

Short Communication

Using community knowledge in data-deficient regions: conserving the Vulnerable dugong *Dugong dugon* in the Sulu Sea, Malaysia

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Abstract Community knowledge of the status, threats and conservation issues affecting the dugong *Dugong dugon* was investigated in the Sulu Sea, Malaysia. Interviews with local fishermen were conducted in 12 villages from the tip of Tanjung Inaruntung to Jambongan Island, in northern Sabah, Malaysia. According to the respondents dugong numbers are low and sightings are rare. Dugongs have been sighted around Jambongan, Tigabu, Mandidarah and Malawali Islands. The apparent decline of the dugong in this area is possibly because of incidental entanglement in nets, and opportunistic hunting. Seagrasses are present and have economic importance to the community. The fishermen have difficulty in understanding issues of conservation in relation to dugongs. I recommend that conservation initiatives begin with dialogue and an education programme, followed by incentives for development of alternative livelihoods. Using community knowledge for conservation purposes may be the only option in data-deficient regions, especially where financial constraints are high and the need for management intervention for threatened species is urgent.

Keywords Community knowledge, coral Triangle, dugong, *Dugong dugon*, Malaysia, Sulu Sea

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Many developing nations are rich in biodiversity but there is often a lack of financial resources and technical capacity for appropriate management (Ban et al., 2009). Knowledge from local communities is sometimes used to inform marine conservation and management (Wilson et al., 2006; Gerhardinger et al., 2009). This may be the knowledge most readily available, especially when there is urgent need to conserve threatened species. In this study I used community knowledge to inform the conservation of

the dugong *Dugong dugon*, a rare species of marine mammal that is categorized as Vulnerable on the IUCN Red List (Marsh, 2008). In Malaysia the dugong is protected by the Wildlife Conservation Enactment 1997 (Sabah) and Fisheries Act 1985, which includes the Federal Territories and the Exclusive Economic Zone.

There has been limited research on this mammal on the Malaysian side of the Sulu Sea, which is also part of the biodiverse Coral Triangle. Dugongs have been sighted at Banggi, Balambangan and Jambongan Islands, and Sandakan (Dolar et al., 1997; Jaaman & Lah-Anyi, 2003; Rajamani & Marsh, 2010). There have been incidences of dugongs harvested in Tambisan, in Sandakan district, and sold in the Sandakan market (Dolar et al., 1997). It is generally believed that dugong numbers are low in East Malaysia (Jaaman & Lah-Anyi, 2003; Rajamani & Marsh, 2010).

The study area was from Tanjung Inaruntung to the south of Jambongan Island, in northern Sabah, Malaysia, in the Sulu Sea (Fig. 1). I undertook this research during the Prime Marine Scientific Expedition in June 2009 as part of Malaysia's commitment to the Coral Triangle Initiative. To obtain information on dugongs and seagrasses I carried out a total of 25 semi-structured, informal individual and group interviews (Supplementary Material 1) with a total of 40 local fishermen from 12 villages (Berg, 1989; Aragonés et al., 1997).

All the respondents had observed dugongs but claimed they have become increasingly harder to see. In 2008 (the year prior to the survey), fishermen in only four of the 25 interviews had observed the species. Dugongs had been observed at Jambongan Island (seen by eight interview groups), Tigabu Island (four), Mandidarah Island (two), Malawali Island (two), Kampung Kanibongan (two) and Paitan Bay (two). Observations were mostly of single animals (21). One stranding was reported at Kampung Semangat and another at Kampung Kanibongan (Fig. 1).

Twenty-one of the interview groups reported that they now see fewer dugongs compared to the 1980s and 1990s. Based on the respondents' answers the main threats appear to be incidental entanglement in nets and hunting for trade and traditional uses. Fishermen in 17 of the interviews claimed that a large shark could be accommodated in their nets (this question was asked to indirectly introduce the

