World Heritage Sites

Protected Areas and World Heritage

NINGALOO COAST AUSTRALIA

The Ningaloo Coast is located on Western Australia's remote coast along the East Indian Ocean. The interconnected ocean and arid coast form aesthetically striking landscapes and seascapes. The coastal waters host a major near shore reef system and a directly adjacent limestone karst system and associated habitats and species along an arid coastline. The property holds a high level of terrestrial species endemism and high marine species diversity and abundance. An estimated 300 to 500 whale sharks aggregate annually coinciding with mass coral spawning events and seasonal localized increases in productivity. The marine portion of the property contains a high diversity of habitats that includes lagoon, reef, open ocean, the continental slope and the continental shelf. Intertidal systems such as rocky shores, sandy beaches, estuaries, and mangroves are also found within the property. The most dominant marine habitat is the Ningaloo reef, which sustains both tropical and temperate marine fauna and flora, including marine reptiles and mammals.

COUNTRY
Australia

NAME
Ningaloo Coast

NATURAL WORLD HERITAGE SITE
2011: Inscribed on the World Heritage List under Natural Criteria (vii) and (x).

STATEMENT OF OUTSTANDING UNIVERSAL VALUE
The UNESCO World Heritage Committee issued the following Statement of Outstanding Universal Value at the time of inscription:

Brief Synthesis
The Ningaloo Coast is located on Western Australia's remote coast along the East Indian Ocean. The interconnected ocean and arid coast form aesthetically striking landscapes and seascapes. The coastal waters host a major near shore reef system and a directly adjacent limestone karst system and associated habitats and species along an arid coastline. The property holds a high level of terrestrial species endemism and high marine species diversity and abundance. An estimated 300 to 500 whale sharks aggregate annually coinciding with mass coral spawning events and seasonal localized increases in productivity. The marine portion of the property contains a high diversity of habitats that includes lagoon, reef, open ocean, the continental slope and the continental shelf. Intertidal systems such as rocky shores, sandy beaches, estuaries, and mangroves are also found within the property. The most dominant marine habitat is the Ningaloo reef, which sustains both tropical and temperate marine fauna and flora, including marine reptiles and mammals. The main terrestrial feature of the Ningaloo Coast is the extensive karst system and network of underground caves and water courses of the Cape Range. The karst system includes hundreds of separate features such as caves, dolines and subterranean water bodies and supports a rich diversity of highly specialized subterranean species. Above ground, the Cape Range Peninsula belongs to an arid ecoregion recognized for its high levels of species richness and endemism, particularly for birds and reptiles.

Criterion (vii): The landscapes and seascapes of the property are comprised of mostly intact and large-scale marine, coastal and terrestrial environments. The lush and colourful underwater scenery provides a stark and spectacular contrast with the arid and rugged land. The property supports rare and large aggregations of whale sharks *Rhincodon typus* along with important aggregations of other fish species and marine mammals. The aggregations in Ningaloo following the mass coral spawning and seasonal nutrient upwelling cause a peak in productivity that leads approximately 300-500 whale sharks to gather, making this the largest documented aggregation in the world.

Criterion (x): In addition to the remarkable aggregations of whale sharks the Ningaloo Reef harbours a high marine diversity of more than 300 documented coral species, over 700 reef fish species, roughly 650 mollusc species, as well as around 600 crustacean species and more than 1,000 species of marine algae. The high numbers of 155 sponge species and 25 new species of echinoderms add to the significance of the area. On the ecotone, between tropical and temperate waters, the Ningaloo Coast hosts an unusual diversity of marine turtle species with an estimated 10,000 nests deposited along the coast annually. The majority of subterranean species on land, including aquatic species in the flooded caves are rare, taxonomically diverse and not found elsewhere in the southern hemisphere. The combination of relict rainforest fauna and small fully aquatic invertebrates within the same cave system is exceptional. The subterranean fauna of the peninsula is highly diverse and has the highest cave fauna (troglomorphic) diversity in Australia and one of the highest in the world. Above ground, the diversity of reptiles and vascular plants in the drylands is likewise noteworthy.

