

Shark bay is renowned for its marine fauna, with over 10,000 dugong (V), approximately 12.5% of the world population. Humpback whale (V) uses the Bay as a migratory staging post. The rich avifauna includes over 230 species, with 11 breeding marine birds. Over 35 Asian migratory species occur in the region and four of these breed in Shark Bay. The Bay is noted for the diversity of its herpetofauna and supports nearly 100 species. The islands, peninsulas and gulfs provide a refuge for nine relict or endemic species. Shark Bay supports populations of at least six sea snake species including one endemic. There are 323 fish species. Coral reefs are present, although not abundant, with over 80 coral species.

The record of aboriginal occupation of Shark Bay extends to 22,000 years BP. A considerable number of aboriginal midden sites have been found. In 1712 the ship Zuytdorp of the Dutch East India Company was wrecked offshore. Since the 1960s interaction of man and wild dolphin schools has occurred regularly at Monkey Mia, the only known interaction on a regular basis in the world, a cultural heritage which parallels similar accounts from North Africa as described by Pliny the Younger in 109 AD.

4. STATE OF PRESERVATION / CONSERVATION

Shark Bay is a complete marine ecosystem containing many important features, including the Wooramel seagrass bank, the Faure sill and ecosystems dominated by benthic microbial communities which flourish in the hypersaline embayments. The marine environment is largely undamaged and the terrestrial ecosystems greatly modified by pastoralism and other human activities. Currently 200,000ha of the total nominated site are designated as conservation areas, with 686,000ha proposed for future inclusion in parks or reserves.

The responsible administrative body is the Department of the Arts, Sports, the Environment, Tourism and Territories (DASETT), with its headquarters in Canberra. An agreement exists between the Government of Australia and the State of Western Australia on legislative and administrative arrangements for the management of Shark Bay. In the event of World Heritage listing, day-to-day administration will be undertaken by Western Australia in accordance with existing Western Australian legislation including the Fisheries Act, Local Government Act, Land Act, Conservation and Land Management Act and the Environmental Protection Act. The Shark Bay Region Plan was adopted by the Western Australian Government in June 1988. More detailed management plans for specific sites have yet to be formulated. Any future major changes to land-use would require further public consultation and Western Australian parliamentary approval. Zonation effectively occurs already; the greatest concentration of units such as the benthic microbial communities, microbial mats and stromatolites are found within designated nature reserves. Offshore islands, including Bernier and Dorre islands, are also nature reserves managed for conservation and island reserves are recognised by restrictions on public access. Management of the trawl fishery includes restricting the number of boats, minimum mesh sizes, specifications and size of the fishing gear, setting up closed seasons and protection of the Shark Bay nursery areas.

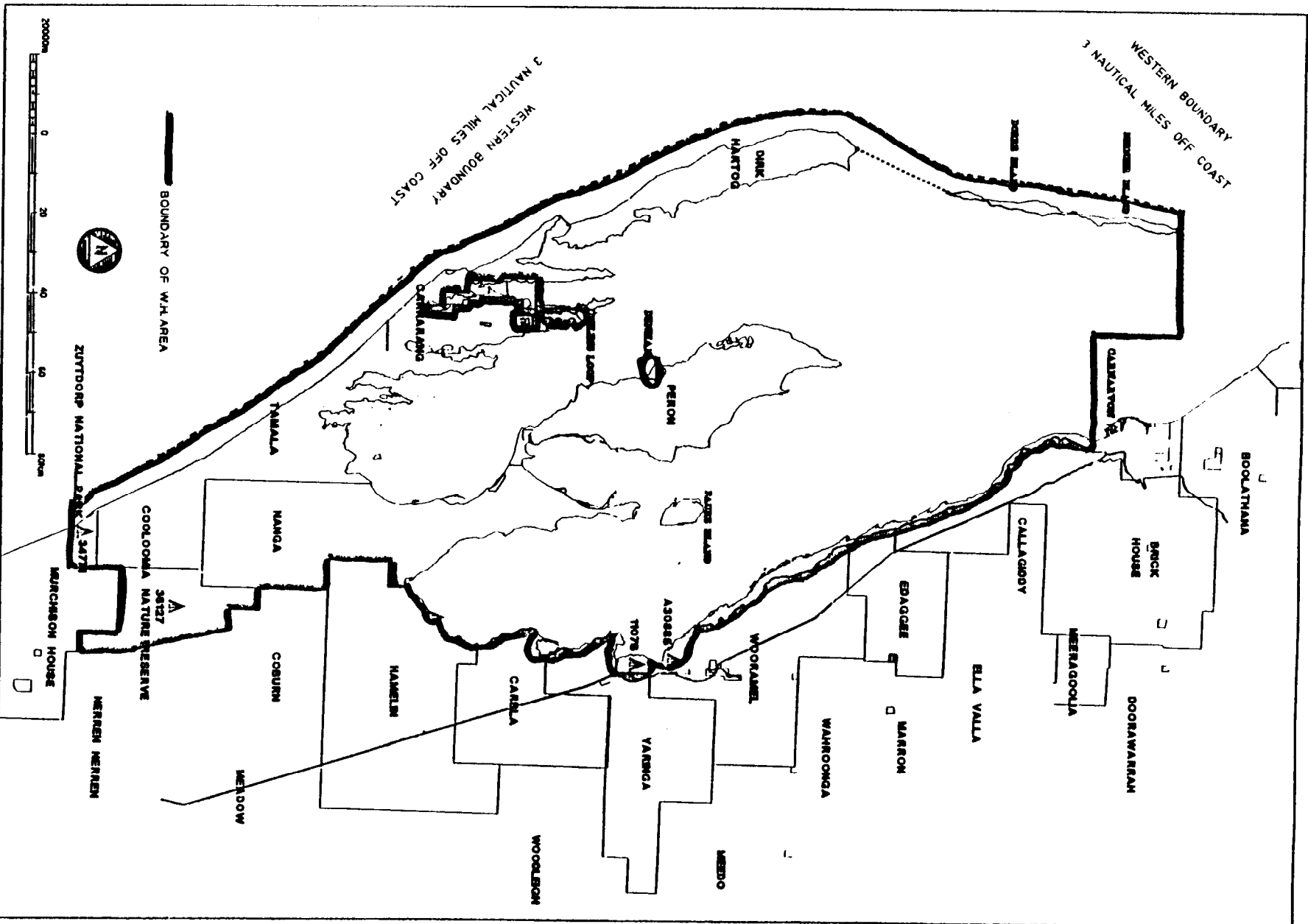
The township of Denham and the areas around Useless Loop and Useless Inlet are excluded from the nominated area although situated in the centre of the zone. The Useless Loop evaporation salt works and the gypsum mine on Edel Land have been listed as potential threats. Tourism, such as recreational boating activity, also poses a threat putting dugong, dolphin and marine turtles at risk. Insufficient staff has long been regarded as a hindrance. For long, only one fisheries officer was available to patrol the entire region and proved entirely inadequate to effectively monitor the use of marine resources. The construction of a new road to Denham/Monkey Mia and the building of motels, hotels and caravan parks is dramatically increasing visitor numbers to the area.

5. JUSTIFICATION FOR INCLUSION ON THE WORLD HERITAGE LIST

The nomination, as presented by the Government of Australia, provides the following justification for designation as a World Heritage property:

D) Natural property

- (i) **Outstanding examples representing the major stages of the Earth's evolutionary history** Shark Bay contains, in one place, the most diverse and abundant examples of stromatolitic microbialites in the world. Analogous structures were the dominant benthic ecosystems on Earth for 3,000 million years.
- (ii) **Outstanding examples representing significant ongoing geological processes, biological evolution and man's interaction with his natural environment** Shark Bay provides outstanding examples of processes of biological and geomorphic evolution, including the evolution of the Bay's hydrologic system, the hypersaline environment of Hamelin Pool and the biological processes of ongoing speciation, succession and the creation of refugia;
- (iii) **Contains unique, rare or superlative natural phenomena, formations or features of exceptional natural beauty** Stromatolites represent the oldest form of life on Earth. Hamelin Pool is the only place in the world with a range of stromatolite forms comparable to fossils in ancient rocks. Shark Bay is one of the few marine areas of the world dominated by carbonates as represented by the Wooramel Bank, which is also the largest seagrass meadow in the world.
- (iv) **The most important and significant habitats where threatened species of plants and animals of outstanding universal value from the point of view of science and conservation still survive** Shark Bay has the only or major populations of 5 out of the 26 globally threatened mammal species of Australia. Twelve nationally rare and endangered endemic reptiles occur, two endangered or threatened marine turtles nest here, three vulnerable bird species, and plant species of rare, threatened, little known, undescribed or endemic status also occur.



WORLD HERITAGE NOMINATION - IUCN TECHNICAL EVALUATION

578: SHARK BAY, WESTERN AUSTRALIA

1. DOCUMENTATION

- i) IUCN Data Sheet
- ii) Additional Literature Consulted:
 - Environmental Protection Authority, 1987. Implications of the Shark Bay Region Plan for Conservation, 43p.
 - Berry, P. F., et. al., 1990. Research in Shark Bay, 325p.
- iii) Consultations: CALM and DASETT Government Officials, Shire Council, R. Slatyer, G. Mosely, D. Collins, H. Marsh, D. Henry, anonymous reviewer.
- iv) Field Visit: November, 1990, J. Thorsell, H.K. Eidsvik.

2. COMPARISON WITH OTHER AREAS

The Shark Bay area is dissected by the boundaries of two biogeographical and botanic provinces. It is a transition area and thus contains a mix of temperate and tropical elements with many species reaching the limits of their northern or southern distribution. It is the only protected area on the Australian continent that lies astride the Mulga/Schlerophyll provinces. To the north and south there are a number of other protected areas in the State of Western Australia found along the Indian Ocean (Cape Range, Kalbarri, Nambung) but Shark Bay is the only embayment which contains a large marine area and offshore islands. With its coral reefs, mangroves and dugongs, Shark Bay has certain affinities with two other World Heritage sites in Australia: Kakadu and the Great Barrier Reef. Shark Bay's species mix, climate and landforms are very different, however, and its stromatolite and seagrass communities are not matched in any of these sites or, indeed, on the planet.

There are no comparable ecosystems in the Southern Hemisphere between latitude 10° and 40°S. Between 10° and 40°N similar embayments of equivalent size are found at Palk Strait, Gulf of Bahrain, Chesapeake Bay and the Aegean Sea. All the latter are subject to industrial impacts and/or the claims of dense and long-established human populations. Other coastal/marine World Heritage sites are found in the Everglades, Sian Kaan, and the Banc D'Arguin. The latter, with its location on the edge of an arid desert is a similar ecosystem type but, of course, is located in a different biogeographic realm and has no species affinities.

