



First underwater sighting and preliminary behavioural observations of Dugongs (*Dugong dugon*) in the wild from Indian waters, Andaman Islands

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Abstract: Sighting of Dugongs in Indian waters have become increasingly rare due to their declining numbers. Further, there have been no reports on underwater observations on dugongs in the wild from these waters. During our surveys in the Andaman and Nicobar Islands, we sighted three independent immature sized dugongs. These individuals were sighted at Havelock and Neil Island and Kodiaghat in South Andaman Island. In this paper, we report dugong sightings, present preliminary behavioural observations and emphasise the need to initiate community based conservation along with monitoring of their habitats.

Keywords: Andaman islands, behaviour, Dugongs in Indian waters, sighting

INTRODUCTION

Dugongs (*Dugong dugon*) are large marine mammalian grazers of the tropical Indo-west-Pacific region where they feed primarily on near-shore sea grasses (Johnstone & Hudson 1981; Marsh et al. 1982). They are the only extant member of the family Dugongidae in the order Sirenia. Dugongs are bottom feeders and spend little of their time at or near the surface but must surface for 1 to 2 seconds to breathe at regular and frequent intervals (Anderson 1981). They have a large body size (Spain & Heinsohn 1975) and a hindgut fermenting digestive system (Lanyon & Marsh 1995). These features, combined with the relatively low nutrient and energy content of their aquatic plant food, suggest that they must spend a high proportion of their time feeding in order to meet their daily food requirements.

The documented geographical range of the dugong extends over the coastal waters of some 37 countries ranging from east Africa, through south and south-east Asia to Australia. This herbivorous mammal, inhabiting the marine environment was once abundant in many parts of its range but numbers have declined and its area of occupancy has decreased in recent times due to exploitation and loss of habitat (Marsh et al. 2001). It is currently listed in the IUCN Red List of Threatened Species as being vulnerable to extinction throughout its global range (IUCN 2007). It is also listed in Appendix I of the Convention on International Trade in Endangered species of Wild Fauna and Flora (CITES), which prohibits all trades in this species or any products derived from it. In India, dugong has been given the highest level of legal protection and is listed under Schedule I of the Indian Wildlife Protection Act, 1972.

Dugongs have been reported from the Gulf of Kutch, off the Saurashtra coast, the Gulf of Mannar and Palk Bay which are part of the Indian main continent (Lal Mohan 1963; Lal Mohan 1980; Mani 1960; Silas 1961; Frazier & Taej Mundkur 1990; Kumaran 2002). These reports have been based on studies carried out on stranded and incidentally caught dugongs and the only observations on live dugongs from India have been made by Jones (1967a,b) on a pair of dugongs in captivity at Mandapam (Gulf of Mannar). Dugongs have also been reported to be found in the Andaman and Nicobar Islands (Anon 1909; Jones 1980; James 1988; Bhaskar & Rao 1992; Rao 1990). It has been declared as the State Animal of these Islands. The only comprehensive report on dugongs is by Das and Dey (1999) who estimated the presence of around 40 dugongs based on interviews of fishermen and regular divers that had encountered or sighted dugongs from the Andaman and Nicobar Islands.

To derive appropriate conservation strategies of any endangered wild animal, an understanding of its behaviour in the wild is important (Buchholz 2007; Caro 1999). Dugong sightings around the Andaman and Nicobar islands are rare due to their low numbers (Das 1999) and also because it is difficult to sight and make behavioral observations on aquatic animals that generally live in turbid water and only come to the

