities and saltmarshes	1. Species diversity. 2. Spatial extent. 3. Canopy cover.	1. No loss of mangrove species diversity, spatial extent or canopy cover as a result of human activity in the marine park. 2. No loss of saltmarsh species diversity, spatial extent or canopy cover as a result of human activity in the marine park.
Waterbirds, including migratory species	1. Survival rate of migratory shorebirds. 2. Disturbance levels (number of alarm flights).	1. No decline in survival rate of migratory shorebirds as a result of human activity in the marine park. 2. No significant disturbance of roosting shorebirds as a result of human activity in the marine park.
Marine turtles	1. Abundance of nesting turtles. 2. Reproductive success. 3. Disturbance levels (number of false crawls, nests disturbed by human activities or feral animals).	1. No loss of abundance of nesting turtles or breeding success as a result of human activity or feral predation in the marine park. 2. No significant disturbance of nesting turtles as a result of human activity or feral predation in the marine park.
Scalefish	1. Species composition. 2. Abundance of indicator species.	1. Scalefish species composition and abundance of indicator species in sanctuary zones to be at natural levels. 2. Management targets for scalefish in other zones to be determined in consultation with DoF, in its role as the lead agency for managing fisheries.
Remote seascapes	Marine and coastal debris at selected monitoring sites.	1. Preserve areas of remote seascape value in the marine park.

9.1 Annual review by Parks and Wildlife

The prioritised strategies in Sections 5-8 of the management plan will be implemented primarily through the annual works programs of the department's Kimberley region, Marine Science Program and other specialist branches in partnership with traditional owners through JMBs.

Parks and Wildlife's Kimberley region will prepare an annual review of management plan implementation for the MPRA's consideration. The review will assess progress in implementing the management plan strategies; identify issues affecting implementation; and assess the condition of marine park values against performance measures and targets.

9.2 Audit by the MPRA

The MPRA is responsible for assessing the implementation of management plans. The MPRA examines the annual reviews undertaken for all Western Australian marine parks and reserves, and prepares an annual audit report.

The MPRA will also assess implementation of the management plan on a periodic basis (e.g. mid-term) and before the statutory ten-year review of the plan. Periodic and ten-year assessments will be based on input from JMBs, the preceding annual reviews and discussions with key stakeholders.

The management plan provides the principal framework to enable the MPRA to carry out its audit function.

9.3 Revision of the management plan

This plan will guide joint management of the marine park for 10 years, or until a statutory revision is undertaken and a new management plan prepared. Full public consultation will occur at the time of a statutory revision and before a new management plan is submitted to the MPRA and then to the Minister for Environment for approval.

Over the next 10 years, management will also be informed by new knowledge, including traditional owner input through joint management arrangements and scientific research, leading to a better understanding of marine park values, uses and pressures. Accordingly, the implementation of management strategies shall be reviewed and updated as needed throughout the life of the plan. This should ensure the plan remains relevant as part of an adaptive management framework and assists marine park managers to achieve long-term outcomes.

9.4 State of the Environment reporting

The Western Australian *State of the Environment Report*, which has been published in 1992, 1998 and 2007, is designed to communicate credible, timely and accessible information about the current condition of the environment to decision makers and the community. The report discusses objectives, indicators, overall condition, key findings and suggested responses for marine and terrestrial ecosystems.

The audit process for Western Australia's marine parks and reserves, as described above, is broadly consistent with the State of the Environment reporting framework.

9.5 National environment reporting

At a national level, there are two major reporting mechanisms relevant to marine conservation reserves: the national *State of the Environment Report* and the performance assessment framework for the NRSMPA.

The national *State of the Environment Report*, which has been published in 1996, 2001, 2006 and 2011, is prepared by an independent committee, with advice from experts including the department. Performance assessment criteria are being developed to assess whether the goals of the NRSMPA are being achieved.

9.6 Ramsar rolling review

Part of the Eighty Mile Beach Ramsar site lies within the marine park and Parks and Wildlife is responsible for reporting on the condition and management of the site every three years as part of a rolling review. While only recently implemented, the rolling review process should provide valuable information and analysis about the national Ramsar estate and help the Commonwealth to address reporting requirements for the Ramsar Convention.