Three of Shark Bay's outstanding natural features are its extensive seagrass beds, its dugong population and its stromatolites. The seagrass meadows are the most extensive (4000 Km²) and species rich (12 species) in the world, surpassing those such as the Florida Bay and the eastern Gulf of Mexico which have only patchy cover and are mainly composed of small species. Shark Bay is also one of the world's six main strongholds for dugongs as indicated in the following global ranking (Source: H. Marsh, pers. comm.):

<u>Location</u>	<u>Population Estimate</u>
Western Gulf of Carpentaria	16,846
N Coast Northern Territory	13,800
Torres Strait	12,522
Shark Bay	10,146
N Barrier Reef	8,110
Arabian Gulf (1987)	7,310

Shark Bay's stromatolites (colonies of blue-green algae that build mound structures and are among the oldest life-forms on earth) are the best living examples found in the world. There are other areas (Hudsons' Bay and Great Salt Lake) where they are found but nowhere near the abundance as those growing in Hamelin Pool. Curiously, the closest fossil analogue occurs in the 1.9 billion year old fossil stromatolites that outcrop on the Pethei Peninsula in the east arm of Great Slave Lake in northern Canada.

In conclusion, the statement made by the Australian Geographic Society (April/June 1989 issue of Journal) that "There is no place on Earth quite like Shark Bay" is correct. This Bay with its islands and land around it encompasses an area with exceptional natural heritage values. The extent of development and the resident human population are both limited and Shark Bay still retains its wild character where nature is the dominant force.

3. INTEGRITY

Shark Bay not only contains an exceptional combination of natural heritage values but it is also an area with unique conservation challenges. Much attention and progress has been evident since the preparation of the Region Plan in 1988 and in the years leading up to the World Heritage nomination. IUCN would commend both the local population and the relevant government agencies for their increased awareness of the need for conservation in Shark Bay while at the same time making some observations where management could be further strengthened.

3.1 Human Impact

Up to the present, dense human settlement in the Shark Bay region has been discouraged by aridity, limited fresh water supply, high summer temperatures, mediocre highway systems and relatively high cost of energy.

Nevertheless, the terrestrial ecosystems of the area have been partially modified due to the impact of pastoralism and other human activities. The pastoral leases exhibit localised areas of high disturbance around homesteads and stock water points. A number of areas show evidence of past overgrazing by stock leading to soil erosion. The most disturbed areas are in the Tamala and Peron stations, where grazing pressures were severe and feral animals, particularly introduced rabbits and goats as well as predators such as fox and domestic cat, have adversely affected the abundance of native animals and fire regimes.

The marine environment has undergone some modification as a result of the pearl shell industry, whaling and heavy fishing, the latter of which continues using bottom trawling, nets, lines and cray pots. Several conservation organisations have expressed concerns over trawling techniques and level of offtake. The fishing industry in the area, however, state that fishermen harvest these resources at a sustainable level. As far as could be determined, the effects of trawling on the benthic and pelagic communities in Denham Sound have yet to be evaluated. In particular, the potential impact of trawling activities on the use of the Bay by humpback whales has not been assessed even though the Bay was once a concentration point for the species.

The township of Denham and the land around Useless Loop are excluded from the nominated area although situated in the centre of the zone. They could cause adverse impacts on the environment of the nominated area in the future. In particular, the Useless Loop evaporation salt works and the gypsum mine on Edel Land have been listed as potential threats. Tourism, such as boat activity along the inner coast of Dirk Hartog Island, also poses a threat. There are significant risks of dugong, dolphin and marine turtle casualties from recreational boating. This is a much greater threat than the less than a dozen dugongs presumed killed annually by local inhabitants, partly for food.

Aside from these impacts, Shark Bay ecosystems appear relatively unaltered by human intrusion. Two factors could change this. The first is terrestrial or submarine mining of mineral sands (a threat that emerged, but was fended off in 1988-89). The second is a major increase in the supply of potable water. Water supplies could be increased via an abundant energy supply for desalination (e.g. natural gas by way of a branch from the pipeline from the NW shelf), or via a branch of a proposed water pipeline leading to the SW of Western Australia from Lake Argyle. Tourism and/or retirement developments (potentially abetted by World Heritage status) could conceivably create the demand for one or the other of these "solutions to the water problem." Highway improvement, in conjunction with promotion of tourism, is already increasing the resident human population. Other possible threats include agricultural development on the mainland to the east (dependent on water supply) which could lead to inputs of herbicides or pesticides, expansion of gypsum mining, or introduction of intensive aquacultural or fishery enhancement technologies. A greenhouse-induced sea level rise would cause major readjustments in the biotic communities within the bay but would not destroy the system.

3.2 Management

An agreement exists between the Government of Australia and the State of Western Australia on legislative and administrative arrangements for the management of Shark Bay. Collaborative bodies include the Department of Conservation and Lands Management (CALM) of the State of Western Australia, the Department of Agriculture and the Department of Fisheries. In the event of successful World Heritage nomination, day-to-day administration will be undertaken by Western Australia in accordance with existing Western Australian legislation, including the Fisheries Act, Local Government Act, Land Act, Conservation and Land Management Act and the Environmental Protection Act.

In 1986 the Government of Western Australia prepared a planning strategy for Shark Bay, the Shark Bay Region Plan. It was released for public comment in 1987 and finally adopted by the Western Australian government in June 1988. More detailed management plans for specific sites have yet to be formulated. Any future, major changes to land-use would require further public consultation and Western Australian parliamentary approval. The plan lists a current total of 200,000ha in existing protected areas. It identifies further a proposed protected areas extension to 755,000ha or 35% of Shark Bay. There are no aboriginal reserves in the Shark Bay area and no legal hunting by aboriginal people.

To date the marine park is still in proposed form. Zonation effectively occurs already; many of the main features, such as the benthic microbial communities, microbial mats and stromatolites, are found within designated nature reserves. Offshore islands, including Bernier and Dorre islands are also nature reserves. The island reserves are recognised by restrictions on public access. The management of the trawl fishery includes restricting the number of boats, minimum mesh sizes, specifications and size of the fishing gear, setting up closed seasons and protection of the Shark Bay nursery areas. Damaging use of gill nets, which became serious in 1980, was effectively curbed by regulations introduced in 1982. The Western Australian Department of Fisheries has assessed commercial fishing pressure and undertaken extensive aerial survey programmes and identified that commercial fishing in and around Shark Bay is relatively light.

In June 1990, the 105,352ha Peron pastoral lease was purchased by the Government of Western Australia primarily for the purposes of conservation as outlined in the region plan.

A feral animal control programme is ongoing, and consideration is being given to extend control measures to prevent increases in populations. Successful control programmes have been undertaken already, such as the eradication of goats from Bernier island.

In terms of management resources, insufficient staff are a major constraint. Only one fisheries officer is available to patrol the whole region and enforcement is minimal. There is also only one CLAM

conservation officer (provided with vehicle but no boat). There are other staff at the Monkey Mia dolphin area who concentrate on public awareness activities based at the new information centre facility. There thus remains a need for strengthening management presence, much of which could be met by involving local residents in field operations.

Along with insufficient staff resources, several reviewers felt that CALM itself needs greater power and authority in the area. Attempts to strengthen the CALM Act have been thwarted and fisheries, pastoral and mining interests take precedence in most decisions. There also appears to be a considerable overlap and conflict among different government departments which hopefully will be reduced with the new proposed management structure.

3.3 Boundaries

Boundaries of the area nominated for World Heritage Listing are adequate, but those of the proposed conservation areas within the World Heritage Listing are still in the process of establishment. Specific suggestions are listed below (details can be found in Bulletin 305 of the Environmental Protection Authority).

- The northern boundary of the Hamelin Pool Class A Marine Reserve has been set at the 26th parallel. This is not in accordance with the recommendation of the committee of international experts assembled in Perth in 1973 to make recommendations for protection of the stromatolite communities which "stressed that conservation measures which do not include the protection of the Faure Sill would be ineffectual, as this barrier has been the key element in the development of the environment and in the maintenance of hypersaline conditions in Hamelin Pool."
- The southern boundary of the terrestrial park on the northern end of the Peron Peninsula is drawn along the Denham-Monkey Mia Road. This boundary is economically, ecologically, and strategically difficult to rationalise. The south boundary of the Park should be extended to the isthmus N of Nanga station, along the Nilemah-Tamala road, or along the lines proposed in Fig. 9.1 of Bulletin 305 of the Western Australian Government's Environmental Protection Authority.
- The boundary of the Hamelin Pool Reserve should ideally be extended to include the Gladstone Embayment. Further, in the region of the Gladstone Embayment and the delta of the Wooramel River, the Marine Park boundary extends only to the Low Water Mark. This is a peculiar exception as all other boundaries extend to the High Water Mark. The Gladstone Embayment is the site of a dugong nursery and summer foraging area, and it is also the location at which male dugongs form their mating aggregation or lek. Research indicates that this is the most critical and sensitive dugong habitat in the entire Bay and development of any kind there could have serious affects for the dugong population.

- The northern boundary line of the Marine Park in the Denham Sound area should be extended to latitude 25°30'. This was the former southern limit of trawler operations. The extension of trawling south to the Denham Channel Beacon was a relatively recent concession to the fishing industry and should have been reversed in the course of establishing the park.
- Although there is an expressed intention that Dirk Hartog Island will eventually get some kind of reserve status, it is not clear what this might be, when it would come about, or whether there would be excisions for commercial development. The nomination refers to plans for attempted reintroduction to the mainland of some of the marsupial species now confined to Bernier and Dorre Islands. Dirk Hartog is a far superior site for such introductions and the failure of the nomination to mention reintroduction there is an oversight.
- There seems to be no provision for the incorporation of the southern part of Nanga station into the reserve system. This is a significant area floristically (and probably faunistically) and is not now being exploited by the lessee.

All the above internal zoning suggestions taken together indicate that some revisions to the next version of the Region Plan may need to be considered. The above suggestions are not put forward as conditions to acceptance of the nomination, as most may eventually be included in the intended future extension to the protected area system.

4. ADDITIONAL COMMENTS

As with previous nominations from Australia, there has been a vocal minority among the local population who are objecting to World Heritage designation for the area. Much of the campaign is based on misinformation and the Australian authorities are continuing their efforts to provide greater public awareness of the Convention. This campaign stresses that World Heritage status would not affect sustainable commercial fishery, the existing solar salt works, appropriate tourism, and continuing use of viable pastoral leases.