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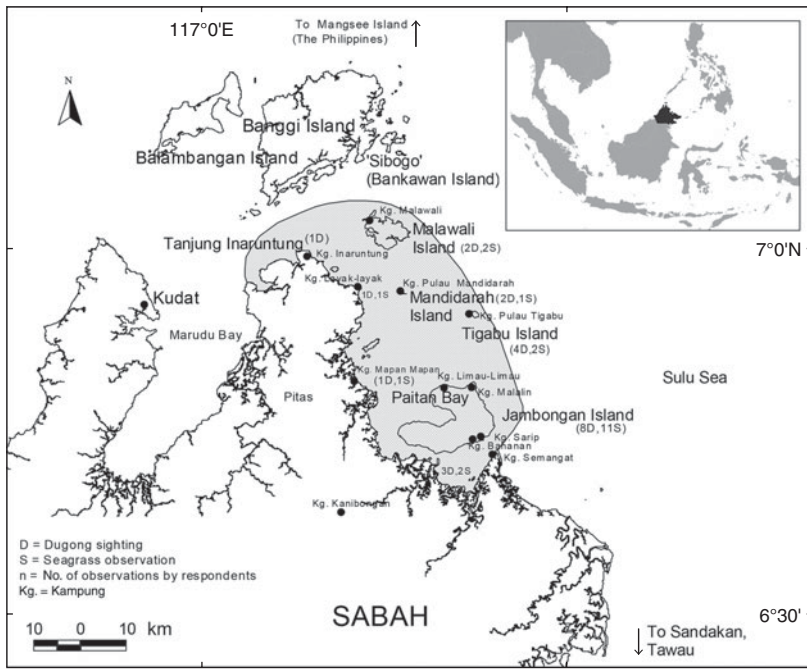


FIG. 1 The study area (shaded grey) from Tanjung Inaruntung south to Jambongan Island, in northern Sabah (in grey). The area shaded black on the inset indicates the location of the state of Sabah, Malaysia, in south-east Asia.

subject of incidental catch of dugongs, as respondents may be reluctant to talk about the subject). This may imply that marine mammals and turtles could also be caught in the nets. Six interview groups indicated that incidental entanglement of dugongs occurs. Opportunistic hunting, along with blast fishing, pollution and unavailability of feeding habitat, were suggested by respondents as potential causes for the decline of the dugong (Fig. 2). There appears to be some trade from Kampung Inaruntung to 'Sibogo' (Bankawan Island). Kampung Semangat and Mangsee Island in the Philippines were mentioned as places where dugong meat can be purchased. An elderly person at Kampung Tigabu produced one tusk that he claimed was collected on Tigabu Island from a dead, stranded dugong.

The dugong is mostly consumed for meat (12 of the interviews) and medicine (14). Tusk shavings are boiled and the mixture is used in the treatment of asthma and back pain. Dugong blubber, when eaten, is said to strengthen and cool the body. Sometimes the dugong tears are collected and used for love charms (three interviews) and perfumes (one).

Some of the respondents had a historical connection to the dugong through a myth (seven interviews). One popular story tells of a pregnant woman who began to eat seagrass and slowly turned into a dugong and disappeared into the sea. Another story from Mandidarah Island tells that there was a poor man who married a wealthy woman; he did not want to acknowledge his poor background and his parents cursed him, and he was banished to sea as a dugong.

Thirteen of the interview groups expressed kinship with the dugong and that they would be sad if the species went extinct. However, seven groups did not appear concerned about potential extinction. Two groups did not understand

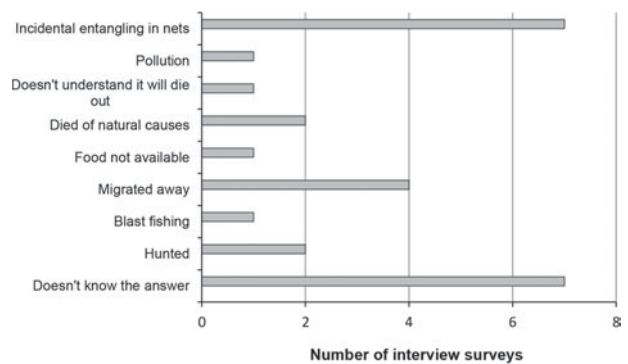


FIG. 2 Perceptions about why the dugong *Dugong dugon* is becoming extinct, as determined from interviews with 25 groups of local fishermen (see text for details), from Tanjung Inaruntung to the south of Jambongan Island, northern Sabah (Fig. 1).

the concept of extinction and two did not understand how dugongs could become extinct. However, 18 interview groups indicated that they knew the reasons for dugongs becoming extinct. When asked if the dugongs would return after a long absence eight groups believed that dugongs would not return, seven that they would return, and 10 were unsure.