Colourful sponges survive at the southern end of the marine park. Photo – Steve Bunce

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Appendices

Appendix I: Acronyms and commonly used terms

AIMS	Australian Institute of Marine Science
ANZECC	Australia and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
CMS	Convention on the Conservation of Migratory Species of Wild Animals 1979
CALM Act	*Conservation and Land Management Act 1984*
CAMBA	China–Australia Migratory Bird Agreement
CEO	Chief Executive Officer
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DER	Department of Environmental Regulation
DAA	Department of Aboriginal Affairs
Parks and Wildlife	Department of Parks and Wildlife
DoF	Department of Fisheries
DMP	Department of Mines and Petroleum
DoT	Department of Transport
EP Act	*Environmental Protection Act 1986*
EP Regulations	Environmental Protection Regulations 1987
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
FRM Act	*Fish Resources Management Act 1994*
H	High priority
H-KMS	High – key management strategy
ILUA	Indigenous Land Use Agreement
IMCRA	Integrated Marine and Coastal Regionalisation of Australia
IUCN	International Union for the Conservation of Nature
JAMBA	Japan–Australia Migratory Bird Agreement
JMA	Joint Management Agreement
JMB	Joint Management Body
KPI	Key performance indicator
KTLA	Karajarri Traditional Lands Association
L	Low priority
LGA	Local Government Authority
M	Medium priority
MoU	Memorandum of Understanding
MPRA	Marine Parks and Reserves Authority
NRSMPA	National Representative System of Marine Protected Areas
Pulany	Spirit snakes or serpents
Ramsar Convention	Convention on Wetlands of International Importance, especially as Waterfowl Habitat 1971
RoKAMBA	Republic of Korea–Australia Migratory Bird Agreement
Traditional owners	Aboriginal people who belong to, have the right to speak for, and have spiritual responsibilities for the care of a certain place or places based on their own laws and customs. Traditional owners may be directly descended from the original Aboriginal inhabitants of the land and may also be the common law holders of native title for the country being discussed.
UCL	Unallocated Crown land
WAITOC	Western Australian Indigenous Tourism Operators Council
Wildlife Act	*Wildlife Conservation Act 1950*

Appendix II: Management framework

Management objectives

Management objectives identify what the primary aims of management are and reflect the statutory requirements of the CALM Act. Objectives have been developed for each overarching management program and all of the cultural, ecological and social and economic values. Due to the remote setting of the marine park, and the fact that visitation is mainly seasonal and restricted to a small number of sites, no current major pressures or threats have been identified in the management plan. Given the limited understanding of existing and potential pressures on the marine park values, the objectives in this plan simply provide a broad direction for management.

Management strategies

Management strategies provide direction on how the management objectives will be achieved. All strategies outlined in this plan have been prioritised as high (H), medium (M) or low (L) to provide an indication of their relative importance. The (H) strategies considered to be critical to achieving the objectives of the marine park are presented as *key management strategies* (H-KMS). These strategies form part of the performance assessment by the MPRA (Section 9). Prioritised management strategies for specific cultural, ecological, social and economic values should also guide operational work programs. It should be noted, however, that management strategies and priorities are likely to alter in response to changes in usage patterns and new knowledge acquired over the life of the management plan.

Performance measures

Performance measures are indicators of management effectiveness in achieving the marine park's objectives and targets. They are developed (or will be developed during the early phase of the implementation of the management plan) for each of the cultural and ecological values, plus several of the social and economic values. Where possible, performance measures should be quantitative, representative, simple and cost-effective. All performance measures listed in this plan are indicative only and will be reviewed and, where necessary, revised during the design and implementation of monitoring programs.

In regard to the active social and economic values (i.e. those that have the potential to impact negatively on the cultural and ecological values of the marine park) the performance assessment approach incorporates information on the status and level of human activity. This has been termed reporting. Such information is important in monitoring human activities to assist in determining trends in use, and in assessing impacts of these uses on the cultural and ecological values of the marine park.

