



Fisheries bycatch mortality reconfirm foraging olive ridley (*Lepidochelys olivacea*) in Northern Oman Sea in Sistan and Baluchestan province, Iran

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Abstract

The coastal areas of the Northern part of Oman sea area have been recorded as foraging grounds for Marine turtle species, mainly Green sea turtles (*Chelonia mydas*). These populations receive mortality caused by fisheries activities. Monitoring the coals of the area, in Sistan and Baluchestan province, we could record of 5 Olive Ridley turtles (*Lepidochelys olivacea*) from the area, four dead and 1 alive entangled in the net. None of the specimens were adult, according to the size, indicating the utilization of the existing habitats by the species in early and sub-adult stages of life. More research and monitoring works give more observations and records on the species which are supposed to be rare both in the Oman Sea and the Persian Gulf. Genetic works could help us to find the origin of the Olive ridley turtles in the area. Conservation measures, mainly local fishermen education are necessary to control mortality caused by fisheries activities.

Keywords: Conservation, fisheries bycatch, foraging area, marine turtles, olive ridley, Oman Sea

Introduction



As the only remnants of the formerly diverse and widespread Family Cheloniidae, the few modern marine turtle species play important ecological, economic, and cultural roles in our oceans and related human communities (Eckert et al. 1999). Although these species spend the majority of their life in the marine ecosystems, our knowledge and understanding about their marine life are incomparable to what we know about their minor terrestrial life, when reproductive females come to the nesting beaches and hatchlings return to the sea. (Eckert et al. 1999; Bowen and Karl 2007). Marine turtles are key species in their ecosystems and their existence helps sustain marine biodiversity (WWF 2003).

This successful group, passing through a series of natural disasters and changes during millions of years, has been faced with a series of serious human-induced activities depleting and destroying their historical populations. Destruction and loss of nesting and foraging grounds, overexploitation of turtles, especially nesting females in the nesting grounds, various kinds of pollutions, fisheries bycatch, over-harvesting of the eggs, and global threats like climate change have put all the species into different categories of IUCN Red List of threatened species. This situation would indeed need more research works to increase our knowledge, based on which could set the priority conservation actions and programs (Lutz and Musick 1997, Eckert et al. 1999).

Considering the gaps in our knowledge on foraging groundworks, studying the different aspects of foraging grounds and feeding activity of sea turtles would help us to define suitable and effective management and conservation measures. Identification and delineation of species and populations, finding migration routes and corridors, knowing abundance, population relationship, and anthropogenic influences are the aims and goals of such research and studies. Foraging grounds play a critical role in the life of marine turtles by providing a variety of food resources and shelter and considering the numerous threatening factors that are in need for the identification of management plans and measures. (Lutz and Musick 1997).

Olive Ridley (*Lepidochelys olivacea*) as one of the small members of the *Cheloniidae* family, like other relatives, has a complex life stage with a strange nesting stratagem called 'Arribada' which means mass nesting, although they undertake solitary and mix strategy too. The number of nesting females in Arribada in Ghahirmatha in India exceeds 130 thousand. Its carapace is short and wide and usually with six to eight coastal scutes with up to 72 cm straight length. The species typically weigh 35-50 kg. It is an omnivore capable to exploit crabs, snails, barnacles, and clams (Spotila 2004, Eckert et al. 1999). In the latest classification in IUCN Red List the species has been classified as 'Vulnerable' with decreasing population trend (Abreu-Grobois & Plotkin, 2008).

The Oman sea area in Iran consists of the most important nesting sites for Green sea turtles (*Chelonia mydas*) as well as supports considerable foraging populations of the species (Mobaraki et al. 2020, Mobaraki 2004). The breeding population is very low and in dispersed areas with less integrity, vice versa, the foraging turtles are quite popular and could be observed in different parts, especially in rocky shores covered with different algae species.

As fishing is the most important and common activity in the area for local people livelihoods, deploying regular set and drift nets, as well as trawling and other traditional methods, the mortality of turtles as bycatch is usual too (Mobaraki 2020 MTSG), especially in the main fishing grounds, namely Tang, Beris, Darak, Pozm, Konarak, and Ramin.

Olive Ridley is supposed to be very rare in the country, both the Oman Sea and the Persian Gulf. The two records for the species in the country, first one occasional nesting in Nayband bay in the Persian Gulf (Tollab et al 2015) with records of 9 foraging turtles in different parts of the Persian Gulf mainly from Qesh Island and coastal waters of Bushehr province, and the second one is the record of 3 dead adult and subadults in the Oman Sea area, close to Gowater bay, in the vicinity to Pakistan border (Kami 1997). Nesting of the species has been reported from UAE (Yaghmourland Rodríguez-Zárate, 2021) and in an occasion a stranded one reported from Kuwaiti waters in western the Persian Gulf too (Bishop et al 2007).



