Project Update: June 2019

Objective 1: To monitor the green sea turtle demography and distribution
For partial fulfilment of this objective, 1 km single observer transects were conducted in the lagoons of Agatti, Kadmat and Kalpeni. No turtles were seen in Kadmat during transects in 2019, but one green and one hawksbill turtle were seen near the reef region during snorkelling. In Agatti, seven turtles were observed between transects in 2019.

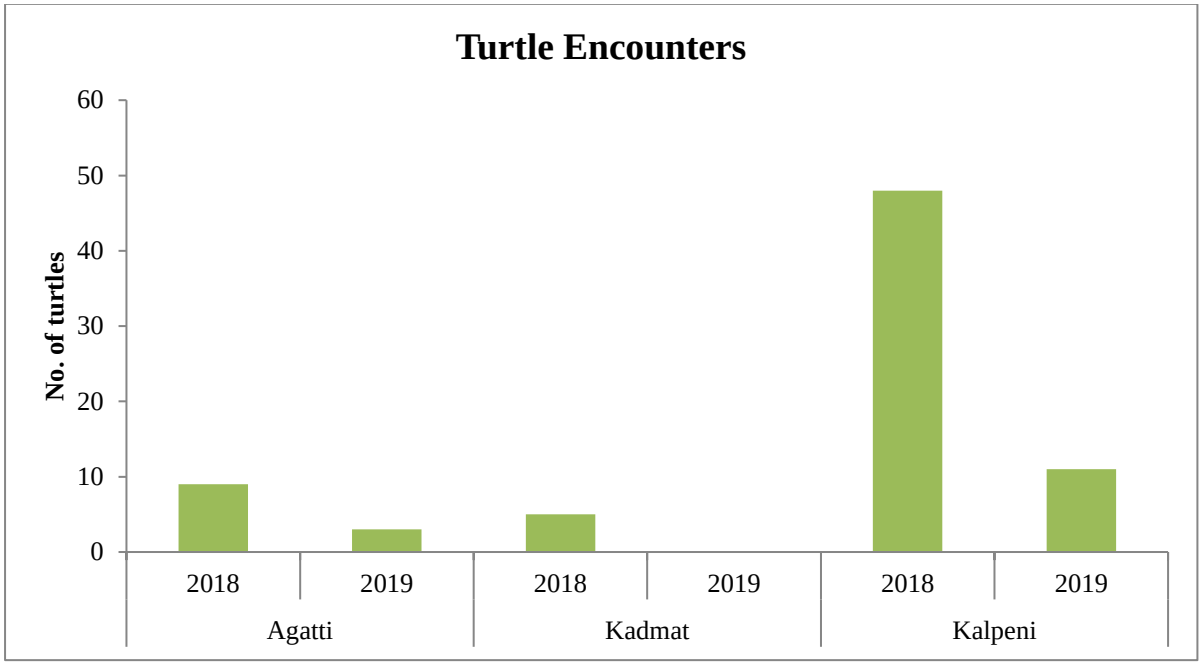

Fig 1. Density of turtles encountered in the 3 islands

The change in turtle abundance in these islands every few years indicates that these turtles could be moving from one island to another after exhausting the seagrass resources. Moreover, it seems that most of the population moves within the Lakshadweep islands for foraging, but a few turtles continue to remain in some of the islands despite sparse seagrass numbers. These assumptions need further investigation through tagging or satellite tracking.

Transects were also distributed within the lagoon to cover different regions categorised as near shore, reef and mid-lagoon. It was observed that in Kadmat, turtles were mainly observed to be uniformly distributed in the three regions while in Agatti, turtles were not at all observed in the reef region of the lagoon. In Kalpeni, turtles showed a clear preference to the mid-lagoon area.