Seagrasses had been observed by 23 of the respondent groups. The most common seagrass species observed were *Halophila* (13 groups), followed by *Enhalus acoroides* (seven), *Halodule* (four), *Cymodocea* (four) and *Thalassia* (two). Seagrasses were reported around Jambongan Island, near Kampung Kanibongan, Tigabu Island and Malawali Island. Twenty-two interview groups reported that seagrasses are mostly observed in water < 3 m deep.

Approximately half of the interviews indicated there had been no change in seagrass abundance in the previous 10–20 years. Eight interview groups appeared to understand the importance of having seagrasses to protect aquaculture and fisheries activities. Thirteen of the groups would feel a loss if seagrasses disappeared but seven were not concerned about potential extinction of seagrasses.

Dugong numbers in the Sulu Sea appear to be low and the species rare. Most observations were of single animals, consistent with results from interview and aerial surveys in Kudat, Banggi Island, Jambongan Island, Sandakan, east Sabah, and Tawau, south Sabah (Jaaman & Lah-Anyi, 2003; Rajamani & Marsh, 2010). However, seagrasses appear to be present in the Sulu Sea. The areas where seagrasses and dugongs were observed are coincident; the most important areas were Jambongan, Tigabu, Malawali and Mandidarah Islands. This indicates that the information provided in the interviews was valid, as dugongs are usually found in areas with seagrasses (Husar, 1978).

Although the dugong does not appear to play an important role in the respondents' lives, it seems to have some historical and cultural significance. The respondents appear to have local knowledge of the dugong, and of the types and locations of seagrasses. They also understand the importance of seagrasses to their livelihoods, especially to sea cucumber aquaculture and fisheries.

The scarcity of recent sightings of dugongs could be because of a higher incidence of entanglement in nets, and blast fishing, rather than because of habitat loss, as seagrasses remain abundant. In addition to the trade reported in islands close to and in the Philippines, trade has been reported from Banggi Island to Sibogo, for sale, with prices of up to USD 105 per dugong (Rajamani et al., 2006). Both Malaysia and the Philippines are contracting parties to CITES, and there is a need to monitor this illegal trade as the dugong is listed in CITES Appendix I, which allows trade only in exceptional circumstances. The reported indigenous uses, such as of the tusk for medicinal purposes and the tears for love potions, are similar to those described by other researchers in Sabah (Jaaman & Lah-Anyi, 2003; Rajamani et al., 2006).

Although the dugong is protected locally and internationally, the implementation of conservation specifically for the dugong has been limited. The fisher community in this region of the Sulu Sea appears to be well informed about the causes of the dugong's decline but concepts of conservation and extinction appear to be poorly understood. I therefore make three recommendations: (1) Government and non government organizations could initiate dialogue and conservation education with the community, and posters about dugongs, seagrasses, fisheries, incidental entangling in nets, blast fishing and species extinction could be of value. A starting point for dialogue could be discussion of myths about dugongs. (2) Community knowledge could be

incorporated into conservation initiatives, and expert local knowledge could be used to determine the approximate distribution of the dugong and seagrasses. (3) Introduction of alternative livelihoods could reduce the impact of destructive fishing, such as blast fishing, prevalent in many parts of the Coral Triangle (Alcala & Gomez, 1987; Fox et al., 2003; Ismail, 2008). Seaweed farming, previously introduced in areas close to the current study area, has been only partially successful (Majid Cooke, 2004). Before implementing any alternative livelihood programmes detailed studies are therefore required to determine which potential alternative livelihoods could suit these communities.

Scientific studies of the status of the dugong and of seagrasses are important but require significant financial support. When funding is limited, investigating community knowledge through interview surveys may be the only option in data-deficient regions of developing countries. The key findings of this study are that dugong numbers are low, and declining, apparently because of anthropogenic threats. The community knowledge obtained was helpful in understanding the issues involved and will be used as a basis for addressing the conservation needs of the dugong. This information will be provided to the relevant governmental and non-governmental authorities, for incorporation into relevant management and policy.

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Biographical sketch

LEELA RAJAMANI is interested in interdisciplinary and transdisciplinary studies in marine biology, ecology, anthropology and sociology. She studies conservation problems in relation to community involvement in conservation, marine protected area management and policy, and uses local knowledge for the management of marine resources, integrating it with scientific knowledge.