There is a small nesting population in Sultanate of Oman, in Masirah Island too, estimated to be about 150 nesting turtles annually (Rees et al 2012).

Material and Methods

Study sites/Locations

The Oman Gulf, as the northwestern part of the Arabian Sea, connects the Indian Ocean to the Persian Gulf via the Hormuz strait. The rocky shores provide a suitable substrate for the growth of different algae species, serving as foraging grounds for marine turtles (ROPME 2013, Rigel and Purkins 2012). Sistan and Baluchestan province with 540 km coastline has the longest contact with this water body with diverse habitats. Considering the long coastlines, to cover the longest part, we monitored the coastal area during different seasons and times during 2019-2020, to find the dead turtles washed out of the sea or left at the land by fishermen, especially in June- August in which turtles are seen more frequently in the sea. We also asked local fishermen to assist us and in case of entanglement and finding dead turtles in their nets, keep and bring that to us. After finding the dead bodies, Curved Carapace length (CCL), from the anterior point of nuchal scale to the posterior tip of the supracaudals (Eckert et al 1999) and Curved Carapace Width (CCW), at the middle part of the carapace, were measured using fiberglass flexible tape measures with an accuracy of 1 cm.

Results

Although 10s of dead turtles were found, indicating the high mortality caused by fisheries activities, only four were belonging to Olive Ridley, and the others were Green turtles, all in different life stages. Of the four Olive Ridley, two were found in Tang Village in the western part and the other in the Kacho area (figure 1). Both of these are important fishing grounds and recorded as foraging grounds for the turtles too (Mobaraki 2004). All four specimens have been entangled in small-scale fishing drift nets. As the carcasses were deteriorating; it was impossible and useless to weigh them. On one occasion one of the local fishermen kindly gave us a live Juvenile Olive Ridley which has been entangled in his net in the Ramin area. The results of measurements on carapaces are provided in table1. Figure 1 illustrates the location of the collected samples. The live one captured in a fishing net in Ramin had a problem in diving in the sea and using hind limbs.

Table 1: The result of measurements on the collected specimen of Olive Ridley

Turtle	CCL(cm)	CCW(cm)	Observed area	status
1	54	58	Tang	dead
2	26	28	Tang	dead
3	49	51	Kacho	dead
4	54	57	Kacho	dead
5	50	54	Ramin	Alive with the problem for diving



Figure 1: the recorded localities for Olive Ridley in Northern Oman Sea area, S&B, Iran,

Discussion

The sizes of the turtles indicate that the species utilizes the habitats of the northern Oman sea area in Sistan and Baluchestan provinces as the developmental and foraging ground in early and middle life stages. Considering the record of the species in other countries of the area, including Kuwait and UAE in the Persian Gulf, the area plays a role as a migratory corridor for the species too. Moreover, recent research works in the area give more data on the presence of the species in the region, which previously was rare and unknown. This means that different habitats in the Oman sea area could support the species in different life stages, as breeding or foraging populations. According to the Arribada nesting sites in India, as well as the small nesting population in Oman State, indeed it would be reasonable to expect to see the species in the Northwestern parts of the Indian Ocean too. The long and remote coastal area, somehow, prevents proper monitoring and possible observation of nesting specimens as well as finding more foraging grounds. This study confirms the importance of Tang and Gowater bay as well as Chabahr to Gowater coastal habitats as foraging grounds for the Olive Ridley in Iran. It seems to be obvious that more research and field works would increase the record numbers and obtain more details on the foraging habitats. The record of the species in Kuwait and UAE reflects the low density of the species in the Persian Gulf region, but the capacity of the area in supporting the populations of the species (Bishop 2007, Yaghmour 2021). The findings and records also reflect the negative impacts of bycatch and mortality of marine turtle species in fisheries activities in the region. Satellite telemetry in Oman also reveals that female Olive turtles take post-nesting migration to the northern parts of the Persian Gulf and Oman Sea (Rees et al 2012).



Conclusion

According to the dispersal behavior of hatchlings and turtles in their early stages of life to find a reliable source of food and proper developmental area, as well as considering the large nesting population of the species in India as *Arribada* forms it could be hypothesized that the foraging turtles in the western Oman sea area and even the Persian Gulf originate from Indian populations, or maybe from Oman. This, to be determined, needs genetic work to identify the exact origin of the specimen and may clarify their relation to India. The mortality rate and the number of dead turtles in fisheries bycatch highlight the need for suitable and urgent conservation measures including local fishermen education and awareness.

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