Integrity

The property is embedded into a comprehensive legal framework for the various protected areas and all other land. As a National Heritage area, it is subject to the federal Environment Protection and Biodiversity Conservation Act of 1999 (EPBC) according to which all proposed activities with possible significant impacts on the values of the site require assessments. The EPBC is applicable to activities located outside of the boundaries of the property. While no formal buffer zones have been established for the property, the Act therefore serves as a legal buffer zone. The boundaries encompass the key marine and terrestrial values with the exclusions being small in size and not conflicting with the maintenance of the values if managed adequately.

Both the marine and the terrestrial areas may face a number of threats to the property's integrity. Learmonth Air Weapons Range Facility, located within the property, includes an ancient reef-complex and cave fauna of exceptional importance. It was one of Australia's most active bombing ranges until around 1990 and future bombing activities may pose a threat, in particular for the Bundera sinkhole which is located on Defence Land. Tourism is on the increase leading to associated threats such as damage to vegetation, illegal fishing, sewage and waste disposal and disturbance to wildlife. Comprehensive management programs and an overall tourism development strategy are functioning as well as appropriate responses which require consolidation in anticipation of further increasing visitation. Future concerns include increased water demand leading to water abstraction with potential effects on the groundwater systems as well documented in arid areas with abruptly increasing numbers of visitors.
Fire, historically part of local indigenous management, is a potential threat to the terrestrial vegetation and requires monitoring and control.

Potential off-shore hydrocarbon extraction in the region surrounding the property requires careful consideration in order to prevent potential pollution and disturbance. The coastline's significant length and remoteness poses major challenges to responses to pollution incidents suggesting a need for further investments in emergency response. Sea level rise and increases in seawater temperatures associated with climate change have had comparatively little effect on the property. The good overall integrity suggests a higher resilience that in disturbed systems under additional stress. Still, careful monitoring is highly recommended. A concern affecting both marine and terrestrial parts of the property and requiring permanent monitoring and management are invasive alien species, most importantly foxes, cats, goats and weeds on land and some marine species.

Protection and Management Requirements

The Ningaloo Coast benefits from its remoteness and low population density affording it a high degree of natural protection. The entire, mostly state-owned property is comprehensively protected and managed, including by an overarching strategic management framework. Given the various governmental levels and agencies involved and the differentiation between terrestrial and marine parts of the property, effective coordination of the multiple plans in an overall management framework is critical. Full cooperation between agencies, including fisheries, are necessary to ensure management and law enforcement in the vast and remote marine and terrestrial areas. Funding from federal and state levels and staffing as of the time of inscription would benefit from increases.

There is a need for ongoing management of fisheries and careful planning of resource extraction and corresponding monitoring and disaster preparedness to protect the values of the property. Communication, consultation and joint efforts with local and indigenous stakeholders, including negotiation of native title claims and pastoral leases, are indispensable elements of effective management and local acceptance of conservation efforts. Given the vastness of the area and the limited human and financial resources, co-management approaches with local stakeholders are a promising option. The establishment of a "Ningaloo Coast World Heritage Advisory Committee" or a similar body bringing together representatives from the traditional owners, local government, scientific experts and members of the community, has an important role to play in this regard. Tourist numbers are expected to rise which will require additional management efforts. Increased water abstraction, including from demand from increased tourism, may affect fragile subterranean aquatic habitats and species communities will require constant monitoring and management.

IUCN MANAGEMENT CATEGORY

Unassigned

BIOGEOGRAPHICAL PROVINCE
Western Mulga (6.8.7)

GEOGRAPHICAL LOCATION
The property is located on the mid-west coast of Western Australia 1,100 km north of Perth. The approximate centre point is S 22° 33' 45.4896" and E 113° 48' 37.3176".

DATES AND HISTORY OF ESTABLISHMENT
1964: Establishment of Cape Range National Park

1987: The Western Australian Government gazetted the state waters of the Ningaloo Coast, inland to 40 metres above the high water mark, as a Marine Park. The boundary included around 90 per cent of the reef, extending from approximately 260 kilometres from North West Cape south to Amherst Point. Ningaloo Marine Park (Commonwealth Waters) was declared by proclamation under the *National Parks and Wildlife Conservation Act 1975* (NPWC Act) on 7 May 1987.

