

6C. SIRENS OF NORTHERN AUSTRALIA: THE DUGONGS*

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Sea cows belong to an obscure order of aquatic mammals known as the Sirenia. There are only four surviving species of sea cows, comprising three species of manatee, genus *Trichechus* in the family Trichechidae, and a single species of Dugong, *Dugong dugon*, in the family Dugongidae. Another species of the family Dugongidae, Steller's Sea Cow, *Hydrodamalis gigas*, was hunted to extinction within about thirty years of its discovery in 1741 in the Bering Sea. Although only four species of Sirenia exist today, the order has an extensive fossil history. However, even at its zenith in the Miocene, the order Sirenia, only had about a dozen (mostly monotypic) genera world-wide.

Sirenians are believed to have evolved from terrestrial herbivores about sixty million years ago, and it is generally accepted that elephants and sirenians have probably descended from the same terrestrial ancestors. Except for Steller's Sea Cow, all sirenians, both fossil and living, have been confined to tropical and subtropical waters. Living species are sensitive to low temperatures. They are shallow water, near-shore-dwelling animals as a result of their dependence on aquatic plants which only grow in these areas.

The manatees are eastern American and west African in distribution. The Dugong ranges along the coast of east Africa into the Red Sea, along the coast of southern Asia to as far east as the Solomon Islands, Vanuatu (New Hebrides) and New Caledonia, and along the northern coasts of Australia from southern Queensland to subtropical Western Australia. Dugongs have occasionally been found as far south as the Sydney area.

Adult Dugongs reach weights of more

FIG. 2: Dorsal view of the skull. Note large opening of external nares on dorsal surface and downward pointing snout (premaxillae).

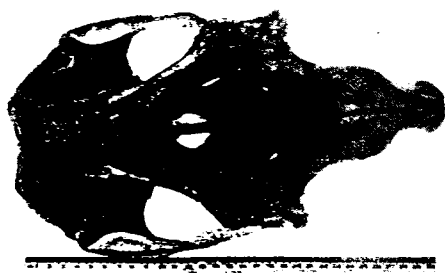


FIG. 1: Head of mature male Dugong showing fleshy snout and erupted tusks on upper and lower jaws.

than 400 kg and measure up to more than three metres in length. Their smooth thick skin is grey to bronze, although animals tend to look brown when observed from aircraft. The skin carries sparsely distributed, short, bristle-like hairs. The massive body is streamlined and spindle-shaped, tapering forward from the abdomen to the head and backward from the abdomen to a narrow tail stock and tail. The large, notched, horizontally-flattened tail-fluke is rather like that of a whale or a dolphin. The Dugong's forelimbs or flippers are paddle-like and, unlike those of manatees, have no externally discernible digits. Hind limbs are absent, but small rudimentary pelvic bones serve as a reminder of the Dugong's terrestrial origins.

The head of the Dugong is remarkable because of its huge snout, which is covered with large bristles and smaller stiff hairs. The eyes are small and situated on the sides of the head, and, externally, the ears are present only as minute holes. The nostrils, which are closed by valve-like flaps when diving, are placed on the top of the front end of the snout, allowing the Dugong to breathe quickly when surfacing with only the top of the snout exposed.

Two to six cheek teeth are present on each side of the jaws in both male and female animals, the number of teeth depending on age. Mature males, and occasionally old females, also

have slightly protuberant tusks, the function of which is not known. The tusks could be of limited value in defence against predators.

The Dugong is undoubtedly the basis of the mermaid legend, but even though the female Dugong has protuberant mammary glands in approximately the same position to those of a woman, other features could lead one to conclude that the ancient and medieval mariners who initiated the legend must have been at sea for extended periods.

Dugongs are difficult animals to study and are now considered to be rare over much of their range and approaching extinction in some areas. They spend almost all their time under water, surfacing to breathe for one to two seconds, approximately every two minutes. They can remain submerged for at least eight minutes. Dugongs often occur in muddy water where underwater observation is impossible. There have only been a few successful attempts at keeping Dugongs alive in captivity, and they have not been bred in captivity. Like most work on marine mammals, Dugong research is difficult and expensive.