5. EVALUATION

The nomination document for Shark Bay presents a solid case for World Heritage status for the area. The property itself is as complex as it is large with many elements to it, both terrestrial and marine. The biological richness of the area, along with the evolutionary lessons it provides in a largely natural setting, aggregate to merit inscription on all four criteria for natural properties:

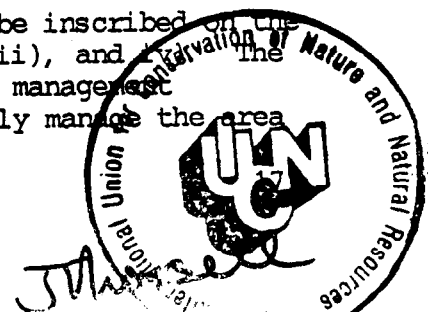
- i) **earth's evolutionary history.** The Hamelin Pool stromatolites are of special interest to science as they represent one of the most ancient life-forms in existence and are considered the world's classic site for study of these "living fossils".
- ii) **on-going geological processes and biological evolution.** Shark Bay is a unique system, its hydrology (particularly its extensive seagrass beds) and its transitional location at the meeting point of two botanical provinces and the offshore island refugia combine to distinguish the area as one of the richest and most exceptional coastal sites in the world.
- iii) **superlative natural phenomena.** Shark Bay contains the largest seagrass beds in the world. Its attractions are also supplemented by secondary features such as Shell Beach, Big Lagoon and the Zuytdorp Cliffs which combine to add even further interest to the area.
- iv) **habitats for threatened species.** Shark Bay is home to major populations of 5 species on IUCN's Red List of Threatened Mammals as well as the two marine mammals (dugong and humpback whale) considered vulnerable. It also has a rich avifauna, herpetofauna, fishery and marine flora. Recovery of the humpback whale population is also possible in which case Shark Bay could again become known as a major staging area during their migration.

Regarding the conditions of integrity the area nominated is of sufficient size and contains the components required to demonstrate all aspects of the natural processes. In terms of migratory species (whales, birds, turtles) survival will depend on their protection in regions outside the property. As noted in section 3 above, however, there are a number of concerns relating to Condition of Integrity number (vi). These include threats from excessive grazing of domestic stock, introduced species, the effects of trawling and tourism, saltwork activities, sand mining, and increased water supply.

The cooperative agreement between the State of Western Australia and the Commonwealth of Australia along with the Shark Bay Region Plan provides the general framework whereby these issues can be addressed. The Bureau sought clarification on plans to augment management resources (including possible involvement of local people as resident staff) and the timing and prospects for increasing the extent of protected areas within the nominated site. A detailed response was sent on 3 October by the Australian authorities which satisfactorily addresses all these points.

6. RECOMMENDATION

Shark Bay is of outstanding universal value and should be inscribed on the World Heritage list meeting natural criteria i), ii), iii), and iv). The Committee may wish to urge speedy implementation of the management agreement and acceleration of efforts to more effectively manage the area for conservation purposes.



COUNTRY Australia - Western Australia

NAME Shark Bay

IUCN MANAGEMENT CATEGORY

Ia (Strict Nature Reserve)

II (National Park)

IV (Habitat/Species Management Area)

Natural World Heritage Site - Criteria i, ii, iii, iv

BIOGEOGRAPHICAL PROVINCE 6.04.06/6.08.08 (Western Sclerophyll/Western Mulga)

GEOGRAPHICAL LOCATION Situated over 800km north of Perth, on the westernmost point of the coast of Australia, Shark Bay is bounded by the town of Carnarvon to the north, and extends westwards to include the outer chain of Bernier, Dorre and Dirk Hartog islands, then over 200km southwards joining up with Edel Land and extending southwards to Zuytdorp Nature Reserve. The western boundary is three nautical miles off the coast. The eastern boundary is adjacent to the coast south from Carnarvon to Hamelin Pool, then continuing southwards approximately 70-30km inland from the west coast. The township of Denham and the areas around Useless Loop and Useless Inlet, although within the main boundary are specifically excluded from the World Heritage property. 24°44'S-27°16'S, 112°49'E-114°17'E

DATE AND HISTORY OF ESTABLISHMENT The site was inscribed on the World Heritage List 1991.

AREA 2,197,300ha. Protected areas, such as marine parks, marine nature reserves, terrestrial nature reserves and national parks, cover 1,004,000ha. In addition, land in public ownership is divided into: pastoral land 450,000ha; marine environment 687,750ha; land in private ownership 750ha; other reserves 2,500ha; and vacant Crown Land 55,000ha.

Existing conservation reserves include Friday Island (0.8ha), Bernier and Dorre Islands (9,720ha), Charlie Island (0.8ha), Small Islands (205.58ha), Koks Island (2.6ha), Zuytdorp Nature Reserve (58,850ha), Hamelin Pool Marine Nature Reserve (132,000ha), Shark Bay Marine Park (748,725ha), Francois Perou National Park (52,529ha), Shell Beach Conservation Park (518ha), and Monkey Mia Reserve (477ha) in addition to Hamelin Pool/East Faure Island High-Low Water Mark (area undetermined).

LAND TENURE The state of Western Australia, the Government of Australia and private ownership

ALTITUDE Sea-level to 20m

PHYSICAL FEATURES Shark Bay comprises a series of north-south facing peninsulas and islands which separate inlets and bays from each other and the Indian ocean. The coastline is 1,500km long and includes the 200m high Zuytdorp cliffs, which are amongst the highest of the Australian coastline. There are three distinct landscape types: Gascoyne-Wooramel province which comprises the coastal strip along the eastern coast of the bay and consists of a low-lying plain backed by a limestone escarpment; Peron province which comprises the Nanga/Peron peninsulas; Faure Island/sill comprising undulating sandy plains with gypsum pans or birridas, and ancient interdune depressions filled with gypsum. The seaward margin of this province terminates in a scarp 3-30m high and narrow sand beaches; Edel province which comprises Edel Land peninsula and Dirk Hartog, Bernier and Dorre Islands, is a landscape of elongated north-trending dunes cemented to loose limestone. The province terminates to the west as a series of spectacular cliffs (DASETT, 1990).

The basement rock in the area is Late Cretaceous Toolonga limestone and chalk. The most extensive younger rocks are Peron sandstones and Tamala limestones (the offshore islands are composed of the latter). These rocks are often overlaid by a series of longitudinal fossil dunes accumulated during

the Middle to Late Pleistocene (for further details see DASETT, 1990). The extensive supratidal flats of Gladstone Embayment, Hutchison Embayment and Nilemah Embayment are comparable to the coastal 'Sabkhas' of the coast of the Arabian Gulf. Gypsum has been formed as a result of evaporation of saline groundwaters within the sediments of broad tidal flats adjacent to areas such as Hamelin Pool. Shell beaches occur at the southern end of Lharidon. The inland terrestrial landscape of Shark Bay is predominantly one of low rolling hills interspersed with birridas (inland salt pans that are at sea-level). Shark Bay itself is a large shallow embayment, approximately 13,000 sq km in area, with an average depth of 9m (maximum of 29m). The bay is enclosed by a series of islands. Influx of oceanic water is through the wide northern channel, the Naturaliste channel, between Dorre and Dirk Hartog islands and South Passage between Dirk Hartog Island and Steep Point.

The outstanding feature of the bay is the steep gradient in salinities. The salinity gradient ranges from oceanic (salinity 35-40 ppt) in the northern and western parts of the bay through metahaline (salinity 40-56 ppt) to hypersaline in Hamelin pool and Lharidon bight (salinity 456-470 ppt). The salinity gradient has created three biotic zones that have a marked influence on the distribution of marine organisms within the Bay. Tides vary with a spring range of 1.7m and a neap range of 0.6m. The Leeuwin current sweeps past Shark Bay, an intrusion of warm low-salinity tropical water of great zoological significance. The interaction of wind drift with tidal currents leads to a Bay circulation in which overall movement is anticlockwise from west to south-east, then east and finally north-west (DASETT, 1990).

Two rivers drain into Shark Bay, including the intermittent flows of the Gascoyne and Wooramel River into the eastern part of the Bay. There is very little surface run-off because of the low rainfall, high evaporation and permeable soils. There is active regional saline groundwater flow, however, and some freshwater springs, such as in the intertidal zone north of Monkey Mia (DASETT, 1990). There is a large quantity of artesian water approximately 300m below the ground surface.

CLIMATE Shark Bay has a semi-arid to arid climate characterised by hot dry summers and mild winters. Summer temperatures average between 20°C and 35°C and winter temperatures between 10°C and 20°C. Average annual precipitation is low, ranging from 200mm in the east to 400mm in the far southwest. Annual high evaporation ranges from 2000mm in the west to 3000mm in the east.

Sea surface temperature outside the Bay varies from 20.9°C in August to 26°C in February. Within the Bay water temperatures vary; in the inner bay temperatures drop to 17°C in August. In February a maximum of 27°C has been recorded in Hamelin Pool, 26°C in Freycinet Reach and 24°C in the oceanic salinity zone. The Leeuwin Current flows along the West Australian coastline and greatly influences the temperature of seawater in the bay.

VEGETATION The flora consists of a transition of the South-west Botanical Province to the Eremaean Botanical Province and more than 620 species have been recorded for the entire Shark Bay region, 145 at the northern limit of their range, 39 at their southern limit and 25 considered rare or threatened at the national level (DASETT, 1990).

The South-west Botanical Province consists of vegetation that is rich in Eucalyptus species, forming woodland with diverse, shrubby understories and heathlands poor in grasses. The Eremaean province is correspondingly rich in Acacia species but has large areas dominated by grasses, especially prickly hummock grasses of the genera *Triodia* and *Plectrachne*. The Province includes shrublands of *Acacia ligulata*, *Pimelea microcephala* and *Stylobasium spathulatum*. Vegetation on the older dunes includes *Melaleuca cardiophylla*, *Thryptomene baeckeacea* and *Plectrachne bromoides* (for further details see DASETT, 1990).

Mangroves occur in small, relatively isolated areas in southern and western Bay, only becoming abundant towards Carnarvon. The southernmost extensive stand of white mangrove *Avicennia marina* occurs on the Peron Peninsula (Anderson, n.d.). The marine flora is dominated by seagrass beds covering 4,000 sq. km. Twelve species of seagrass occur in the Bay: the most abundant species is *Amphibolis antarctica*, covering 90% of the seagrass bed area, providing a substratum for 66 species of algal epiphyte. *Halodule* seagrass beds occupy an area of approximately 500 sq. km.