Management targets

Management targets represent the end points of management. Targets should be measurable, time bound and expressed spatially. The long-term targets provide specific benchmarks to assess the success or otherwise of management strategies within the life of the plan. The management targets for the marine park's ecological values are often set to maintain ecosystem integrity and functioning (e.g. no loss as a result of human activity). The targets for some active social and economic values are qualitative (e.g. visitor satisfaction), whilst others are process-based and stated as 'Implementation of management strategies within agreed timeframe'.

Short-term targets, where identified, provide rehabilitation milestones and are used when the condition of a value is well below the desired condition (i.e. the long-term target). Where no short-term target is identified, it is considered that the condition of the value is close to or at the desired condition and, as such, the long-term target applies.

Key performance indicators (KPIs)

KPIs are a measure of the overall effectiveness of management in relation to the strategic objectives of the marine park. Management targets of key cultural, ecological, social and economic values of the park are used as KPIs of management effectiveness. These key values reflect the highest conservation and management priorities of the MPRA, Parks and Wildlife, traditional owners and the community. KPIs are a key element of the MPRA audit process (Section 9).

Appendix III: Ramsar listing criteria, critical components and processes

The Eighty Mile Beach Ramsar site was listed as a wetland of international importance under the Ramsar Convention on 7 June 1990. To qualify for listing, a wetland must meet at least one of the nine Ramsar criteria. The Eighty Mile Beach Ramsar site currently meets criteria 1-6.

Table 9: Ramsar listing criteria met by the beach section of Eighty Mile Beach Ramsar site

Group A of the criteria: sites containing representative, rare or unique wetland types	
	Criterion 1: *A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.* • Eighty Mile Beach represents the greatest extent of continuous intertidal flats in excellent condition within the Northwest (IMCRA) Province.
Group B of the criteria: sites of international importance for conserving biodiversity	
Species and ecological communities	**Criterion 2:** *A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.* • Eighty Mile Beach supports the flatback turtle, listed as vulnerable under the Commonwealth EPBC Act and data deficient on the IUCN Red List (IUCN 2010). • Coastal waters of Eighty Mile Beach support several sawfish species listed as vulnerable under the EPBC Act and as critically endangered by the IUCN (IUCN 2010).
	Criterion 3: *A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.* • The entire beach section of the Ramsar site is recognised within a distinct meso-scale bioregion (Commonwealth of Australia 2006).
	Criterion 4: *A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.* • Eighty Mile Beach is one of the most important non-breeding and migratory stopover areas for shorebirds both in Australia and globally. The beach represents the most important site internationally (in terms of numbers of individuals) for nine species of migratory shorebirds in the East Asian-Australasian Flyway (Bamford *et al.* 2008). • The beach also supports flatback turtle nesting.
Waterbirds	**Criterion 5:** *A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.* • Eighty Mile Beach is considered to regularly support in excess of 500,000 waterbirds (Department of Environment and Conservation 2009b). The most recent survey of the entire beach section in December 2008 counted more than 323,000 birds (Rogers *et al.* 2009).
	Criterion 6: *A wetland should be considered internationally important if it regularly supports one per cent of the individuals in a population of one species or subspecies of waterbird.* • Maximum counts in the beach section exceed one per cent of the flyway population (or one per cent of the Australian population for resident species) for 21 waterbirds, including 13 migratory shorebirds, three grassland migrants (that forage on adjacent grasslands but use the beach as a thermal refuge), two resident shorebirds and three terns (including two subspecies) (Rogers *et al.* 2009; Rogers *et al.* 2011).

Under the Convention, Contracting Parties commit to promoting the conservation of listed wetlands, with the aim of preventing changes to their ecological character. The critical components and processes for the beach section of the Eighty Mile Beach Ramsar site are listed below:

- Geomorphology
- Hydrology
- Primary production and nutrient cycling
- Invertebrates
- Fish
- Waterbirds
- Marine turtles

Several of these align with the KPIs of the marine park and should be considered as part of research and monitoring activities.

The marine park protects the beach section of the Eighty Mile Beach site. Photo – Parks and Wildlife

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