Over a period of more than 10 years, data and material were collected from Dugongs caught and accidentally drowned in shark nets,

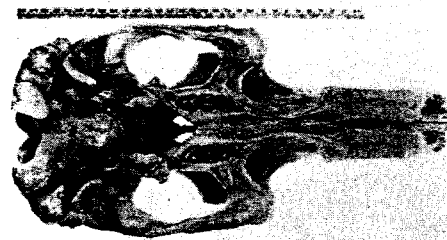


FIG. 3: Ventral view of skull. The distal tips of the unerupted tusks are visible in their sockets at the anterior end of the rostrum. Four cheek teeth (P4, M(1-3)) are present. Part of the socket of P3 is still present anterior to the very worn P4. During the life of the Dugong there is a total of six pairs of cheek teeth in both jaws. The anterior cheek teeth progressively fall out or are resorbed and the sockets are occluded with bone. Further teeth are added posteriorly during growth and the whole process continues until only two pairs of teeth (M(2-3)) remain in each jaw in the older animals. These have persistent pulp cavities and continue to grow throughout life.

* Aust. Nat. Hist. 1977, 19: 106-11. (Revised edition).



FIG. 7: A Dugong being butchered on the beach.

of seagrasses from their feeding trails. They feed against the current presumably to minimize the ingestion of bottom sediment. During aerial surveys Dugongs are often located by the conspicuous mud streaks produced when they feed on muddy bottoms. If the plane circles for long enough, a Dugong can usually be seen surfacing at the head of each streak.

However, in localities where taller growing species predominate, such as in Shark Bay, Western Australia, Dugongs crop the seagrasses and do not dig up the substrate.

The alimentary canal of the Dugong is well adapted to digest seagrasses. This animal has a simple stomach and most of the digestion of plant fibre is carried out by bacteria in the caecum and large intestine. The quantity of food required by Dugongs under natural conditions is not known. Two captive Dugongs at Mandapam Camp, India, ate 50-60 kg (wet weight) of seagrasses per day. On this basis, assuming an average grazing efficiency of 63% removal of seagrasses along feeding trails, an area of more than three and a half hectares of the sparsely distributed seagrasses in areas such as Cleveland Bay near Townsville would be required to support one Dugong for a year.

The daily movements of Dugongs are largely determined by tides and, to a lesser extent, by weather. On tidal areas they feed on inshore seagrass beds at high tide and move out to offshore beds at low tide. They are only observed moving or feeding along exposed coastal areas in calm weather.

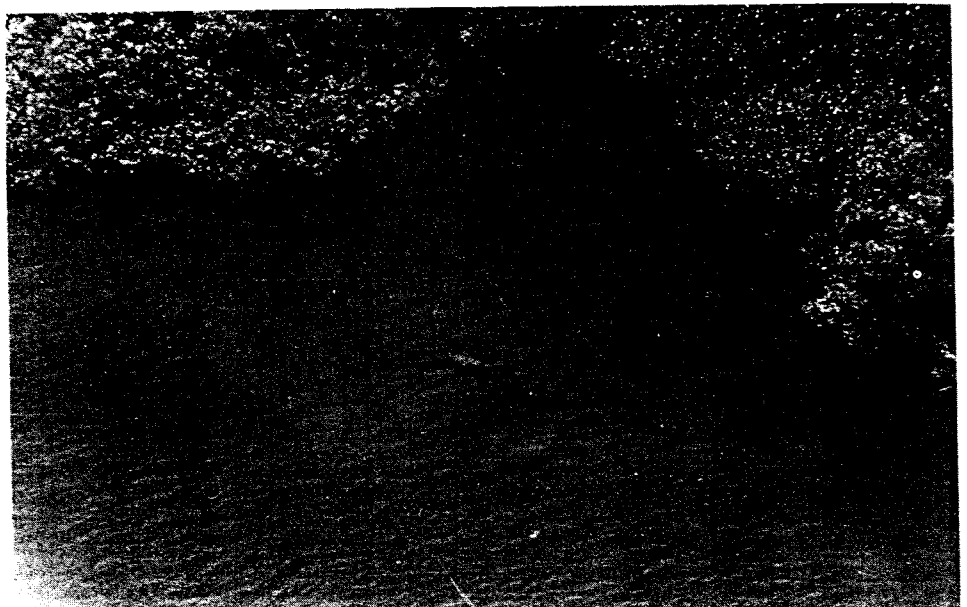
Very little is known about seasonal movements including possible migrations. Results of aerial surveys