2004: The government extended the park boundary south another 40 kilometres to Red Bluff, to ensure protection of the entire Ningaloo Reef.

2004: A 28,000-hectare marine management area at the Muiron and Sunday islands, approximately 15 kilometres north of North West Cape, was established by the State government in November.

AREA
The World Heritage property area is 604,500 ha or 705,015 ha (both in UNESCO description of 2011).
It comprises:
Ningaloo Marine Park (Commonwealth Waters)
Ningaloo Marine Park (State Waters)
Muiron Islands Marine Management Area (including the Muiron Islands)
Jurabi Coastal Park
Bundegi Coastal Park
Cape Range National Park
Learmonth Air Weapons Range

The exact area of the property should be confirmed because the UNESCO World Heritage Committee referred some of the originally nominated areas back to the State Party for further consultation with stakeholders. The area originally nominated was 708,350 ha. No buffer zone has been designated.

LAND TENURE
Resource ownership is divided among the Australian Government, the Western Australian Government, the Shire of Exmouth, Private owners, private lease, and Native title claim.

ALTITUDE
~50m below to ~50m above sea level.

PHYSICAL FEATURES
The Ningaloo Coast is located on the remote western coast of Australia. Its marine environment is dominated by the spectacular Ningaloo Reef, which is spread out beneath the red limestone turrets of Cape Range. More than a set of physical, biotic and climatic attributes superimposed over bedrock, the outstanding value of the Ningaloo Coast derives from its functionally integrated reef and karst system lying along an arid coastline.

Ningaloo Reef forms an unusual nearshore barrier reef that extends for almost 300 kilometres from Red Bluff in the south to the fringing reefs of the Muiron Island group north of the Cape Range peninsula, and around the top of the peninsula to Bundegi Reef in Exmouth Gulf.

The Cape Range peninsula is characterised by the low, steep karst limestone of Cape Range, built from the skeletons of marine creatures deposited in vanished tropical seas and eroded over millennia into the majestic shapes of the karst terrain. The oranges, pinks and browns of the range contrast with patches of sage green vegetation and vibrant red dune fields. A series of wave-cut terraces stretching for a distance of 90 kilometres sculpts the western side of the range– the legacy of former high sea levels

and recent terrestrial uplift. Parched ephemeral river beds wind their way through the rocky gullies, recharged only occasionally by heavy rains from the north.

CLIMATE

The Ningaloo Coast experiences the high summer and mild winter temperatures typical of north-western Australia. The mean summer (December–February) maximum and minimum temperatures in Exmouth are approximately 38°C and 21°C, respectively. Over the winter months (June–August), mean maximum temperature is about 25°C, and mean minimum temperature is around 12°C.

The region is characterised by an arid to semi-arid climate, with variable summer and winter rainfall. Annual regional rainfall of between 200 and 300mm along the coast is far exceeded by evaporation rates of around 2,000 to 3,000mm. Rainfall is influenced by mid-latitude depressions and cyclonic activity and has been known to vary from 84mm to around 570mm. Cyclones move across the Ningaloo Coast once every three to five years, bringing intense rain. These concentrated rainfall events flood through the desert valleys and bring forth vivid flushes of wildflowers that set seed ready for the next rainfall event. They also play a critical role in recharging underground aquifers with water and organic matter and revitalising cave life. Cyclonic winds may be severe, exceeding speeds of 150 km per hour.

VEGETATION

Part of the Carnarvon Xeric Scrub Global Ecoregion, the Cape Range peninsula has a high diversity of plant species, with a total of 630 taxa of vascular plants recorded. The flora is comprised of communities that have adapted to the wide range of generally arid or semi-arid landscapes found across the peninsula, and some relictual taxa. The terrestrial landscapes include a mosaic of rangelands, dune fields, coastal dunes, tidal mud flats, sand flats, alluvial plains and red aeolian dune fields. These landscapes support sparse eucalypt woodlands and acacia shrublands, mixed with more dominant *Triodia* (spinifex) grasslands. The coastal dunes, tidal mud and sand flats, and saline alluvial plains support more specialised samphire and mangrove communities.

