Aust. J. Wildl. Res., 1976, **3**, 117–21

Extreme Risk of Mortality to Dugongs (Mammalia: Sirenia) from Netting Operations

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Abstract

Successful and unsuccessful attempts at catching dugongs for research are described, including the capture of seven animals in one night near Townsville, Qld. Aspects of handling captured animals from a small boat and the effects of net fishing on dugongs are discussed.

Introduction

Studies of the dugong, *Dugong dugon* (Müller), have been pursued at Townsville in north Queensland, over the past few years. These were initially based mainly on animals drowned in nets set, ostensibly, for the protection of bathers (Heinsohn 1972; Heinsohn and Spain 1974). Studies of food eaten (Heinsohn and Birch 1972; Spain and Heinsohn 1973), cranial (Spain and Heinsohn 1974; Spain *et al.* 1976) and 'soft body' size and weight allometry (Spain and Heinsohn 1975) have been conducted. Also, some preliminary studies on the histology of the gut (Kenchington 1972) are currently being extended. Bertram and Bertram (1973) published some comments on presumed population levels in north Queensland waters. More recently, as part of a developing program on the ecology of this species, successful aerial surveys have been made along the coast to the north of Townsville (Heinsohn *et al.* 1976).

However, the quality of soft tissues and alimentary tract contents available from specimens obtained some time after death precludes critical study. Accordingly, it was decided to catch a dugong and sacrifice it in order to obtain fresh blood and a wide range of tissues for histological, histochemical and biochemical work. In particular, it was desired to obtain a good series of tissue samples from the alimentary tract.

Secondary aims of this work were to ascertain whether netting is a feasible method of catching these animals alive for other studies, such as tagging programmes. Further, it was hoped to demonstrate the practicability of handling an animal thus caught from a small boat and of releasing it after tagging.

Equipment and Methods

The boat used during this work was an open 'Clark' aluminium vessel 4·27 m long and 1·83 m wide at its broadest, with a 4·48-kW outboard motor.

The net was constructed of a braided nylon material (8 mm circumference) and was similar to those used by the Queensland Department of Harbours and Marine in its shark netting program. It was 183 m long, 3·05 m high, and constructed in three

equal-sized panels; mesh size was 46 cm. The net was hung from a 38-mm circumference polyethylene rope with cork floats and lead weights, anchored at each end with 5·9-kg plough-type anchors. The lead weights used were somewhat lighter than normal to allow any dugong caught to surface more readily for breathing.

Table 1. Sequence of events associated with capture and dissection of dugong in Young Bay
Information on tides from Anon. (1974)

Date	Time	Event
21.ii.75	1765	High tide, 2·2 m above datum
	2100	Net set at initial location (depth 1 m)
	2300	Net checked, empty with only 0·15–0·3 m water depth
22.ii.75	0022	Low tide, 0·6 m above datum
	0600	Net checked, three shovel-nosed rays (two male *Rhinobatus armatus* and one female *Rhynchobatus djiddensis*) and one coachwhip ray, *Himatura* sp., released
	0646	High tide, 3·2 m above datum
	1100	Net checked, empty
	1200	Net relocated in deeper water (2·7–3·0 m)[A]
	1316	Low tide, 0·9 m above datum
	1500	Net checked, one female eagle ray, *Myliobatus australis*, removed
	1830	Net checked, one shovel-nosed ray, *R. armatus*, tagged and released
	1833	High tide, 2·5 m above datum
	2230	Net checked, one male dugong found drowned, one female alive in net
	2242	Female died during removal from net, secured alongside boat and towed to West Pt
	2300	Regained West Pt with female; dissection started almost immediately
	2315	Two people returned to net, released one large dugong, returned to West Pt for assistance with two other dugongs caught in net
23.ii.75	0020	Three people returned to net, released two female dugongs and two of unknown sex. Dissection of female complete

[A] As originally set, the net was too close to shore and potentially effective for approximately half the tidal range only. The depth of water at the new site was approximately 2·85 m at 1·25 h before low tide.

Attempts using Traditional Methods

Two attempts were made to harpoon dugongs from the boat, using the traditional method of drifting quietly downwind onto a feeding animal. The first was made in Upstart Bay, 113 km south of Townsville on 16 March 1974. Conditions were difficult, with high winds, and although dugongs were observed the attempt to harpoon one failed. On the second occasion, in Rockingham Bay, 169 km north of Townsville, on 16 June 1974, one dugong was observed but it was not possible to approach it closely enough.

Netting

The lack of success at harpooning influenced the decision to attempt netting. This appeared to be the most desirable way of catching a dugong, since the animal could, potentially, be obtained in a relatively undamaged condition.

The site chosen for the net was off Young Bay, close to West Point on the sheltered inshore (western) side of Magnetic I. (Heinsohn and Spain 1974). There were several reasons for choosing this location. Dugongs had been observed here on several

previous occasions both from small boats and from the air (Heinsohn *et al.* 1976), and on the morning of the day of setting the net, one of us (G.E.H.) had seen a dugong from the air hereabouts. Sea grasses commonly eaten by dugongs (Heinsohn and Birch 1972) are also prevalent in the area. Those most common at the netting site were *Halodule uninervis*, *Halophila ovalis* and *H. ovata*, and the following species were sparsely distributed in the area: *Halophila spinulosa*, *Cymodocea serrulata*, *Zostera capricorni* and *Thalassia hemprichii*.