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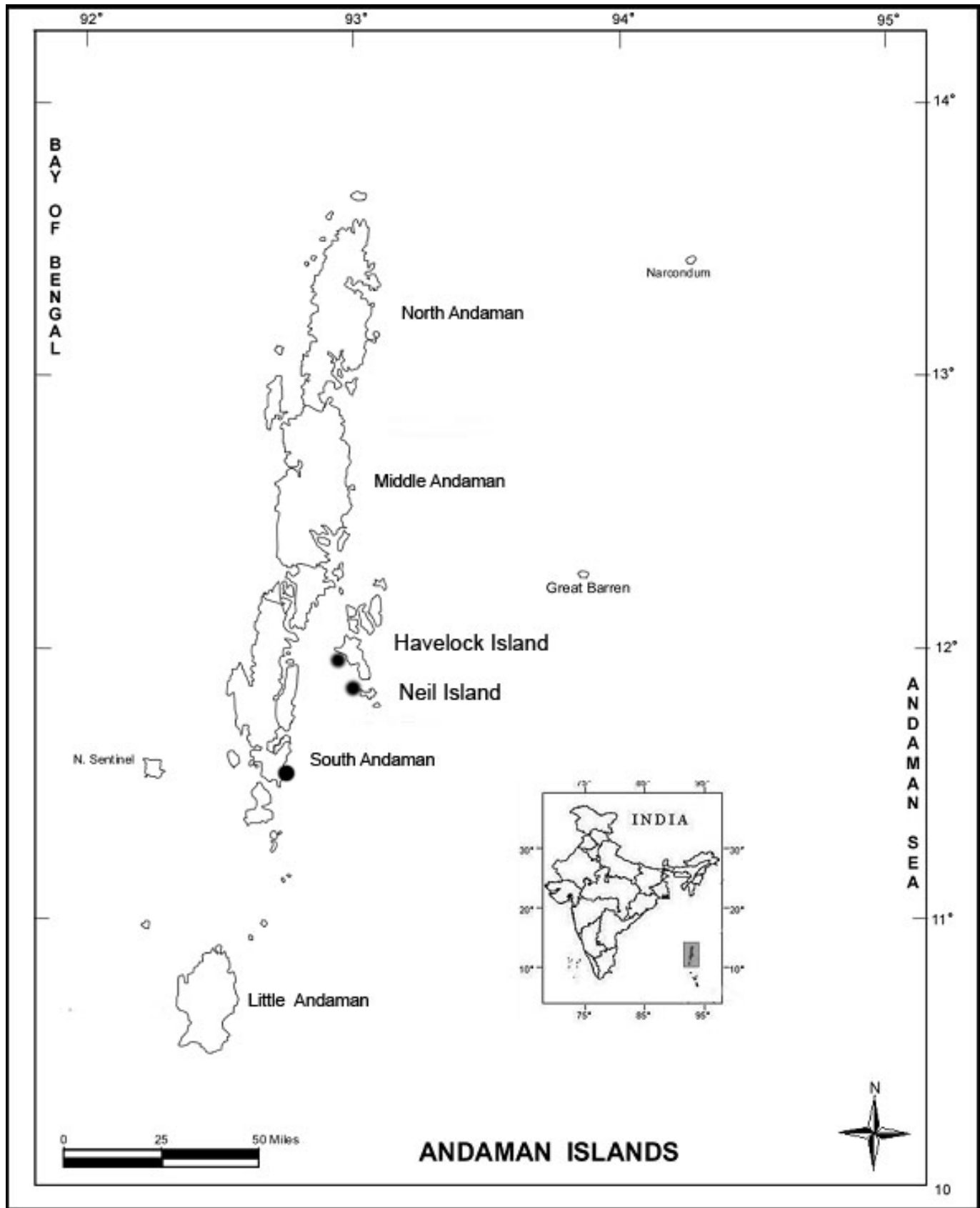