The vegetation communities are composed mainly of widespread species, originating from both temperate and tropical regions. This overlap reflects the position of the Cape Range peninsula as a biogeographic transitional zone. A subset of the flora is restricted to the region between Shark Bay and the Cape Range peninsula, such as the spectacular Forrest's featherflower *Verticordia forrestii.* Another 18 species are confined solely to the peninsula and immediate surrounds. These endemic plants include the Yardie Creek morning glory *Ipomoea yardiensis*, two grevillea species *Grevillea calcicola* and *G. variifolia*, a eucalyptus *Eucalyptus ultima* and a bottle tree *Brachychiton obtusilobus.* Many other plants are at the limit of their ranges, including 50 species with southern temperate affinities. Several of these species are unusually disjunct, such as the millstream palm *Livistona alfredii* the nearest population of which is approximately 300 kilometres to the north-east, in the Pilbara region. There are more than 1,000 species of marine algae.

FAUNA

The reef contains a high diversity of corals (300 species), reef fish (738 species), molluscs (655 species) and crustaceans (600 species). Due to the particular location and oceanography, tropical marine species from Ningaloo are transported more southerly than is typical, in some instances until the Great Australian Bight. An example of this are the reef systems of the Houtman Abrolhos Islands, the southernmost true coral reefs in the Indian Ocean and one of the highest latitude reef systems in the world, that are found 600 km south of the property.

The property is recognized for its large annual aggregations of whale sharks *Rhincodon typus* (VU) Population estimates range between 300 and 500 whale sharks. Aggregations generally occur between March and June, and coincide with mass coral spawning events and seasonal localized increases in productivity.

Marine reptiles include six recorded marine turtle species, all threatened, and the olive sea snake *Aipysurus laevis.* This extraordinary diversity of turtle species related to its location on the ecotone between the tropical and temperate waters. Extrapolations from available data suggest that around 10,000 nests are deposited along the coast annually. This is a significant figure from a national, regional, and global perspective.

Manta rays *Manta alfredi* (VU) have been recorded in the reserve and are found on the outer reef. Nineteen species of shark including the oceanic white tip shark *Carcharhinus longimanus* (VU). Tiger

shark *Galeocerda cuvier*, blue shark *Prionace glauca* and grey reef shark *Carcharinus amblyrhyncos* also occur in deeper waters. The open ocean supports large aggregations of fish, including trevally, tuna, mackerel, marlin and sailfish, many of which are found much closer to shore than in other parts of the world due to the narrow continental shelf.

Furthermore, dugong *Dugong dugon*, (VU) and dolphins frequent the lagoons and other marine areas, as do eight species of whales regularly with documented records of a total of 20 cetaceans. The property is notable for the presence of humpback whales *Megaptera novaeangliae* migrating through twice a year on their annual migration between calving grounds off the Kimberley coast and feeding grounds in Antarctica. Blue and sperm whales *Balaenoptera musculus* (EN), *Physeter macrocephalus* (VU) have been observed in the offshore regions of the property, as have minke, Bryde's, southern right and killer whales *Balaenoptera acuitrostrata*, *B.edeni*, *Eubalaena australis*, *Orcinus orca.* The Indo-Pacific humpback dolphin *Sousa chinensis* is also relatively common in this area.

Recent research has revealed a wide variety of bottom dwelling species in the Marine Park, including many previously unrecorded in Australia or even new to science. Sponges dominate the deeper water communities with soft corals and algae living among them. The high numbers of 155 sponge species and 25 new species of echinoderms, and unusual forms found in the diverse sponge garden habitats, add to the significance of the area.

CONSERVATION VALUE

The property is located on the remote coast of Western Australia where the East Indian Ocean meets the Australian continent. The property includes interconnected marine and terrestrial values and features. The Ningaloo Coast hosts a major near shore reef system and a directly adjacent limestone karst system and associated habitats and species along an arid coastline. The property is notable in that it contains a high level of terrestrial species endemism and high marine species diversity and abundance.