in Queensland and Western Australia indicate that Dugongs undergo extensive movements. For example, large differences in numbers have been observed at different times of the year along a 230 kilometre stretch of coast between Townsville and Hinchinbrook Island, indicating that they may be migratory. Aerial surveys of the Wellesley Island Group in the Gulf of Carpentaria, carried out at different times of the year, suggest that Dugongs are both migratory and resident, with some animals remaining in a given area as residents and others migrating to other islands within the group. The annual pattern

of these migrations is, however, well known to the Aboriginal Dugong hunters who live in the area.

If Dugongs do undergo extensive migrations along the Queensland coast, each shallow, protected bay with seagrasses would be a critical habitat of importance to the survival of the species because of the long stretches of coast that are not suitable as feeding grounds. The number and sizes of marine national parks and other reserves that need to be established along the Australian coast to conserve Dugongs will depend on whether the animals undertake long distance or

FIG. 8: A Dugong producing mud streaks while feeding in Hinchinbrook Channel, northern Queensland.





Dugongs are also legally protected in Western Australia and in the Northern Territory. However, Aboriginal and Torres Strait Islanders in Queensland, Western Australia and the Northern Territory are allowed to take Dugongs under prescribed conditions. The rate of Dugong exploitation by Aborigines is possibly declining as traditional hunting methods are gradually abandoned and as the need for Dugongs as a food source declines. This may, however, be offset by increased hunting efficiency through the use of modern equipment such as power boats to find and chase the animals.

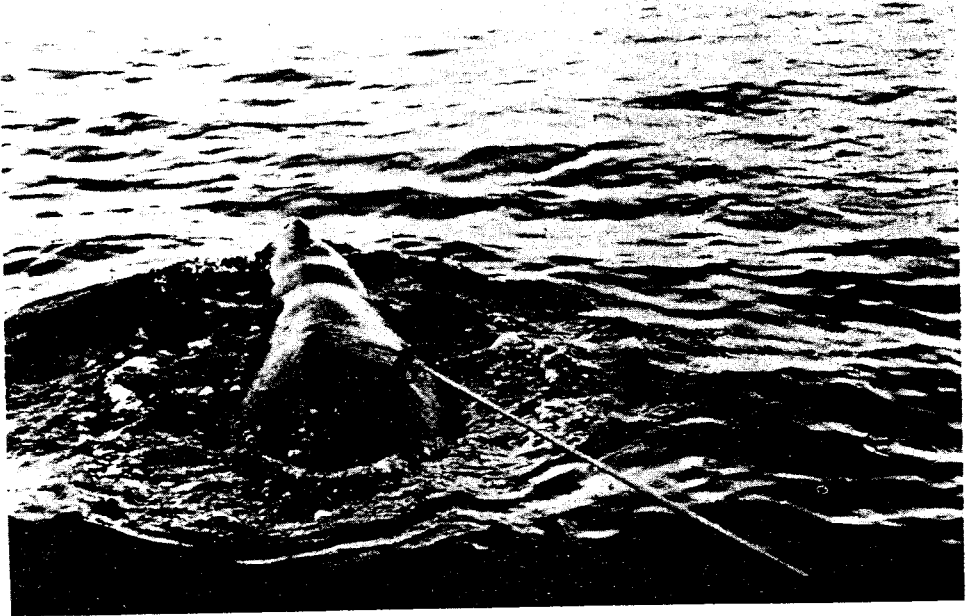


FIG. 11: A Dugong which has been harpooned, in the Wellesley Islands, by Mornington Island Aborigines.

