

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.

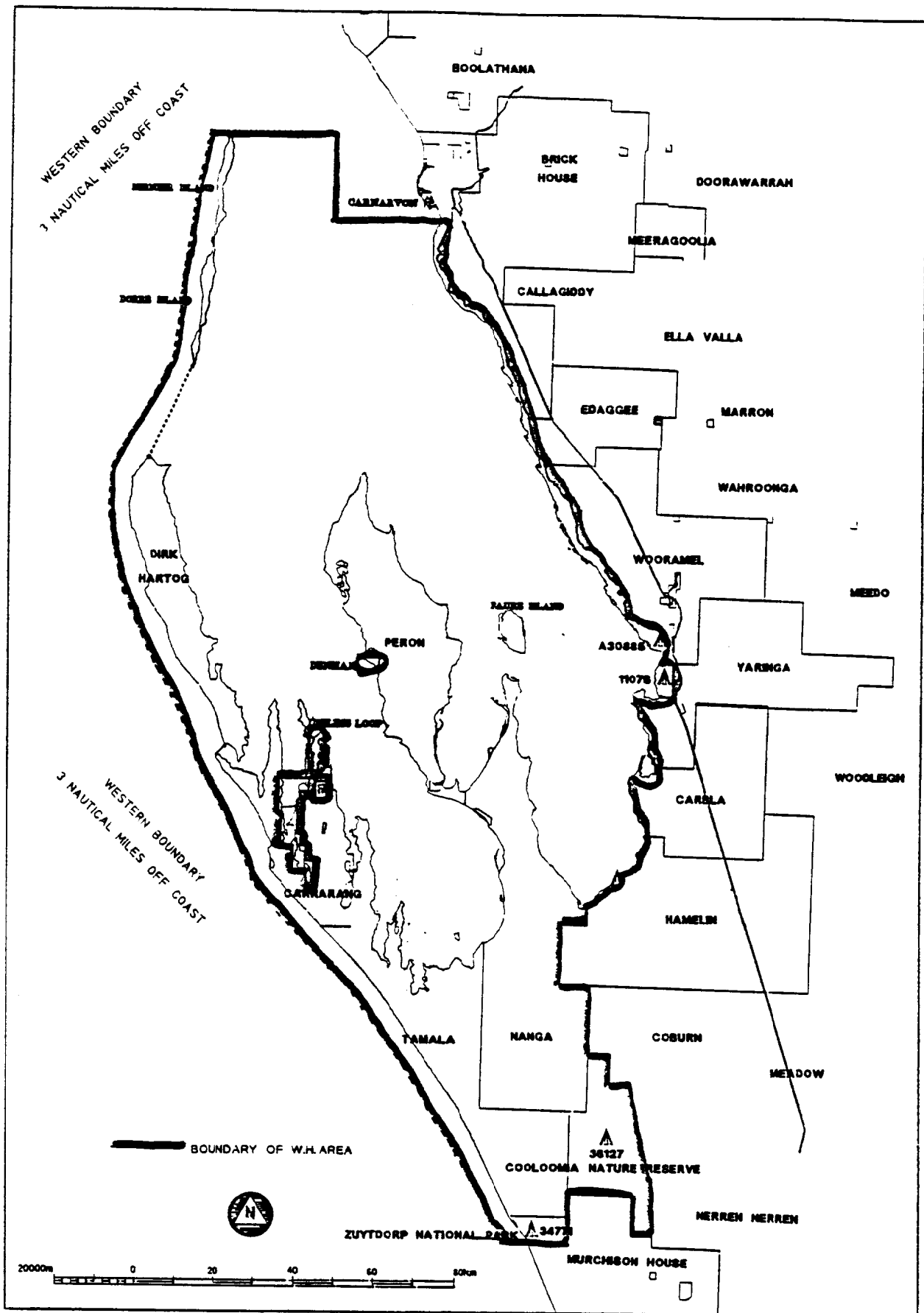
5. JUSTIFICATION FOR INCLUSION ON THE WORLD HERITAGE LIST

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.

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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.