The 290 km long Ningaloo Reef is one of the longest near shore fringing reefs in the world. Although by some definitions Ningaloo would not be classified as a true barrier reef, the marine portion contains a high diversity of habitats that includes lagoon, reef, open ocean, the continental slope and the continental shelf. Intertidal systems such as rocky shores, sandy beaches, estuaries, and mangroves are also found within the property. The water depths range from 5 to 30m on the reef to oceanic waters over 500m deep. The continuous “barrier” portion of the reef is approximately 200km and includes a lagoon between 200 and 7000 meters wide. North and south of this continuous “barrier” reef are fringing and patch reefs that constitute an additional 100km of reef habitat.

The various habitats not only support a high diversity of species but also jointly form diverse and aesthetically striking landscapes and seascapes. Less conspicuous but nevertheless one of the major features of the area is the rapid drop-off in bottom depth in the northern part, resulting in a narrow continental shelf that brings the shelf break unusually close to shore. In contrast, the continental shelf in the southern end of the property extends more than 30km from the coastline.

The most dominant marine habitat is the Ningaloo reef, which sustains both tropical and temperate marine fauna and flora, with many species at the limit of their distribution or occurring at atypical latitudes to what is biogeographically considered their normal range. This exceptional transition zone is the result of the mixing between the cold north-flowing West Australian Current and the warm Indian Ocean Counter Current or Leewuin Current.

A major feature of the terrestrial parts of Ningaloo Coast is the extensive karst system and network of underground caves and water courses of the Cape Range. Karst landscapes are characterized by sinking streams, caves, enclosed depressions, dry valleys, gorges, natural bridges, fluted rock outcrops and large springs. The Cape Range Peninsula within the property is characterised by karst limestone that is the product of millions of years of marine fauna skeletons that were deposited in what is now ancient regressed seas and uplifted terrain. The karst system includes hundreds of separate features such as 535 caves, 180 dolines, and 5 permanently standing subterranean water bodies. Currently, below the arid terrain lies a substantial network of caves, conduits, groundwater streams, pools and aquifers that support a diversity of subterranean aquatic species. More than 80 subterranean taxa have been recorded, 75 of which are completely underground and confined to subterranean habitats. In addition to the large number of arthropods, there are two subterranean fish species. The species of the highly specialized underground fauna tell the story of a long-term evolutionary response to an

inhospitable environment and habitat. The biogeographic history and geological history of the region, including the movements of supercontinents, the emerging of the Range from the sea, and subsequent karstification, is narrated through the subterranean fauna and distribution of the karst communities.

The Cape Range Peninsula belongs to the Carnarvon Xeric Scrub ecoregion recognized by WWF for its high levels of species richness and endemism, particularly for birds and reptiles.

LOCAL HUMAN POPULATION

There are fewer than 37 permanent inhabitants within the property (2007). The adjacent townships of Exmouth and Coral Bay have permanent populations of 1,844 and 190 people, respectively, and nearby Carnarvon has a population of 5,283.

VISITORS AND VISITOR FACILITIES

Visitors and tourism present a relatively minor pressure to the property. Visitors are attracted to the area for its natural beauty and for the unique wildlife experiences it offers. Visitor numbers have increased steadily since the late 1990s and some areas have experienced more rapid increases than others. The Ningaloo Coast attracts an estimated 180,000 visitors annually, who either stay in the property itself or in the adjacent towns of Exmouth, Coral Bay and Carnarvon. Most visitors to the Ningaloo Coast visit Cape Range National Park at least once, and the park is also popular with locals. The park receives approximately 220,000 visits each year, mainly between April and October.

A wide range of tours, activities and facilities are available for visitors. These include: glass-bottom boat tours; self-guided walk trails; dive trips; snorkel tours; safari tours; and interpretive activities during school holidays. Visitor facilities and interpretive information are provided throughout the property, including at Milyering Visitor Centre and Shop, Jurabi Turtle Centre, picnic areas and key interpretive sites. Environmentally friendly toilets at day-use areas and certain campgrounds, and clearly marked car parks and pedestrian paths at popular sites contribute to visitor safety and ensure that visitor impacts are managed at key sites.