Shark Bay is notable for benthic 'living fossil' microbial communities, forming an expansive and wide variety of microbial mats, which are best developed in Hamelin pool, giving the area the most significant assembly of phototropic microbial ecosystems in the world. These photosynthetic prokaryotes and analogous eukaryotic microalgae, which commenced growing in the Pool when it

first formed about 4000 years BP, trap and bind detrital sediment and thereby create organo-sedimentary microbialites or microbial mats, which have mineralised to form stromatolites in Hamelin Pool (see DASETT, 1990 for details; Fox, 1991; Collins, in litt., 1990).

FAUNA The Shark Bay region is an area of major zoological importance, primarily due to the isolation of the marine and terrestrial ecosystems over significant periods of time. The Bay is located near the northern limit of a transition between temperate and tropical. For example, of the marine fish species 83% are tropical, 11% warm temperate and 6% cool temperate.

Of the 26 species of threatened Australian mammals, 5 are found on Bernier and Dorre islands; burrowing bettong *Bettongia lesueur*, rufous hare-wallaby *Lagorchestes hirsutus*, banded hare-wallaby *L. fasciatus*, Shark Bay mouse *Pseudomys praecox* and western barred bandicoot *Perameles bougainville*. Greater stick-nest rat *Leporillus conditor* has recently been introduced on Salutation Island. In 1992, burrowing bettong was introduced on Heirisson Prong, and was followed with the release of Shark Bay mice in June 1994. Shark Bay is renowned for its marine fauna, with 10,150 dugong *Dugong dugon* (V) (Marsh, H., pers. comm., 1991). Humpback whale *Megaptera novaeangliae* (V) and southern right whales use the bay as a migratory staging post. Bottle-nosed dolphin *Tursiops truncatus* can be seen at Monkey Mia. A minke whale was stranded on shore in 1981 and killer whales *Orchinus orca* were sighted attacking dugongs at Sandy Point in May 1983 (Anderson, n.d.; DASETT, 1990; Fox, 1991).

The rich avifauna includes over 230 species, with 11 breeding marine birds including osprey *Pandion haliaetus* and Caspian tern *Sterna caspia*, for which Failure Island is a key breeding area. Over 35 Asian migratory species occur in the region and four of these breed in Shark Bay. A number of birds reach their northern limit in the Bay including regent parrot *Polytelis anthropeplus westralis* and western yellow robin *Eopsaltria australis griseogularis* (for a full species list see DASETT, 1990).

Shark Bay is noted for the diversity of its herpetofauna, and supports nearly 100 species. It is rich in 'old Australian elements' with 12 species of diplodactyline geckos and 12 species of pygopodid lizards. Several characteristic species include leptodactylid *Neobatrachus wilsmorei*, hylid *Cyclorani maini*, gecko *Diplodactylus squarrosus*, skinks *Egernia depressa*, *Lerista muelleri* and *Morethia butleri*, and the monitors *Varanus brevicauda*, *V. caudolineatus*, *V. eremius* and *V. giganteus*. Green turtle *Chelonia mydas* (E) and loggerhead turtle *Caretta caretta* (V) occur in the bay, nesting on the beaches at Dirk Hartog Island and Peron peninsula. The islands, peninsulas and gulfs provide a refuge for nine relict or endemic species: pygopodids *Aclys concinna major*, *Aprasia haroldi* and *Pletholax gracilis edelensis*, skinks *Ctenotus youngsoni*, *C. zasticus*, *Egernia stokesi aethiops*, *Lerista maculosa* and *Menetia amaura*. Shark Bay supports populations of at least six sea snake species including the endemic *Aipysurus pooleorum* (DASETT, 1990).

Shark Bay is also an important nursery ground for crustaceans, fishes and coelenterates. The marine flora is dominated by seagrass beds providing a substratum for 100 species of zoophytes, juvenile fish and sea snakes. There are 323 fish species. Large numbers of sharks including bay whalers, tiger shark and hammerheads are readily observed in Shark Bay. There is also an abundant population of rays, including manta ray.

Because of the high organic productivity and development of seagrass beds and carbonate sand flats, the shallows of Shark Bay support a benthic invertebrate fauna of exceptional abundance, diversity and zoological significance. The invertebrate communities of Shark Bay remain essentially unstudied (see DASETT, 1990 for further details).

Coral reefs are present, although they are not abundant, with over 80 coral species. Hermatypic or reef building corals are found in South Passage and there are large patches along the east coast of Dirk Hartog, Bernier and Dorre Islands (Anderson, n.d.). The initiation of the Leeuwin current coincides with the mass spawning of hermatypic corals and is believed to be a major factor in the distribution and maintenance of coral communities in the region. In addition, of the 218 species of bivalve in the region, 75% have a tropical range, 10% a southern Australian range and 15% are west coast endemics (DASETT, 1990).

CULTURAL HERITAGE The record of aboriginal occupation of Shark Bay extends to 22,000 years BP. At that time most of the area was dry land, rising sea levels flooding Shark Bay between 8,000-6,000 years BP. A considerable number of aboriginal midden sites have been found,

especially on Peron Peninsula and Dirk Hartog Island which provide evidence of some of the foods gathered from the waters and nearby land areas. The mild climate favoured permanent residence.

Shark Bay was named by the English buccaneer William Dampier in the late 17th century. It is the site of the first recorded European landing in Western Australia, with the visit of Dirk Hartog in 1616, followed by William Dampier in 1699. The landing of Dirk Hartog on 25 October 1616 was commemorated by a pewter plate nailed to a post on the northern tip of Dirk Hartog Island, Cape Inscription (Doak, 1989; Fox, 1991). By virtue of its position, the area was a key navigation aid for navigators and explorers at this time. In 1712 the ship *Zuytdorp* of the Dutch East India Company was wrecked offshore and the French ships *Uranie* and *Physicienne*, commanded by Captain Freycinet, visited and studied Shark Bay in 1818. After 1850, the Shark Bay region was variously occupied by guano miners, pearlers, fishermen and pastoralists. Pearlring was the biggest industry from 1850 until its decline in the 1940s to be replaced by fishing. The fishing industry peaked in the 1960s and has declined over the last two decades with the introduction of regulations introduced to prevent over-exploitation of fish stocks (DASETT, 1990).

In 1904, until abandoned in 1911, quarantine hospitals were set up for aborigines with leprosy and venereal disease on Bernier and Dorre islands. After World War Two, a whaling station was located at Carnarvon, and between 1950 and 1962 up to 7,852 humpback whales were killed. The station collapsed in 1963 due to a lack of whales (DASETT, 1990).

Since the 1960s interaction of man and wild dolphin groups have occurred regularly in Monkey Mia on Shark Bay's Peron peninsula, the only known interaction on a regular basis in the world, a cultural heritage which parallels similar accounts from North Africa as described by Pliny the Younger in about 109 AD (Edwards, 1988; Anderson, n.d.).

LOCAL HUMAN POPULATION Shark Bay has a population of approximately 750, principally located at Denham (population of 450) and Useless Loop (Fox, 1991). Some of the local residents are of aboriginal descent (Anderson, n.d.).

The economy of the region now includes tourism, fishing, and pastoralism. The residents of Carnarvon (located just outside of the bay area) are partially reliant on the fishing industry established in Shark Bay. The area is fished by 27 boats of the prawn fleet with a harvest reported to have stabilised at 2,000 tonnes over the last 20 years (WAFIC, 1991). Scallop fishery catches average at 3,500 tonnes per year from the 14 boats based at Carnarvon. The Shark Bay fisheries have a capital investment of approximately Australian \$80 million, employing 500 people in the region. The fisheries harvest approximately Australian \$35 million per year (WAFIC, 1991). In the 1960s salt evaporation works were established at Useless Loop, and a gypsum mine (now defunct) (DCLM in litt, 8 February 1996) on Edel Land (Anderson, n.d.; DASETT, 1990).

VISITORS AND VISITOR FACILITIES Tourism is important and more than 160,000 visitors per year are estimated to visit Shark Bay. The figure is increasing as a consequence of easier access with the construction of new roads, motels and hotels. One of the greatest tourist attractions of the region is sport fishing for which a number of fishing tours and charter vessels exist (Anderson, n.d.). Nearly all visitors (100,000 per year) come to see a group of wild bottle-nose dolphins which has been coming regularly to feed and interact with people at Monkey Mia beach for more than 30 years (Edwards, 1988). In 1986 an information centre was constructed at Monkey Mia in conjunction with the Shire of Shark Bay. The Department of Conservation and Land Management (CALM) has developed visitor facilities at Hamelin Pool, Shell Beach and Francois Peron National Park and provides a wide range of interpretive literature about the World Heritage Area (DCLM in litt. 8 February 1996).

SCIENTIFIC RESEARCH AND FACILITIES Scientific specimens were first collected in 1699 by William Dampier on Dirk Hartog Island. In 1801, the naturalist Francois Peron, during the Baudin Expedition, made important observations on the marine fauna and made plant collections. Subsequently, the naturalists Quoy and Gaimard collected zoological specimens in Captain Freycinet's voyage to Shark Bay. Between 1818 and 1822 Phillip Parker King made the first comprehensive charts of the region for the Royal Navy (Fox, 1991). A summary of recent research in the Shark Bay area was produced in 1990 by the France-Australe Bicentenary Expedition Committee (Berry et al., 1990).

CONSERVATION VALUE Shark Bay is a complete marine ecosystem containing many

important features, including the Wooramel seagrass bank, the Faure sill and ecosystems dominated by benthic microbial communities which flourish in the hypersaline embayments, and living fossil stromatolites. Other features include a diversity of endemic and threatened plant and animal species and areas of great natural beauty.

Shark Bay contains the most diverse and abundant examples of prokaryotic stromatolitic microbialites in the world, the world's best example of three-dimensional grazing stromatolites (Collins, in litt., 1991). The Hamelin pool occurrence of these microbial ecosystems offers the only extensive living analogue for comparable studies with Proterozoic stromatolites which yielded information of the nature, palaeoenvironment and evolution of the Earth's biosphere until the early Cambrian period. Modern examples including coccoid cyanobacterium which are thought to be descendants of a 1,900 million year old form, thus representing one of the longest continuing biological lineages known (DASETT, 1990). The only other major microbialite occurrences in the world are in Lake Clifton in Western Australia and Lee Stocking Island in the Exuma cays of the Bahamas (DASETT, 1990).

The hydrological structure of Shark Bay, altered by the Faure Sill, and a high evaporation rate has produced a basin which is one of the few areas in the world where marine waters are hypersaline, with salinities almost twice that of normal seawater. Shark Bay is one in the few marine areas of the world dominated by carbonates. The outstanding feature of the bay is the steep gradient in salinities which have created three biotic zones that have a marked effect on the distribution and abundance of marine organisms. With significant ongoing geological and biological processes in the marine environment, the steep saline gradients have produced genetic divergence within local populations, and so is an important area for genetic biodiversity such as the hypersaline conditions in Hamelin Pool leading to the development of unique microbialites and microbial mats.