Dugongs are taken illegally in northern Australia, particularly in isolated areas, but the extent of illegal hunting is unknown as poachers are rarely apprehended.

Large nets set off swimming beaches ostensibly to catch sharks for the protection of bathers have been responsible for killing large numbers of Dugongs near Townsville in northern Queensland. Eighty-two Dugongs were killed in this manner in 1964-65, the first year of netting, and over 200 Dugongs have been killed to date. Shark netting has undoubtedly led to serious depletion of Dugong stocks in other areas along the Queensland coast as well. The accidental netting and drowning of Dugongs in commercial fishing nets, in particular gill nets (e.g. for barramundi), has undoubtedly also been responsible for the drop in

numbers. However, the total effects of such commercial netting in northern Australia would be almost impossible to evaluate, although limited information indicates it to be very serious. Reports indicate that net fishing greatly reduced Dugong numbers in Sri Lanka and Kenya as well.

The inshore habitats required by Dugongs, particularly seagrass communities, are particularly vulnerable to Human disturbances. Dredging and other

disturbances of bottom sediments increases material suspended in the water which reduces light penetration and photosynthesis; accelerates sediment deposition, which smothers grass; changes the chemical reactions occurring within sediments; and releases toxins from sediments. Areas of seagrass beds have been destroyed in Moreton Bay (the southern most major habitat of Dugongs in eastern Australia) through the deposition of sediments. In Cleveland Bay near Townsville, another important Dugong area, seagrass beds are reported to have been damaged by increased siltation resulting from harbour dredging. Proposed sand mining on North Stradbroke and Moreton Islands poses an equally serious threat to Dugongs in Moreton Bay. Sand mining for titanium and zirconium is very extensive along the east coast of Australia, but fortunately sand mining on Fraser Island which is adjacent to Great Sandy Strait (an important Dugong habitat) has been stopped by Australian Government action.

Large scale clearing of land for agriculture and overgrazing by livestock have occurred in northern Australia resulting in extensive erosion and the deposition of sediments into offshore areas. Large amounts of sediments resulting from mining are also carried into the sea. Seagrass beds in Hinchinbrook Channel, an important Dugong habitat north of Townsville, may have been adversely affected by dredge spoil from tin mining which is carried by the Herbert River during annual wet seasons.

The direct effects on seagrasses of toxic substances, such as pesticides and other chlorinated hydrocarbons,

FIG. 12: A harpooned Dugong being brought into a dinghy by Mornington Island Aborigines.



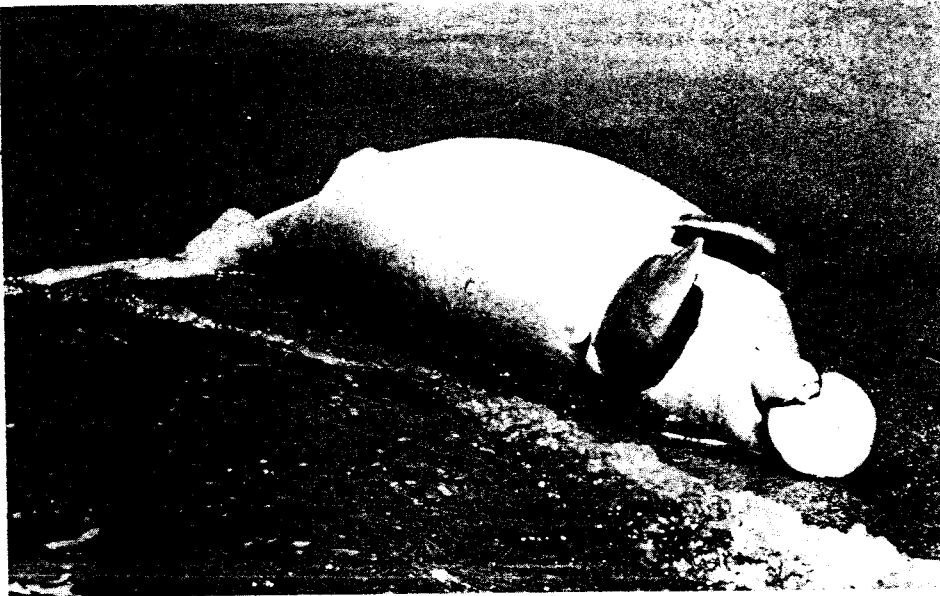


FIG. 13: Ventral view of a mature female Dugong, accidentally drowned in a shark net on Magnetic Island (near Townsville, Queensland).