SCIENTIFIC RESEARCH AND FACILITIES

The Ningaloo Research Program brings together an estimated AU$30.5 million over five years for research activities associated with the Ningaloo Coast that are conducted through DEC, Western Australian Marine Science Institution, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Wealth from Oceans Flagship–Ningaloo Collaboration Cluster, the Australian Institute of Marine Science, various universities, the Western Australian Museum and the Cooperative Research Centre for Sustainable Tourism.

The Ningaloo Research Program, discussed in Section 6.C, ensures that government decisions are based on sound scientific information. The program aims to improve the understanding of ecological resources within Ningaloo Marine Park, the processes that support them, and the effectiveness of monitoring programs and management strategies. The program undertakes and analyses marine-based research to ensure the preservation of the outstanding natural values. In addition, a number of research programs focus on the terrestrial ecosystems of the property. DEC manages these programs and coordinates research to ensure that findings and outcomes are recognised, integrated and used in decision making. The wealth of research and monitoring currently underway is outlined in *Current Marine Research in Ningaloo Marine Park 2007.*

Established in 2005, the Ningaloo Research Program is an integrated program of research into biodiversity, species distribution and human-use patterns within Ningaloo Marine Park. The program brings together Ningaloo Coast-related research activities being conducted through state government departments; the Western Australian Marine Science Institution; the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Wealth from Oceans Flagship–Ningaloo Collaboration Cluster; Australian Institute of Marine Sciences; Western Australian universities; and industry.

The Ningaloo Research Coordinating Committee oversees the research program by coordinating and integrating the research, and establishing linkages between researchers, managers and the broader community. DEC manages programs and coordinates research to ensure that findings and outcomes are recognised and used in decision making. A wide range of monitoring and research projects document important findings on the state of conservation of marine flora and fauna within the property. Research reports address pressures on outstanding heritage values and may make recommendations for the relevant state and national governments.

A key part of the research program is the establishment of comprehensive baseline data, which will enable ongoing monitoring of visitor impacts, climate change, and other pressures on ecosystems and habitats. For example, several benthic surveys have been conducted in the Commonwealth waters of Ningaloo Marine Park. The surveys indicated that the benthic community in the Commonwealth waters is dominated by soft corals such as gorgonians; along with sponges. Fish diversity has been found to be the greatest in areas with the highest density of sponge and octocorals. A further survey in the deeper waters of the Ningaloo Marine Park is currently underway and a range of additional research programs target specific marine species. The wealth of research and monitoring currently underway is outlined in *Discovering Ningaloo: Latest Findings and Implications for Management*.

MANAGEMENT

All areas within the property fall under of one of the following management plans: Cape Range National Park Management Plan 2010; Jurabi and Bundegi Coastal Parks and Muiron Islands Management plan 1999; Ningaloo Coast Unallocated Crown Land Management Framework 2009; Ningaloo Marine Park (Commonwealth Waters) Management Plan 2002; Management Plan for the Ningaloo Marine Park and Muiron Islands Marine Management Area 2005-2015; Environmental Management Plan, RAAF Learmonth and Associated Properties 2001.

An independent review (Strategen, 2008) concluded that the requirements for the protection of potential World Heritage values were adequately met. All management plans make adequate provision for the monitoring of management effectiveness. The individual management plans and their respective governance arrangements are combined under the Ningaloo Coast Strategic Management Framework. In addition, there are various species-specific conservation plans.

With the following exceptions, DEC is the management authority for the property: Defence Land is managed by the Department of Defence; the Commonwealth Waters of the Ningaloo Marine Park are managed by the Department of the Environment, Water, Heritage and the Arts (DEWHA) and the Department of Fisheries with DEC responsible for day-to-day managerial duties; Jurabi and Bundegi coastal parks and the Muiron Islands are co-managed between DEC and the Shire of Exmouth; the Marine Park (State waters) is co-managed between DEC and the Department of Fisheries.

MANAGEMENT CONSTRAINTS

As visitor numbers and resident populations increase, challenging tasks include law enforcement and the day-to-day management of remote regions of the Marine Park and the southern regions of the 2km wide coastal strip. In this regard, the establishment and nurture of key collaborations with other management agencies such as the Department of Fisheries are crucial. Pastoralism is stated to be a principal land use along the coast. A cooperative management framework between management agencies, leaseholders and scientists is currently lacking.