Shark Bay contains the largest reported seagrass meadows in the world (4,000 sq. km) as well as some of the most species-rich seagrass assemblages in the world. As such, these meadows are of international importance for their rich biodiversity and high organic productivity, supporting a benthic fauna of exceptional abundance. The Wooramel seagrass bank is the largest reported structure of its kind in the World, covering some 1,030 sq. km. The bank is one of the largest bodies of carbonate sediment formed by an organic baffle (stabilised carbonate sediment bound by seagrass beds) yet recorded from a modern environment. The only deposits of comparable origin and size are the seagrass beds on the Mediterranean coast of France (DASETT, 1990; Collins, in litt., 1990).

Shark bay is of great botanical and zoological importance as the habitat of many species at the limit of their geographical range. It is the habitat for many species of plants and animals that are recorded as nationally and globally rare, vulnerable or threatened. Fifteen species of plant are considered to be rare or threatened at the national level. There are 26 globally threatened mammal species in Australia, Shark Bay has the only or major populations of five of these. Shark Bay contains approximately 12.5% of the world population of dugong (Marsh, H., pers. comm., 1991), is a significant staging post for humpback whales and provides notable nesting sites for two species of endangered marine turtle. The only known 'lek' mating system in any marine mammal in the world is observable amongst South Cove dugong. The phenomenon of wild dolphins voluntarily approaching humans is extremely uncommon worldwide; the only other similar long term interactions of wild dolphin and man are at Banc d'Arguin in Mauritania and another more recently established site in Brazil.

CONSERVATION MANAGEMENT The responsible administrative body is the Department of the Arts, Sports, the Environment, Tourism and Territories (DASETT), with its headquarters in Canberra. An agreement exists between the Government of Australia and the State of Western Australia on legislative and administrative arrangements for the management of Shark Bay. Collaborative bodies include the Department of Conservation and Land Management of the state of Western Australia. Day to day administration is undertaken by Western Australia primarily by the Department of Conservation and Land Management. It is in accordance with existing Western Australian legislation, including the Fisheries Act, Local Government Act, Land Act, Conservation and Land Management Act and the Environmental Protection Act.

In 1986 the Government of Western Australia resolved to prepare a planning strategy for Shark Bay, the Shark Bay Region Plan which is reported to simply favour the maintenance of the economic status quo (Humphries, 1990). It was released for public comment in 1987 and finally adopted by the Western Australian government in June 1988. The Shark Bay Region Plan is currently being reviewed by the Western Australian Government. More detailed management plans are currently being prepared for all conservation reserves in the area. Draft management plans for the Shark Bay

Marine Reserves, and the Monkey Mia Reserve were released in 1994 and 1993 respectively. A draft plan for the management of fish resources in the World Heritage Area was released in 1995. A strategic plan for the Shark Bay World Heritage Property is also in preparation (DCLM in litt. 8 February 1996). Any future, major changes to land-use would require further public consultation and Western Australian parliamentary approval (DASETT, 1990). The region plan listed a total of 200,000ha in existing protected areas in 1988. It identified further a proposed protected areas extension to 755,000ha or 35% of Shark Bay. There are no aboriginal reserves in the Shark Bay area.

The Sustainable Future for Shark Bay report shows that environmental protection and appropriate local economic development can be integrated into the area's management. It contains a broad management plan which if adopted, will enable conservation values to co-exist with fishing, tourism and the existing salt works. The disruption to the region's pastoral industry, it is reported, would be minimal (Humphries, 1990). Offshore islands, including Bernier and Dorre islands are also nature reserves managed for conservation. The island reserves are recognised by restrictions on public access. The management of the trawl fishery includes restricting the number of boats, minimum mesh sizes, specifications and size of the fishing gear, setting up closed seasons and protection of the Shark Bay nursery areas (WAFIC, 1991). Damaging use of gill nets, which became serious in 1980-81, was effectively curbed by regulations introduced in 1981-82 (Anderson, n.d.). The Western Australian Department of Fisheries has assessed commercial fishing pressure and undertaken extensive aerial survey programmes and identified that commercial fishing in and around Shark Bay is relatively light (Anderson, n.d.). Insufficient information is available as to whether World Heritage nomination will lead to further restrictions of the local fishery as has been claimed by some sources (WAFIC, 1991).

In June 1990, the 105,352ha Peron pastoral lease was purchased by the Government of Western Australia primarily for the purposes of conservation as outlined in the region plan. The northern part of the lease was gazetted as the Francois Peron National Park in 1993.

A feral animal control programme is ongoing, and consideration is being given to extend control measures to prevent increases in populations. Successful control programmes have been undertaken already, such as the eradication of goats from Bernier island.

In 1986 five full-time rangers were appointed to Monkey Mia dolphin area to prevent interference with dolphins and to undertake public awareness programmes as a consequence of increased human pressure (Edwards, 1986).

MANAGEMENT CONSTRAINTS The whole terrestrial section of the Shark Bay area has been partially modified due to the impact of pastoralism and other human activities. The pastoral leases exhibit localised areas of high disturbance around homesteads and stock watering points. A number of areas show evidence of past overgrazing by stock leading to soil and erosion. The most disturbed areas were in the Tamala and Peron stations, where grazing and feral animals, particularly introduced rabbits and goats as well as predators such as fox and domestic cat, adversely affected the abundance of native animals, fire regimes have changed and grazing pressure is severe (DASETT, 1990). Peron station has since been purchased by the Government, grazing terminated, major feral animal control programme implemented, and the northern part of the station has been gazetted as a National Park (DCLM in litt. 8 February 1996).

The marine environment has undergone some modification as a result of the pearl shell industry, whaling and heavy fishing, the latter of which continues using bottom trawling, nets, lines and cray pots. In May 1990, a Greenpeace spokesman called for a ban on Shark Bay trawling and in July 1990 the executive director of the Australian Conservation Foundation is reported to have written to the Commonwealth Minister for the Environment stating that he had significant reservations about techniques used by the fishery; as a consequence fishermen are opposed to World Heritage listing. The fishing industry in the area totally refutes these allegations and states that fishermen harvest these resources at a sustainable level (WAFIC, 1991).

The township of Denham and the areas around Useless Loop and Useless Inlet are excluded from the nominated area although situated in the centre of the zone. They could cause adverse impacts on the environment of the nominated area in the future. In particular, the Useless Loop evaporation salt works and the gypsum mine on Edel Land have been listed as potential threats (Anderson, n.d.; DASETT, 1990). Tourism, such as boat activity along the inner coast of Dirk Hartog Island, may

also pose a threat. There are risks of dugong, dolphin and marine turtle casualties from recreational boating. This is a much greater threat than the less than a dozen presumed dugong killed annually by local inhabitants of the region, for food. Insufficient staff has long been regarded as a hindrance. For long only one fisheries officer was available to patrol the entire region and proved entirely inadequate to prevent poaching (Anderson, n.d.).

Insufficient management controls have led to tourist pressure on the habituated population of wild dolphins at Monkey Mia. Tourism is still on the increase, resulting in the appointment of full-time rangers. In 1989 a dead calf and a further six dolphins were presumed to have been killed by pollution from a septic tank which has since been removed (Fox, 1991). The construction of a new road to Denham/Monkey Mia and the building of motels, hotels and caravan parks is dramatically increasing visitor numbers and seriously affecting the area (Fox, 1991). A draft management plan for Monkey Mia was released in 1993. (DCLM in litt. 8 February 1996).

STAFF 12.8 full time equivalents in the Department of Conservation and Land Management and 5.5 full time equivalents in the Department of Fisheries (1996).

BUDGET Western Australian Department of Conservation and Land Management: approx. \$800,000 (1995/96); Fisheries Department approx. \$900,000 (1995/96) (DCLM in litt. 8 February 1996).

LOCAL ADDRESSES

Department of Conservation and Land Management, PO Box 104, Como, WA 6152.

Department of Fisheries, 168 St Georges Terrace, Perth, WA 6000.

Department of Agriculture, Baron-Hay Court, South Perth, WA 6151.

Gascoyne District Headquarters, Department of Conservation and Land Management, 67 Knight Terrace, Denham, WA 6537.

Department of the Environment, Sports and Territories, GPO Box 787, Canberra, ACT 2601 (Tel: 06 274 1111; Fax: 06 274 1123).

REFERENCES

Anderson, P.K. (n.d.). Shark Bay: comments relevant to possible reserve status. Unpublished. 21 pp.

Berry, P.F., Bradshaw, S.D. and Wilson, B.R. (Eds.). Research in Shark Bay. Report of the France-Australic Bicentenary Expedition Committee. Western Australia Museum. 312 pp

DASETT (1990). Nomination of Shark Bay, Western Australia by the Government of Australia for inclusion in the World Heritage List. Prepared by the Department of the Arts, Sport, the Environment, Tourism and Territories. Includes unseen film material.

Davis, S.D., Droop, S.J.M., Gregerson, P., Henson, L., Leon, C.J., Lamlein Villa-Lobos, J., Synge, H., and Zantovska, J. (1986). Plants in danger, what do we know? IUCN, Gland, Switzerland, and Cambridge, UK. 461 pp.

Doak, W. (1989). The Monkey Mia Dolphins: a family affair. Encounters with Whales and Dolphins. Hodder and Stoughton, Sydney. Pp. 137-158.

Edwards, H. (1988). The Monkey Mia Dolphins. In: Harrison, R. (Ed.) Whales, dolphins and porpoises. Merehurst Press, London. Pp. 208-213.

Fox, R. (1991). The sea beyond the outback. National Geographic 179(1): 42-73.

Humphries, R. (1991). Shark Bay. In: Habitat Australia. February 1990. Pp. 6-7.

Hutchins, J.B. (1990). Fish Survey of South Passage Shark Bay, Western Australia. In: Berry, P.F.,

Bradshaw, S.D. and Wilson, B.R. (Eds), Research in Shark Bay. Report of the France-Australe Bicentenary Expedition Committee. Western Australia Museum. Pp. 263-278.

Jones, D.S. (1990). Annotated checklist of marine decapod Crustacea from Shark Bay, Western Australia. In: Berry, P.F., Bradshaw, S.D. and Wilson, B.R. (Eds), Research in Shark Bay. Report of the France-Australe Bicentenary Expedition Committee. Western Australia Museum. Pp. 169-208.

Keighery, G.J. (1990). Vegetation and flora of Shark Bay, Western Australia. In: Berry, P.F., Bradshaw, S.D. and Wilson, B.R. (Eds), Research in Shark Bay. Report of the France-Australe Bicentenary Expedition Committee. Western Australia Museum. Pp. 61-88.