petroleum derivatives and heavy metals, are generally unknown. Such waste material usually impinges more directly on animals than on plants. As part of a study by James Cook University on the long term effects of heavy metals and pesticides on marine organisms, the concentrations of these substances are being monitored in meat, fat and certain organs from Dugongs caught in shark nets near Townsville and by Aborigines and Torres Strait Islanders near reserves in other areas. Effluent being dumped into the sea from a recently completed nickel refinery could result in heavy metal pollution near Townsville. Two additional threats to Dugong habitats are oil spillage from tankers and drilling, and thermal pollution from electricity generating plants, both of which are known to have caused extensive damage to tropical seagrass beds in other regions. Oil exploration using explosives for seismic work would also be expected to kill or injure Dugongs.

Recreational boating is considered to have a disturbing effect as well. Monthly aerial surveys indicate a possible decrease in the numbers of Dugongs seen in Missionary Bay, a major Dugong habitat north of Townsville, since the opening of a resort in the area, which has resulted in increased pleasure boating activities. Injuries caused by collisions with boats and their propellers are believed to cause at least half the known accidental deaths to manatees in Florida, United States.

The most important aim in Dugong research and management should be to conserve the species over its entire range. In areas where Dugongs are rare

or close to extinction, management should be aimed at increasing population size. In northern Australia where relatively large numbers still occur, Dugongs and their habitats need to be protected from the various threats facing them such as commercial net fishing, shark netting, illegal hunting, disturbance from power boats, pollution, and oil exploration and drilling. Limited traditional exploitation by Aborigines should be allowed with accompanying efforts made by scientists to collect from them, Dugong data and specimen material. We have obtained data and specimen material from Dugongs taken near Aboriginal and Torres Strait Islander settlements on Cape York, Mornington Island and the Torres Strait Islands. Extensive marine national parks or other types of reserves, where net fishing is prohibited, should be established to fully conserve Dugongs and other marine life and their habitats. However, because of the long time required to reach reproductive maturity and because of its very low birth rate, managed sustained exploitation of rebuilt populations of Dugongs would, potentially, be of limited value in terms of meat production for Humans.

A large amount of research and an active and effective conservation programme is required to save the Dugong. Uncontrolled deliberate and accidental exploitation (e.g. fish netting) has seriously depleted populations throughout most of its wide range. Local extinctions have occurred and are probably still occurring in coastal and island waters of Africa and Asia and in some western Pacific Island regions. The largest known populations of Dugongs in the

world occur in northern Australia, and even these are under threat. The most effective means of conserving Dugongs would be to establish a series of marine reserves (marine national parks, sanctuaries and management areas) in areas which are known to support large numbers of Dugongs. Such reserves need to protect the full range of required habitats, including feeding, calving and resting areas and be large enough to supply all the food and spatial requirements. Net fishing has to be prohibited in Dugong reserves.

Dugongs are important to indigenous subsistence hunters, including Australian Aborigines and Torres Strait Islanders, as a source of high quality meat and other products and for their ceremonial, religious and cultural values. For the majority of peoples, Dugongs are of educational, scientific and tourist value. If not hunted or harassed, Dugongs show curiosity toward and will approach swimmers and divers. They are active and gentle animals and beautiful to observe in the sea.

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- THORNEBACK, J. & JENKINS, M., 1982. "The IUCN mammal red data book. Part 1". IUCN. Gland: Switzerland. FIG. 8: A Dugong producing mud streaks while feeding in Hinchinbrook Channel, northern Queensland.