In addition, a sense of distrust amongst various organizations exists and contributes to uncertainty about management capacities. Insufficient consultation with stakeholders suggests a need for better communication and education.

Learmonth Air Weapons Range Facility covering about 18,954 hectares within the property is used for military exercises and as a bombing range. It includes an ancient reef-complex and cave fauna of exceptional importance. It was one of Australia's most active bombing ranges until around 1990. Future bombing activities on the Learmonth Air Weapons range may pose a potential threat, in particular to the Bundera sinkhole which is located on Defence Land. A 2009 review of Department of Defence ranges recommended its continued use in the future. Although Defence Land within the heritage site is subject to the EPBC Act, the act may be countermanded if this is “in the interests of Australia’s defence or security, or in relation to a national emergency”.

Although tourism is on the increase, associated threats (damage to vegetation, illegal fishing, sewage and waste disposal and disturbance to wildlife) are mitigated via comprehensive management programs and an overall tourism development strategy. Recreational boat launching facilities are limited and strictly controlled. Future concerns include increased water demand leading to water abstraction with effects on the groundwater systems as well document in arid areas with abruptly increasing numbers of visitors.

Pollution could result from accidents, including accidents provoked by natural disasters. There are important off-shore oil and gas resources near the property. IUCN understands that the State Party has licensed oil exploration in permit WA-384-P roughly 50km offshore of North West Cape. Given that offshore petroleum extraction is expected to increase in adjacent waters, accidental discharge of oil or other pollutants poses a significant threat to the marine life and ecosystems of the Ningaloo coast. Although an integrated national contingency plan is in place and oil spill response equipment has been pre-deployed at Exmouth, the property's coastline is too long and remote to afford any reasonable protection from an oil spill.

Invasive alien species, most importantly foxes, cats, goats and weeds on land and some marine species are satisfactorily monitored and controlled. Further potential concerns on land include limestone quarrying, which is taking place in an extraction lease but at its currently modest scale not posing a risk. Fire, historically part of local indigenous management, is a potential threat to the terrestrial vegetation and must be monitored and controlled.

Sea level rise and increases in seawater temperatures associated with climate change have comparatively little effect on the property. The good overall integrity suggests a higher resilience than in disturbed systems under additional stress. Regardless, careful monitoring is necessary for optimum management.

COMPARISON WITH SIMILAR SITES

The Ningaloo Coast has been inscribed under criteria (vii) and (x) for its marine and terrestrial natural values as a large fringing coral reef, encompassing both a large lagoon and deep-sea continental shelf waters adjacent to an extensive karst system on land. The comparative analysis focuses on arid-zone coastal ecosystems and marine values and contrasts the merits of the Ningaloo Coasts with a large number of World Heritage properties and other sites.

Key features in relation to criterion (vii) are the large aggregations of whale sharks (*Rhincodon typus*) along with important aggregations of other fish species and marine mammals and the contrast and beauty of an arid coast next to a vivid reef and seascape. The rare aggregation of the whale shark, the largest fish in the world, is one of the main features highlighted under this criterion. Although whale shark aggregations occur in other parts of the world such as the Seychelles, Djibouti, Thailand and Belize with predictable periodicity, the aggregations in Ningaloo following the mass coral spawning and seasonal nutrient upwelling cause a peak in productivity that leads approximately 300-500 individuals to gather, making this the largest whale shark aggregation documented in the world.

The most exceptional aggregations of single species contribute to the justification of inscription of the Monarch Butterfly Biosphere Reserve (Mexico), although inscriptions based on the presence of a single species alone are in general not sufficient basis to determine OUV. Several other properties are also recognized for important gatherings of single or multiple species, such as Malpelo Fauna and Flora Sanctuary (Colombia), the West Norwegian Fjords (Norway), and the Islands and Protected Areas of the Gulf of California (Mexico). Other examples include the Brazilian Atlantic Islands of Fernando de Noronha and Atol das Rocas Reserves known for major resident aggregations of dolphins and iSimangaliso Wetland Park (South Africa) featuring massive marine turtle nesting sites.