Pryer, W. (1990). Green's Shark Bay stance draws fire. The West Australian. 7 December 1990. P. 28.

Shark Bay Protection Group (1991). Why World Heritage listing for Shark Bay is opposed by local people and productive industry. Pamphlet.

Slack-Smith, R.J. (1990). The bivalves of Shark Bay, Western Australia. In: Berry, P.F., Bradshaw, S.D. and Wilson, B.R. (Eds), Research in Shark Bay. Report of the France-Australe Bicentenary Expedition Committee. Western Australia Museum. Pp. 129-158.

Storr, G.M. (1990). Birds of the Shark Bay area, Western Australia. In: Berry, P.F., Bradshaw, S.D. and Wilson, B.R. (Eds), Research in Shark Bay. Report of the France-Australe Bicentenary Expedition Committee. Western Australia Museum. Pp. 229-312.

Storr, G.M. and Harold, G. (1990). Amphibians and reptiles of the Shark Bay area, Western Australia. In: Berry, P.F., Bradshaw, S.D. and Wilson, B.R. (Eds), Research in Shark Bay. Report of the France-Australe Bicentenary Expedition Committee. Western Australia Museum. Pp. 279-286.

WAFIC (1991). We share the sea, Shark Bay is fishing. Brochure by the Western Australian Fishing Industry Council, Western Australia.

DATE March 1991, updated December 1991, March 1996

578: BAIE SHARK (AUSTRALIE)

Résumé préparé par le CMSC/UICN (mai 1991) d'après la désignation d'origine soumise par le gouvernement de l'Australie. L'original et tous les documents présentés à l'appui de cette désignation seront disponibles pour consultation aux réunions du Bureau et du Comité.

1. SITUATION

600km au nord de Perth, à l'extrémité occidentale de la côte d'Australie-Occidentale, jouxte la ville de Carnarvon au nord et s'étend sur 200km au sud, jusqu'au Parc national de Zuytdorp. Limite occidentale à 3 miles nautiques des côtes. Ce bien s'étend sur 70-100km à l'intérieur des terres, jusqu'à l'autoroute littorale du nord-ouest. La municipalité de Denham et les zones entourant Useless Loop et Useless Inlet, sont spécifiquement exclues de l'aire désignée, bien que se trouvant à l'intérieur des limites principales. L'aire désignée couvre 2 197 300 ha, dont 200 700 ha de réserves naturelles et de parcs nationaux.

2. DONNEES JURIDIQUES

Les biens désignés à des fins de conservation de la nature sont couverts par la Loi de 1984 sur la conservation et l'aménagement du territoire d'Australie-Occidentale (Conservation and Land Management Act of Western Australia) et par la Loi de 1975 sur la conservation de la faune et des parcs nationaux du gouvernement de l'Australie (National Parks and Wildlife Conservation Act). Les biens couverts incluent l'île Friday, les îles Bernier et Dorre, l'île Charlie, les îles Small, la Réserve naturelle de Cooloomie, l'île Koks, le Parc national de Zuytdorp, la Réserve naturelle d'Hamelin Pool/East Faure Island High-Low Water Mark.

3. IDENTIFICATION

Peu profonde, la baie Shark a une superficie d'environ 13 000km² et une profondeur moyenne de 9m. Elle comprend une série de péninsules et d'îles orientées nord-sud, séparant des criques et des baies les unes des autres et de l'océan Indien. La caractéristique majeure de ce bien est son gradient élevé de salinité, qui explique la présence de trois zones biologiques exerçant une influence considérable sur la répartition des organismes marins dans la baie. La baie Shark présente trois types de paysages distincts: la province de Gascoyne-Wooramel, la province de Peron et la province d'Edel, et englobe les falaises de Zuytdorp (200m de haut). La flore constitue une transition entre la province botanique du Sud-Ouest et la province botanique

érémente; sur les 620 et quelques espèces dénombrées dans toute la région de la baie Shark, 145 se trouvent à la limite septentrionale de leur aire de répartition et 39 à la limite méridionale. La flore marine est dominée par des herbiers marins s'étendant sur 4000km². La baie Shark est remarquable pour ses communautés microbiennes benthiques (fossiles vivants), qui présentent une riche variété de tapis microbiens, dont les plus développés se trouvent à Hamelin Pool. Sur les 26 espèces de mammifères australiens menacés, 5 se trouvent sur les îles Bernier et Dorre.

La baie Shark est renommée pour sa faune marine, qui comprend plus de 10 000 dugongs (V), soit près de 12,5% de la population mondiale. La baie Shark est une étape des mégaptères (V). Sa riche avifaune englobe plus de 230 espèces, dont 11 oiseaux de mer nicheurs. Plus de 35 espèces migratrices asiatiques se trouvent dans la région, dont 4 nichent dans la baie Shark. Cette dernière est remarquable pour la diversité de son herpétofaune, qui comprend une centaine d'espèces. Les îles, péninsules et golfes servent de refuge à neuf espèces reliques ou endémiques. La baie Shark entretient les populations de non moins de six espèces de serpents de mer, dont une endémique; on y trouve en outre 323 espèces ichtyologiques, ainsi que des récifs coralliens, peu abondants, mais comportant néanmoins plus de 80 espèces de coraux.

L'occupation aborigène de la baie Shark remonte à 22 000 ans av. J.-C. De nombreuses "cuisines" aborigènes y ont été retrouvées. En 1712, le navire Zuytdorp, de la Compagnie néerlandaise des Indes orientales sombra au large de la baie. Depuis les années 60, les interactions entre hommes et dauphins sauvages sont régulières à Monkey Mia, fait unique au monde et qui fait partie du patrimoine culturel de l'humanité, au même titre que les récits de Plin le Jeune, en Afrique du Nord, datant de 109 av. J.-C.

4. ETAT DE PRESERVATION / CONSERVATION

La baie Shark est un écosystème marin complet, possédant de nombreuses caractéristiques importantes, notamment le banc d'herbiers marins de Wooramel, le seuil de Faure et les écosystèmes dominés par des communautés microbiennes benthiques, qui prolifèrent dans les baies hypersalines. Le milieu marin est en grande partie intact, alors que les écosystèmes terrestres ont été considérablement modifiés par le pastoralisme et d'autres activités humaines. Sur le total, 200 000ha jouissent du statut d'aire de conservation et on se propose d'inclure 686 000 autres hectares dans des parcs ou des réserves.

L'organe administratif responsable est le Département des Arts, des Sports, de l'Environnement, du Tourisme et des Territoires (DASETT), dont le siège se trouve à Canberra. Un accord a été signé entre le Gouvernement australien et l'Etat d'Australie-Occidentale concernant des dispositions législatives et administratives à prévoir pour la gestion de la baie Shark. Si ce site devient effectivement bien du patrimoine mondial, l'administration régulière incombera à l'Australie-Occidentale, en accord avec la législation en vigueur dans cet Etat, notamment la Loi sur les pêches, la Loi sur le gouvernement local, la Loi sur le territoire, la Loi sur la conservation et

l'aménagement du territoire et la Loi sur la protection de l'environnement (Fisheries, Local Government, Land, Conservation and Land Management, Environmental Protection Acts). Le plan régional de la baie Shark a été adopté par le gouvernement d'Australie-Occidentale en juin 1988. Des plans de gestion plus détaillés restent encore à formuler pour des sites spécifiques. A l'avenir, tout changement majeur enregistré dans l'occupation des terres sera soumis à une nouvelle consultation publique et à l'approbation du parlement d'Australie-Occidentale. Le processus de zonage a déjà commencé; c'est dans les réserves naturelles désignées que la concentration d'unités telles que les communautés microbiennes benthiques, les tapis microbiens et les stromatolites est la plus efficace. Les îles, y compris celles de Bernier et Dorre, sont aussi des réserves naturelles gérées à des fins de conservation et les réserves insulaires se distinguent par un accès public restreint. La gestion de la pêche au chalut prévoit une limitation du nombre d'embarcations, un calibrage minimum du maillage, des spécifications et des limitations de la taille des engins de pêche, des périodes de fermeture de la pêche et la protection des aires de nourrissage des alevins dans la baie Shark.

Bien que située au coeur de l'aire, la municipalité de Denham et les zones entourant Useless Loop et Useless Inlet ne font pas partie du bien désigné. A Useless Loop, les installations d'évaporation du sel et la mine de gypse d'Edel Land sont considérées comme des menaces potentielles. Le tourisme, notamment le canotage, représente aussi une menace pour le dugong, le dauphin et la tortue marine. Le manque de personnel a longtemps été considéré comme un handicap: un seul garde-pêche était chargé de patrouiller dans toute la région, et ne pouvait de ce fait pas surveiller efficacement l'utilisation des ressources marines. Depuis la construction d'une nouvelle route desservant Denham/Monkey Mia, d'hôtels, de motels et de terrains de camping/caravanning, le nombre de visiteurs est monté en flèche.

5. RAISONS JUSTIFIANT LA DESIGNATION POUR LA LISTE DU PATRIMOINE MONDIAL

D) Bien naturel

- (i) **Exemples éminemment représentatifs des grands stades de la l'histoire de l'évolution de la terre.** La baie Shark possède à elle seule les exemples les plus divers et les plus abondants de microbialites stromatolitiques du monde, semblables aux écosystèmes benthiques qui prédominaient sur la terre il y a 3 milliards d'années.
- (ii) **Exemples éminemment représentatifs de processus géologiques importants en cours, de l'évolution biologique et de l'interaction entre l'homme et son environnement naturel.** La baie Shark présente des exemples exceptionnels de processus de l'évolution biologique et géomorphique, y compris de l'évolution du système hydrologique de la baie, le milieu hypersalin de Hamelin Pool et les processus biologiques en cours de spéciation, succession et création de refuges;

- (iii) Contient des phénomènes, formations ou particularités naturels uniques, rares ou éminemment remarquables ou de beauté exceptionnelle. Les stromatolites sont la plus ancienne forme de vie sur terre. Hamelin Pool est le seul endroit connu au monde possédant une gamme de formes de stromatolites comparable aux fossiles des roches anciennes. La baie Shark est l'une des rares zones marines du monde dominée par des carbonates, tels que représentés par le banc de Wooramel, qui est aussi le plus vaste herbier marin du monde.
- (iv) Habitats naturels les plus importants et les plus représentatifs où survivent des espèces de plantes et d'animaux menacées ayant une valeur universelle exceptionnelle du point de vue de la science et de la conservation. La baie Shark abrite les seules ou les principales populations de 5 des 26 espèces de mammifères menacées à l'échelle mondiale d'Australie. On y trouve douze reptiles endémiques rares ou menacés d'extinction au plan national, deux tortues marines menacées d'extinction ou menacées qui viennent y nidifier, trois espèces d'oiseaux vulnérables, de même que des espèces végétales rares, menacées, insuffisamment connues, non décrites ou endémiques.