Figure 1. Locations of Dugong sightings

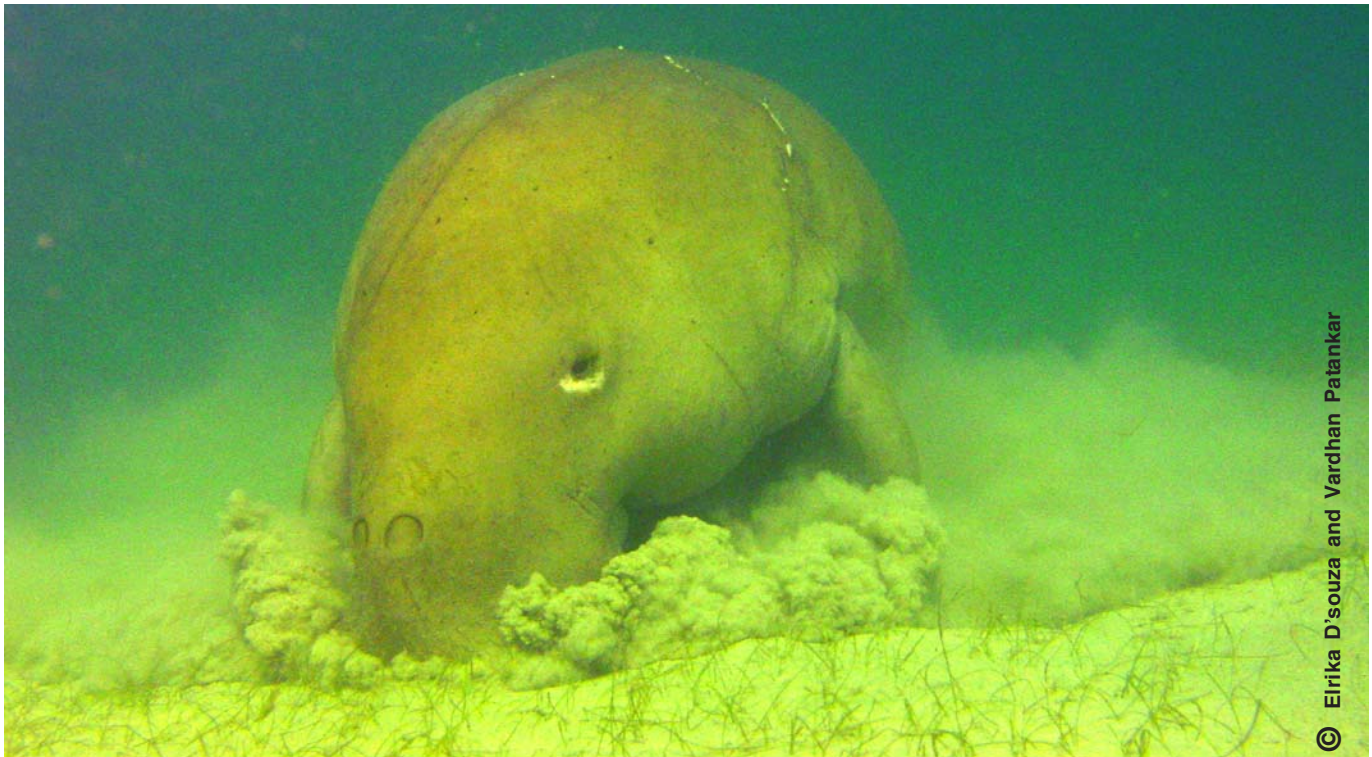


Image 1. Dugong feeding on seagrass

surface briefly to breathe (Chilvers et al. 2004). To date, there have been no reports on dugong behaviour in the wild from Indian waters and studies on dugong diving and feeding behaviours carried out in Australia have been based on visual observations from boats or shoreline vantage points (Anderson & Birtles 1978; Reynolds 1981; Anderson 1982, 1998; Marsh & Rathbun 1990; Whiting 2002) and through satellite tagging (Chilvers et al. 2004). It is expected that the behaviour may vary, given the climatic, environmental and geographical differences. In this context, here we report the first underwater sightings and preliminary behavioural observations of dugongs in the wild from Indian waters, Andaman Islands.

MATERIALS AND METHODS

The Andaman and Nicobar Islands are one of the biodiversity hotspots in the world (Myers et al. 2000), which are located in the south-eastern part of the Bay of Bengal, between 06°45'-13°41'N & 92°12'-93°57'E. The Andaman group consists of 4 large islands, North, Middle, Baratang and South Andaman Islands forming a super island of over 5,000 km² in area, surrounded by archipelagoes and isolated islands (Davidar, 1994). The Nicobar group of islands is separated from the Andaman group by the 10 degree channel. This group comprise of about 23 islands.

The study was carried out between February 2007 and March 2008. Surveys were carried out around Interview, North Reef, Neil, Havelock, Chidiatapu, Burmanalla, Kodiaghath, Kamorta, Nancowry and Trinket. These areas were selected based on earlier documented records of seagrass beds, dugong occurrence and informal discussions with local authorities and islanders. Survey sites were accessed in local dinghies or from the shore by snorkeling and SCUBA diving. Information on the extent of seagrass beds and species composition was

gathered. GPS coordinates of sites that showed dugong feeding trails were recorded and these sites were monitored for the possibility of sighting dugongs. Upon sighting of the animal, underwater observations were made by maintaining a 2m distance from the individual. The sighted individual's size, sex, scars and body parts were observed and photo-documented. The period of time the animal spent at the surface (surface time) and the time spent submerged between successive surfacing (submergence time) were recorded. The behaviour was classified into five categories, *feeding* (movement of muzzles over seagrass resulting in ingestion of food), *idling* (seemingly undirected activity on a small area) (Anderson 1981), *resting* (stillness with absence of any kind of movement), *communicating* (emission of sounds in the form of squeaks and barks) and observer directed behaviour.