Many of the features of the Ningaloo Coast are comparable to other places. Aesthetically and in terms of beauty of landscapes and seascapes, it is the rare mix of largely intact marine, coastal and terrestrial environments that makes the property exceptional. Furthermore, the lush and colourful underwater scenery provides a stark and spectacular contrast with the arid and rugged land.

In terms of in-situ biodiversity under criterion (x) both the terrestrial and the marine systems are noteworthy. The oceanographic conditions on the Ningaloo Coast sustain a wide array of species, both temperate and tropical. The property lends itself to a comparison with Shark Bay, an existing World Heritage property likewise located in Western Australia and comprising both land and sea areas. Both the Ningaloo Coast and Shark Bay belong to the same WWF Global 200 marine priority ecoregion named "Western Australia Marine" and host distinct superlative features within this priority region as the longest nearshore reefs (Ningaloo) and the largest and most species-rich seagrass meadows (Shark Bay). Ningaloo does include seagrass areas but they are nowhere nearly as extensive and important as those in Shark Bay. In contrast, although coral communities are present in Shark Bay, they do not form reefs and are not a key feature of the property. Ningaloo does not contain major mangrove areas, while small areas of mangrove are found in Shark Bay. Unlike Shark Bay, Ningaloo contains mid- to deep-

water areas that are of potentially high and unique biodiversity values associated with feeding communities, such as for example sponge gardens.

Ningaloo and parts of Shark Bay also belong to the same WWF terrestrial priority ecoregions, the "Carnavon Xeric Scrub". Ningaloo does not lie in a terrestrial biodiversity hotspot or Centre of Plant Diversity, while parts of Shark Bay belong to the Southwest Australia terrestrial biodiversity hotspot and the South-west Botanical Province Centre of Plant Diversity, an important distinction in terms of terrestrial biodiversity values. Unlike Shark Bay, Ningaloo contains significant arid karst areas, with associated subterranean habitats and fauna.

From a global biodiversity conservation perspective, Ningaloo and Shark Bay share a number of outstanding characteristics, habitats and species. However, there are also important differences in the biodiversity values of these two sites providing a sufficient basis to make a case for consideration of separate inscription. From a conservation perspective, the biological and ecological linkages between the two sites deserve further research and should be considered in management and protection.

The Cape Range Peninsula belongs to the Carnarvon Xeric Scrub ecoregion recognized for its high levels of species richness and endemism, particularly for birds and reptiles and a number of localised centres.

STAFF

Western Australia Department of Environment and Conservation (DEC) currently employs 33 staff members in the Exmouth district. Because all staff are located at Exmouth (with the exception of one ranger based in the Cape Range National Park and one semi-permanent ranger at Coral Bay), areas south of the Cape Range National Park are rarely visited, the furthest distance from Exmouth being 260 km. The Ningaloo Marine Park includes a 40m coastal strip and, although camping occurs predominantly in this zone, DEC is not able to adequately enforce regulations. Unless staff numbers and funding are significantly augmented, the additional management responsibility of the eastern foothills of the Cape Range, and particularly the 2km coastal strip, may exceed DEC's management capacity in the foreseeable future.

BUDGET

Management of the existing parks is funded primarily by the state government, which expends approximately AU$ five million annually on staff, offices, maintenance, enforcement, monitoring, research and general management. A further AU$ 700,000 is allocated yearly to promote tourism and once-off funding is occasionally provided for specific projects, such as the goat eradication program. DEWHA provides approximately AU$ 100,000 annually for the day-to-day management of the Commonwealth Marine Park. The Department of Defence occasionally allocates funding for special conservation projects (e.g. protection of Bundera sinkhole). World Heritage listing ensures Ningaloo is eligible to receive funding from the ‘Caring for our Country’ program that provides up to AU$ six million annually to Australian World Heritage Sites.

LOCAL ADDRESSES

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REFERENCES

The principal sources for the above information were the original World Heritage nomination, IUCN’s evaluation report and Decision 35 COM 8B.7 of the UNESCO World Heritage Committee.

DATE

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