DESIGNATION POUR LE PATRIMOINE MONDIAL - EVALUATION TECHNIQUE DE L' UICN

578: BAIE SHARK (AUSTRALIE)

1. DOCUMENTATION

- i) Fiches de données de l' UICN
- ii) Littérature consultée:
 - Environmental Protection Authority, 1987. Implications of the Shark Bay Region Plan for Conservation, 43p.
 - Berry, P. F., et. al., 1990. Research in Shark Bay, 325p.
- iii) Consultations: représentants gouvernementaux du CALM et du DASETT, Conseil de Shire, R. Slatyer, G. Mosely, D. Collins, H. Marsh, D. Henry, examinateurs anonymes.
- iv) Visite du site: Novembre 1990, J. Thorsell, H. K. Eidsvik

2. COMPARAISON AVEC D' AUTRES AIRES

Le site de Shark Bay est divisé par les frontières de deux provinces biogéographiques et botaniques. C' est une zone de transition qui présente donc des éléments mixtes, tempérés et tropicaux, avec de nombreuses espèces atteignant les limites de leur aire de répartition septentrionale ou australe. C' est la seule aire protégée du continent australien située à cheval sur les provinces Mulga/sclérophylle. Au nord et au sud de l' Etat de l' Australie-Occidentale se trouvent plusieurs autres aires protégées, le long de l' océan Indien (Cape Range, Kalbarri, Nambung) mais la baie Shark est la seule à englober une vaste zone marine et des îles au large. Avec ses récifs coralliens, ses mangroves et ses dugongs, la baie Shark possède certaines affinités avec deux autres biens australiens du patrimoine mondial: Kakadu et la Grande-Barrière. Le mélange d' espèces, le climat et les formes pédologiques de la baie Shark sont cependant très différents et ses communautés de stromatolites et d' herbiers marins ne sont égalées dans aucun de ces biens, ni d' ailleurs nulle part ailleurs sur terre.

Il n' existe pas d' écosystème comparable dans l' hémisphère austral entre 10° et le 40° de latitude sud. Entre 10° et 40° de latitude nord, on trouve des baies similaires, de taille équivalente, dans le détroit de Palk, le golfe de Bahrain, la baie de Chesapeake et la mer Egée. Tous ces sites subissent cependant des impacts industriels et/ou les demandes de communautés nombreuses, établies là depuis longtemps. Il existe d' autres biens côtiers/marins du patrimoine mondial: les Everglades, Sian Kaan et le Banc d' Arquin. Ce dernier, situé à la limite d' un désert aride, présente un

écosystème du même type mais se trouve, bien entendu, dans une province biogéographique différente et ne possède aucune affinité avec la baie Shark au niveau des espèces.

La baie Shark possède trois caractéristiques naturelles remarquables: ses vastes herbiers marins, sa population de dugongs et ses stromatolites. Ses herbiers marins sont les plus vastes (4000km²) et les plus riches en espèces (12) du monde, dépassant ce que l'on trouve dans la baie de Floride et dans la partie orientale du golfe du Mexique, où les herbiers marins sont clairsemés et principalement composés de petites espèces. La baie Shark est également l'un des six bastions du dugong dans le monde, comme le montre le tableau ci-après (Source: H. Marsh, comm. pers.):

<u>Lieu</u>	<u>Estimation de la population</u>
Ouest du golfe de Carpentarie	16 846
Côte septentrionale du Territoire du Nord	13 800
Détroit de Torres	12 522
Baie Shark 10 146	
Nord de la Grande-Barrière	8 110
Golfe arabe (1987)	7 310

Les stromatolites de la baie Shark (colonies d'algues bleu-vert qui édifient des structures en forme de monticules et sont parmi les plus anciennes formes de vie sur terre) sont les exemples vivants de cette algue les plus intéressants du monde. Bien qu'on les trouve en d'autres lieux (baie d'Hudson et Grand Lac Salé), leur abondance n'égale nulle part ailleurs celle d'Hamelin Pool. Il est curieux de constater que les fossiles les plus ressemblants se trouvent dans les stromatolites fossiles datant de 1,9 milliards d'années, qui affleurent dans la péninsule de Pethei, dans le bras oriental du Grand Lac de l'Esclave, au nord du Canada.

En conclusion, la déclaration faite par l'Australian Geographic Society (Journal, avril/juin 1989) selon laquelle "il n'existe aucun lieu sur terre équivalant à la baie Shark" est correcte. Cette baie, avec ses îles et les terres qui l'entourent englobe une région possédant des valeurs exceptionnelles du point de vue du patrimoine naturel. Le développement est limité, de même que l'occupation humaine résidente et la baie Shark conserve encore son caractère sauvage, avec la nature pour force dominante.

3. INTEGRITE

La baie Shark possède non seulement une combinaison exceptionnelle de valeurs du patrimoine naturel, c'est aussi une région où les problèmes de conservation sont uniques. Depuis la préparation du Plan régional en 1988 et durant les années qui ont précédé sa désignation, la baie Shark a fait l'objet de beaucoup d'attention et a enregistré des progrès notables. Tout en félicitant la population locale et les organismes gouvernementaux concernés pour leur prise de conscience de la nécessité de conserver la baie Shark, l'UICN souhaite faire quelques remarques concernant des domaines où la gestion mériterait encore d'être renforcée.

3.1 Impact humain

Jusqu' à présent, l' aridité, l' approvisionnement limité en eau potable, les températures estivales élevées, le réseau routier médiocre et le coût relativement élevé de l' énergie ont découragé tout peuplement humain intensif de la région de la baie Shark. Les écosystèmes terrestres ont néanmoins été partiellement modifiés par le pastoralisme et d' autres activités humaines. Dans les terres louées à bail, on trouve des zones très perturbées autour des fermes et des points d' eau où le bétail s' abreuve. Plusieurs endroits présentent des signes de surpâturage ancien, ayant entraîné l' érosion des sols. Les zones les plus perturbées se trouvent dans les stations de Tamala et Peron; les pressions du pâturage y ont été importantes et des animaux redevenus sauvages, tels que lapins et chèvres introduits, de même que des prédateurs comme les renards et les chats domestiques, y ont décimé des espèces indigènes et affecté le régime des feux.

Le milieu marin a subi des modifications dues à l' industrie perlière, la chasse à la baleine et la surpêche; la pêche est d' ailleurs toujours pratiquée à l' aide de chaluts, de filets, de lignes et de casiers à langoustes. Plusieurs organisations de conservation de la nature se sont déclarées préoccupées par la pêche au chalut et le volume des prises. Cependant, l' industrie pêchière de la région répond que les pêcheurs effectuent des prélèvements durables. Les effets de la pêche au chalut sur les communautés benthiques et pélagiques de Denham Sound n' ont pas encore été évalués. Il conviendrait, en particulier, d' évaluer l' impact potentiel de la pêche au chalut sur la fréquentation de la baie par les mégaptères, d' autant plus que ce site constituait autrefois, pour cette espèce, un point de rassemblement.

Bien que situées au coeur du site désigné, la municipalité de Denham et les terres entourant Useless Loop ne font pas partie de la désignation. Elles pourraient, en effet, avoir un impact négatif sur le milieu naturel de la baie. Les installations d' évaporation du sel de Useless Loop et la mine de gypse d' Edel Land font partie des menaces potentielles, de même que le tourisme, surtout le canotage près de la côte intérieure de l' île Dirk Hartog. Les bateaux de plaisance causent en effet nettement plus de dommages aux populations de dugongs, de dauphins et de tortues de mer que les habitants locaux qui, chaque année, abattraient à peine une douzaine de dugongs, notamment pour se nourrir.

A part ces impacts, les écosystèmes de la baie Shark semblent relativement à l' abri des intrusions humaines. Deux facteurs pourraient cependant changer la situation. Premièrement, l' exploitation terrestre ou sous-marine des sables minéraux (menace qui a cependant été éloignée en 1988-89). Deuxièmement, l' accroissement de l' approvisionnement en eau potable, qui exigerait énormément d' énergie pour le dessalement (p. ex. gaz naturel via une branche du gazoduc du plateau nord-ouest), ou par une branche d' un aqueduc qui pourrait être construit entre le lac Argyle et le sud-ouest de l' Australie-Occidentale. Le tourisme et/ou les villages pour retraités (potentiellement encouragés par le statut de bien du patrimoine mondial) pourraient vraisemblablement créer une demande pour l' une ou l' autre de ces

"solutions au problème de l'eau". Le développement des routes principales, parallèlement à la promotion du tourisme, entraîne déjà une augmentation de la population résidante. Parmi les autres menaces possibles figurent le développement agricole sur les terres situées à l'est (tributaire de l'approvisionnement en eau), qui pourrait entraîner l'utilisation d'herbicides ou de pesticides, l'intensification de l'exploitation du gypse, et l'introduction de techniques d'aquaculture ou de pêche intensive. Une élévation du niveau de la mer induite par l'effet de serre pourrait entraîner des réajustements majeurs dans les communautés biologiques, à l'intérieur de la baie, sans toutefois détruire le système.

3.2 Gestion

Un accord a été passé entre le gouvernement de l'Australie et l'Etat d'Australie-Occidentale sur les dispositions législatives et administratives à prévoir pour la gestion de la baie Shark. Parmi les organismes qui collaborent figurent le Département de la Conservation et de l'Aménagement du territoire (CALM) de l'Etat d'Australie-Occidentale, le département de l'Agriculture et le département des Pêches. Si la désignation du bien sur la Liste du patrimoine mondial est acceptée, l'administration au jour le jour sera assurée par l'Australie-Occidentale, conformément à la législation en vigueur dans cet Etat, y compris la Loi sur la pêche, la Loi du gouvernement local, la Loi foncière, la Loi sur la conservation et l'aménagement du territoire et la Loi sur la protection de l'environnement.

En 1986, le gouvernement de l'Australie-Occidentale a préparé une stratégie de planification pour la baie Shark: le Plan de la région de la baie Shark ("Shark Bay Region Plan). Ce plan a été soumis au public pour commentaires en 1987 et adopté par le gouvernement de l'Australie-Occidentale en juin 1988. Des plans de gestion plus détaillés pour des sites spécifiques restent encore à formuler. A l'avenir, tout changement majeur enregistré dans l'occupation des terres sera soumis à une nouvelle consultation publique et à l'approbation du parlement de l'Etat. Le plan répertorie un total de 200 000 ha d'aires protégées et présente une proposition d'extension des aires protégées à 755 000 ha, soit 35 pour cent de la superficie de la baie Shark. Dans la région de la baie Shark n'existe aucune réserve aborigène ni aucune chasse aborigène légale.