RESULTS

Three independent immature sized dugongs were sighted. The first dugong was sighted on the south eastern side of Havelock Island (11°56'-11°59'N & 92°56'-92°59'E) and behavioural observations were made for 47h. The individual was approximately 2m long, with distinct scars on its body; an X-mark on its head, a line running back from the right pectoral, roughly circular marks above the left pectoral and on the underside of the base of the tail and 2 notches on the tail. It was observed feeding on seagrass (*Halodule* sp. and *Halophila* sp.) at an average depth of 6 m and at a maximum distance of 100m from the shore. It spent a mean period of 9.4 ± 0.7 h, $n=15$ a day feeding in an area of 0.1km². The density of seagrass was sparse and the lengths of the shoots were less than 100mm. When feeding on these low growing sea grasses, the dugong dug into the bottom with its muzzles, extracting and consuming leaves, stems and interconnecting rhizomes. In this



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Image 2. Dugong idling

process, it reworked the upper 20-30mm of substrate raising clouds of fine sediment and leaving behind distinct long, serpentine feeding trails (Image 1). It surfaced at mean intervals of 231.8 ± 13.5 s, $n=22$ (submergence time) to breathe at an angle of 45° exhaling once it reached the surface. The breathing pattern comprised of 2 short breaths at mean intervals of 31.1 ± 6.0 s, $n=22$ followed by a longer third breath. The mean total surface time was 59.2 ± 6.0 s, $n=22$. This was followed by an arching of the body and a forward roll which raised the mid-dorsal region and then the tail above the surface giving a downward thrust. The descent was generally at a steeper angle and on reaching the bottom; the dugong supported itself on its pectorals without the body actually touching the sea bed. The pectorals were also used for locomotion on the bottom.

The second dugong was sighted around Neil Island ($11^\circ49' - 11^\circ50'N$ & $93^\circ00' - 93^\circ02'E$) and behavioural observations were made for 54h. It was approximately 2.5m long, had a distinct crescent scar on the left side above the pectoral, a notch on the inner side of the left and right pectoral and the left side of the tail and a scar running along the lower half of the trunk. It was observed feeding on *Halodule* sp. and *Halophila* sp. at an average depth of 9m, and at a maximum distance of 100m from the shore during the neap tide. While feeding, it surfaced at mean intervals of 268.4 ± 14.6 s, $n=41$ and spent a mean period of 2.9 ± 0.8 h, $n=36$ a day feeding. During the spring tide it was observed idling and resting at this site (Image 2). While idling, it swam at an average depth of 3m and up-to a distance of 300m from the shore. It moved with the help of its tail and surfaced at mean intervals of 326.1 ± 11.8 s, $n=29$ and spent a mean period of 4.1 ± 0.8 h, $n=14$ a day idling. While resting, it remained close to the surface without any movement

and closed its eyes. It was observed resting for a mean period of 1.2 ± 0.3 h, $n=4$. While *idling* and *resting*, it just submerged while moving forward without arching and rolling. It was observed *communicating* in the form of long squeaks. Both the dugongs sometimes had 1-2 remoras attached posteriorly and ventrally to their bodies and were always preceded by juvenile pilot fish. The third dugong was sighted at Kodiaghat ($11^\circ31'49.25''N$ & $92^\circ43'36.68''E$) in south Andaman and was observed for a brief period of 590 s at a depth of 7m. It was approximately 3m long and it showed observer directed behaviour. It curiously approached us and stopped at a distance of 2m from us. It then circled us twice surfacing to breathe between each circling. It followed the similar breathing pattern of two short breaths and a third long breath. All three individuals were identified as males and confirmation of the sex was done by an observation of the genital parts.

Discussion

The only observations on Dugong behaviour in India have been made by Jones (1967a). These Dugongs were in captivity at the Mandapam camp in a tank where the water was barely 1m deep and therefore freedom of movement was restricted. They could only make horizontal movements and were unable to assume a vertical position. Also, they had become so tame that they had started accepting food from the hands of the feeder (Jones 1967a). Therefore, our observations differ from that of Jones as the observations on the Dugongs were made in their natural habitat and not within a controlled environment. These observations made on dugongs from Indian waters were found to be similar to those made in Australian waters i.e. Dugongs were found to spend a mean time of 4.2 min ± 1 s at mean depths of 7.2 ± 0.1 m (Chilvers et al. 2004). However,

since these observations were limited to 3 individuals, generalisations and conclusive inferences can only be made after studies are extended to a larger population.

Dugongs are very individualistic in their behaviour and movements (Marsh & Rathbun 1990; Marsh et al. 2002) and hence understanding the behaviour of individuals and herds in relation to daily cycles, tidal state, environmental variables can be taken into consideration for the conservation and management of the species in its local area of occupancy. Another significant observation was that the individuals exhibited a non-aggressive and exploratory behaviour which could render them vulnerable to hunting. Therefore we recommend local community-based conservation initiative programmes along with regular monitoring of Dugong habitats. Low-cost studies such as this can reveal important information on the unexplored aspects of the behavioural patterns of the dugong that would be important for formulating conservation strategies in developing countries like India where Dugong populations are relatively small.

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