Fig. 1. Female dugong being dissected on the beach at West Point approximately 30 min after death

A group was organized to set the net from 21 to 23 February 1975. The main camp was established on the foreshore near West Point, since any captured dugong was to be brought back to this location for dissection rather than transport fixatives, illumination sources, etc. The principal events of the period are presented in sequence in Table 1.

Behaviour and Handling of Netted Dugongs

The behaviour with respect to the net of the animals caught is of some interest. It appears that all were initially entrapped by meshes around the head, especially around the muzzle and under the submental sulcus. Soon after this, the animal was caught by one or both flippers, apparently as a result of its tendency to twist around, which frequently results also in the entanglement of the tail fluke. This twisting is

apparently common in attempts to escape from nets, since a number of dugongs have been found in local shark nets with several layers of net wrapped around them. This was also noted during the present study. This twisting is possibly an innate reflex, perhaps developed to avoid entanglement in algae. Such behaviour certainly renders these animals particularly susceptible to drowning in nets.

The first animal caught was dead when first seen on 22 February, and its dissection delayed until the following morning. The female dissected that night was alive at 2230 h; however, despite regular surfacing and breathing while being untangled, she rapidly weakened and died at 2242 h. The head had been held out of water the for several minutes before death and the animal secured by ropes tied around the base of the tail fluke and round the thorax at the level of the axillae. She was towed to the main camp area at West Point for dissection immediately after death (Fig. 1). The other five animals caught in the net were released by cutting the meshes where they could not be removed by hand.

Discussion and Conclusions

It has been decided that in the future the net should be monitored continuously from a boat anchored nearby since, contrary to our earlier beliefs, dugongs may drown quite rapidly after entanglement. Kenny (1967) records a maximum underwater time from a captive dugong of 8 min 26 sec. Aluminium boats are probably not suitable for this, since small waves slapping against the sides and people moving in the boat generate considerable noise which would frighten dugongs and reduce the chance of capture. A wooden or fibreglass vessel would probably be more satisfactory.

The death of the second dugong emphasizes one of the main problems associated with handling: how to maintain a large, potentially struggling animal on the surface and yet secure it against escape. In the future, we intend to place a two-man life raft under the netted animal and inflate it by means of a compressed air bottle. However, the problem of securing the animal still remains. This may be achieved by tying a rope round the base of the tail fluke, and securing the anterior part of the body with a heavy mesh net, allowing the flippers to protrude.

Experience over the past few years and, particularly, the events described above demonstrate the vulnerability of dugongs to set nets of all types. It is not uncommon for commercial fishermen to catch dugongs in their nets. We know of five accidental captures in gill nets set by two commercial fishermen in the Townsville area between May 1974 and March 1975. Three dugongs drowned before being removed from the net and two were successfully released. Many gill netters in Queensland work alone. Under such conditions, often at night, it is considered dangerous to try to remove a live, actively struggling dugong from a net. Often a fisherman with a netted dugong allows the animal to weaken or drown before attemping removal. In addition, the results of a recent mail questionnaire on the status of dugongs in Queensland indicate that dugongs are occasionally netted, and that netting is not infrequent along the more populated stretches of the coast (P. K. Anderson, personal communication). However, the numbers killed in this way are not known. Some fishermen consider that nets of monofilament construction are more likely to catch dugongs than multifilament nets. This has shown to be so with gill netting of fish such as salmon (Washington 1973). It is known that some dugongs are deliberately (and illegally) netted for food in Australian waters.

Commercial net fishing is recognized as a major threat to dugongs by other workers. Bertram and Bertram (1973) state that the main cause for the scarcity of dugongs in waters around Sri Lanka results from the big net fisheries in that region. In waters off Kenya, the extensive use of shark tangle nets has apparently greatly reduced the numbers of dugongs (P. Saw, personal communication).

More important for the dugong populations of Queensland waters are the numbers caught in shark nets set for bather protection, for most of the year, in specified locations in shallow coastal waters. However, it is yet to be demonstrated that these nets have any appreciable effect in protecting swimmers. With increasing urban and tourist development along the Queensland coast, the demand for them will undoubtedly increase. It appears that properly constructed swimming enclosures would protect bathers from sharks to a greater extent, without the destructive aspects of the shark netting.

Acknowledgments

We acknowledge the assistance of the following people who helped in capturing and processing the specimens or through provision of information: A. Birtles, D. Blair, E. Devereux, M. Devereux, A. Murray, M. Murray, P. Saw, C. Spain, E. Teleni, J. Wake, L. Winsor. We thank the Queensland Department of Primary Industries for permission to catch the dugong, and the Queensland Department of Harbours and Marine for a netting permit. The Australian Research Grants Commission funded the operation.

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Manuscript received 19 February 1976