Actuellement, le parc marin est encore à l'état de proposition. Le processus de zonage a commencé; de nombreuses caractéristiques importantes, comme les communautés microbiennes benthiques, les tapis microbiens et les stromatolites, se trouvent dans des réserves naturelles désignées. Les îles, y compris celles de Bernier et de Dorre, sont aussi des réserves naturelles. Les réserves insulaires se caractérisent par un accès public restreint. La gestion de la pêche au chalut prévoit une limitation du nombre d'embarcations, un maillage minimum des filets, des spécifications et des limitations de la taille des engins de pêche, des périodes de fermeture de la pêche et la protection des zones constituant des frayères dans la baie Shark. L'impact négatif des filets araignée, qui s'est intensifié en 1980, a été efficacement réduit par les règlements introduits en 1982. Le département des Pêches de l'Australie-Occidentale a évalué l'impact de la

pêche commerciale et réalisé des programmes de surveillance aérienne intensive, qui ont révélé que la pêche commerciale était relativement faible à l'intérieur et autour de la baie Shark.

En juin 1990, les 105 352 hectares du bail pastoral de Peron ont été rachetés par le gouvernement de l'Australie-Occidentale, essentiellement à des fins de conservation, conformément au Plan de la région de la baie Shark.

Un programme de lutte contre les animaux redevenus sauvages est en cours et il est prévu d'élargir les mesures de contrôle pour empêcher leur prolifération. Des programmes de contrôle ont été couronnés de succès, notamment l'éradication des chèvres sur l'île de Bernier.

Parmi ressources de gestion, la pénurie de personnel constitue une contrainte majeure. Un seul garde-pêche est disponible pour patrouiller dans toute la région et le respect des lois est de ce fait, très limité. Il n'y a aussi qu'un seul représentant du CALM chargé de la conservation (disposant d'un véhicule mais d'aucune embarcation). Les fonctionnaires en poste dans la région de Monkey Mia, où se trouvent les dauphins, se concentrent surtout sur la sensibilisation du public, dans le nouveau centre d'information. Il demeure donc nécessaire de renforcer le personnel chargé de la gestion, ce qui pourrait se faire en grande partie en faisant participer des résidents aux opérations de terrain.

Aux problèmes posés par la pénurie de personnel s'ajoute le fait que, d'après plusieurs examinateurs, le CALM devrait exercer davantage de pouvoir et d'autorité dans la région. A ce jour, toutes les tentatives de renforcer la Loi sur le CALM (CALM Act) ont échoué et les intérêts de la pêche, de l'élevage et des mines ont primé dans la plupart des décisions. Il semble en outre qu'il y ait des conflits et des chevauchements considérables entre les différents départements gouvernementaux, problèmes qui, espérons-le, disparaîtront avec la nouvelle structure de gestion.

3.3 Limites

Les limites de l'aire désignée sont satisfaisantes, mais celles des aires de conservation proposées à l'intérieur de celle-ci n'ont pas encore été fixées définitivement. Des suggestions spécifiques figurent ci-après (pour plus de détails, se référer au Bulletin 305 de l'Autorité de protection de l'environnement de l'Etat d'Australie-Occidentale).

- La limite septentrionale de la Réserve marine de Hamelin Pool (Classe A) a été fixée au 26e parallèle. Cela n'est pas conforme à la recommandation du comité d'experts internationaux réuni à Perth en 1973 pour préparer des recommandations sur la protection des communautés de stromatolites, qui soulignait que "des mesures de conservation ne prévoyant pas la protection de Faure Sill seraient inefficaces, cette barrière ayant été le facteur clé de l'évolution du milieu et du maintien des conditions d'hypersalinité à Hamelin Pool."

- La limite méridionale du parc terrestre, à l'extrémité nord de la péninsule de Peron, longe la route reliant Denham à Monkey Mia. Cette limite est difficile à justifier du point de vue économique, écologique et stratégique. La limite sud du parc pourrait être élargie à l'isthme N de la station de Nanga, sur la route Nilemah-Tamala, ou en suivant les lignes proposées à la Fig. 9.1 du Bulletin 305 de l'Autorité de protection de l'environnement du gouvernement d'Australie-Occidentale.
- Idéalement, il conviendrait de redélimiter la Réserve d'Hamelin Pool pour englober la baie de Gladstone. De plus, dans la région de la baie de Gladstone et du delta de la Wooramel, la limite du parc marin ne s'étend que jusqu'au niveau des basses eaux, chose étonnante car toutes les autres limites vont jusqu'au niveau des hautes eaux. La baie de Gladstone est une aire de nourrissage estivale et une nurserie du dugong, c'est aussi un endroit où les dugongs mâles forment leurs congrégations ou lek à la saison des amours. Des recherches ont révélé qu'il s'agit de l'habitat le plus critique et le plus sensible de toute la baie pour le dugong et que toute forme de développement risque, par conséquent, donc d'avoir un impact négatif sur cette espèce.
- Dans la région de Denham Sound, il conviendrait d'étendre la limite septentrionale du parc marin jusqu'à 25°30' de latitude, c'est-à-dire jusqu'à l'ancienne limite méridionale de la pêche au chalut. L'extension de cette forme de pêche au sud de la balise du canal de Denham est une concession relativement récente faite à l'industrie pêchière et aurait dû être supprimée durant le processus d'établissement du parc.
- Bien que l'on ait visiblement l'intention d'accorder le statut de réserve à l'île de Dirk Hartog, aucun détail n'a encore été donné quant à la forme ou à la date de ce projet, et on ignore si des redevances sont prévues pour les activités commerciales. La désignation renvoie à des plans de réintroduction sur le continent de certaines espèces de marsupiaux actuellement confinées aux îles de Bernier et Dorre. Dirk Hartog conviendrait nettement mieux et le fait que la désignation omette de mentionner la réintroduction sur cette île constitue une lacune.

Il semble qu'il n'existe pas de disposition prévoyant l'incorporation de la partie méridionale de la station de Nanga dans le réseau de réserves. Ce site, important du point de vue floristique (et probablement aussi faunistique) est exploité par un fermier.

Toutes les propositions de zonage interne mentionnées plus haut montrent qu'il conviendrait peut-être de prévoir certaines révisions de la prochaine version du Plan de la région. Ces suggestions ne sont pas des conditions d'acceptation de la désignation et pourraient, pour la plupart, être intégrées dans le futur plan d'extension du système d'aires protégées.

4. COMMENTAIRES ADDITIONNELS

Comme pour les désignations précédentes de l'Australie, il existe au sein de la population locale une minorité opposée à la désignation du site. La campagne d'opposition s'explique en grande partie par la mauvaise information du public, c'est pourquoi les autorités australiennes poursuivent, de leur côté, la campagne de sensibilisation du public à la Convention. Cette campagne souligne que le statut de bien du patrimoine mondial n'aura aucune incidence sur la pêche commerciale durable, les salines solaires, le tourisme respectueux de l'environnement ou les baux pastoraux viables.

5. EVALUATION

La désignation présente des arguments solides en faveur de l'inscription du site sur la Liste du patrimoine mondial. Ce site est aussi complexe que vaste, avec de nombreuses caractéristiques terrestres aussi bien que marines. La richesse biologique du site, ajoutée aux leçons qu'il offre en matière d'évolution, dans un cadre en grande partie naturel, justifie son inscription sur la base des quatre critères naturels:

- i) **Histoire de l'évolution de la terre.** Les stromatolites d'Hamelin Pool présentent un intérêt particulier pour la science car ils sont l'une des plus anciennes formes de vie existantes et sont considérés comme le lieu de prédilection de l'étude de ces "fossiles vivants" dans le monde;
- ii) **Processus géologiques en cours et évolution biologique.** La baie Shark est un système unique, son hydrologie (notamment ses vastes herbiers marins), son emplacement, à la jonction entre deux provinces botaniques et les refuges insulaires qu'il comprend font de ce site l'une des aires côtières les plus exceptionnelles et les plus riches du monde;
- iii) **Phénomènes naturels exceptionnels.** La baie Shark recèle les plus vastes herbiers marins du monde. Ses pôles d'attraction sont complétés par des caractéristiques secondaires, comme la plage de Shell, Big Lagoon et les falaises de Zuytdorp, qui renforcent encore son intérêt;
- iv) **Habitats d'espèces menacées.** La baie Shark abrite d'importantes populations de 5 espèces inscrites sur la Liste Rouge de l'UICN (IUCN Red List of Threatened Mammals) et deux mammifères marins (dugongs et mégaptères) considérés comme vulnérables. Elle possède également une riche avifaune, herpétofaune, ichtyofaune et flore marine. Si la population de mégaptères se restaure, ce qui n'est pas impossible, la baie Shark redeviendra peut-être une étape cruciale de migration pour cette espèce.

Pour ce qui est des conditions d'intégrité, l'aire désignée est suffisamment étendue et possède les éléments requis pour que s'y déroulent correctement tous les processus naturels. La survie des espèces migratrices (cétacés, oiseaux, tortues) dépendra de leur protection dans les régions extérieures au site. Comme indiqué au chapitre 3, le critère d'intégrité (vi) n'est pas entièrement satisfait. On peut citer les menaces suivantes: surpâturage, espèces introduites, pêche au chalut, tourisme, salines, mines de sable et accroissement de l'approvisionnement en eau.

L'accord de coopération signé entre l'Etat d'Australie-Occidentale et le Commonwealth d'Australie constitue, avec le Plan de la région de la baie Shark, un cadre général qui pourrait aider à résoudre ces problèmes. Le Bureau a demandé des précisions sur les plans destinés à renforcer le personnel de gestion (y compris, éventuellement, en engageant du personnel sur place), ainsi que sur la date et les perspectives d'agrandissement des aires protégées situées à l'intérieur du site désigné. Le 3 octobre, les autorités australiennes ont fait parvenir une réponse détaillée qui traitait tous ces points de manière satisfaisante.

6. RECOMMANDATION

La baie Shark a une valeur universelle exceptionnelle. Elle devrait donc être inscrite sur la Liste du patrimoine mondial car elle satisfait aux critères naturels i), ii), iii) et iv). Le comité souhaitera éventuellement demander la mise en oeuvre immédiate de l'accord de gestion et l'accélération des mesures visant à améliorer la gestion du site à des fins de conservation.

C. URBAN/SCHURMAN DGN Oct. 08, 1990 11:17:24 SCALE 1:1 000 000