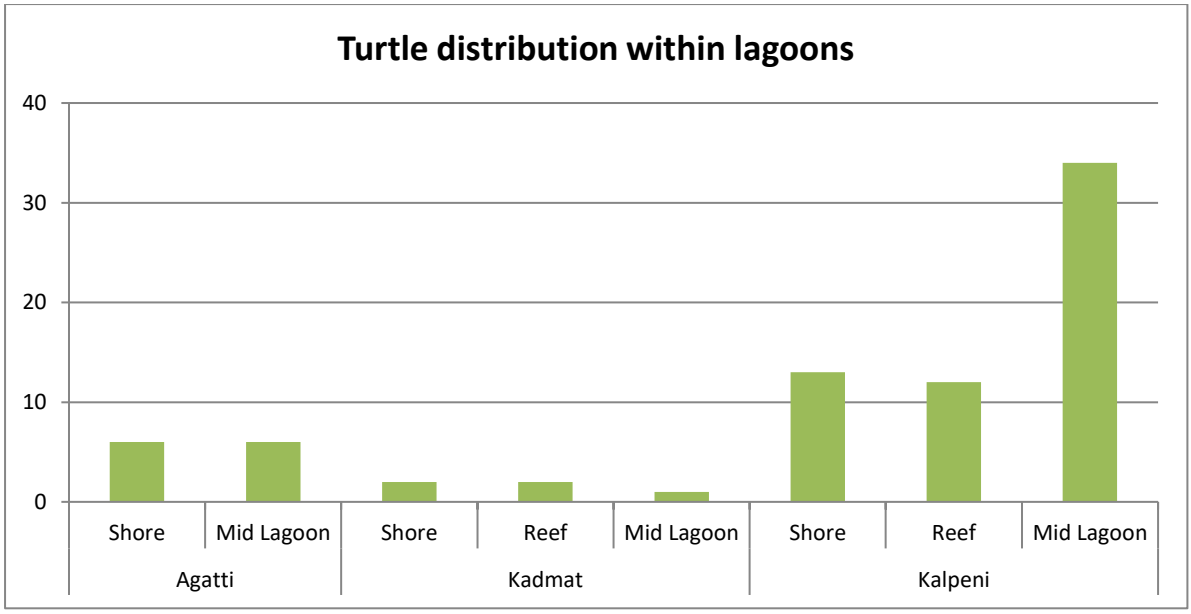

Fig 2. Distribution of turtles in Shore, Reef and mid-Lagoon areas of the islands

Objective 2: To determine green turtle diet

Faecal samples were obtained mainly from Agatti and Kalpeni. Due to changes in turtle densities, the faecal samples found in each island varied in the 2 years. After the samples were separated, the individual fragments were collected, flattened and observed under the microscope at 40 x power. While the seagrass components of the samples were easily identified, there were various other organic components that were found as well which are still under investigation. However, cloth and plastic material was also found in the samples indicating accidental plastic ingestion by the animals. Presence of *Cymodocea* and *Thalassia* coincided with feeding observations; however, the presence of *Halodule uninervis* blade was also detected which has not been observed in previous studies. In addition, algal matter was also detected in the samples from 2019 which is also awaiting identification confirmation.

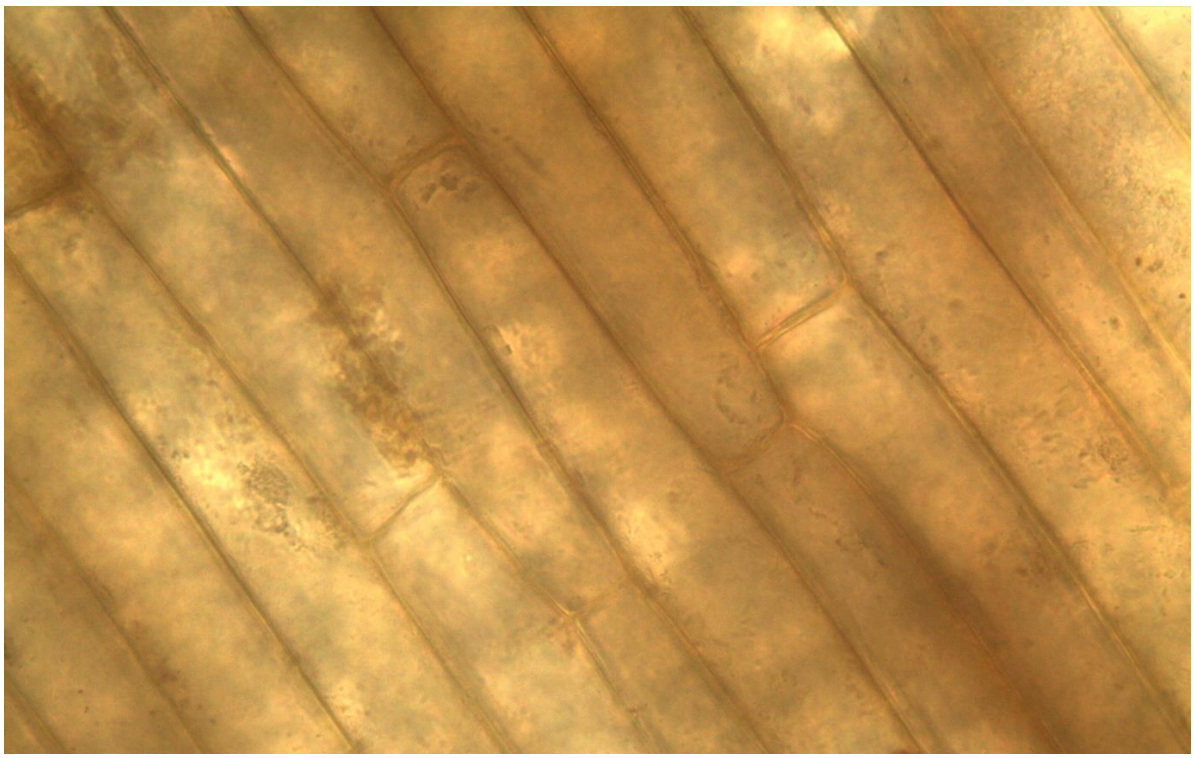

Fig 3. Epidermal cells of the leaf stem of Thalassia hemprichii

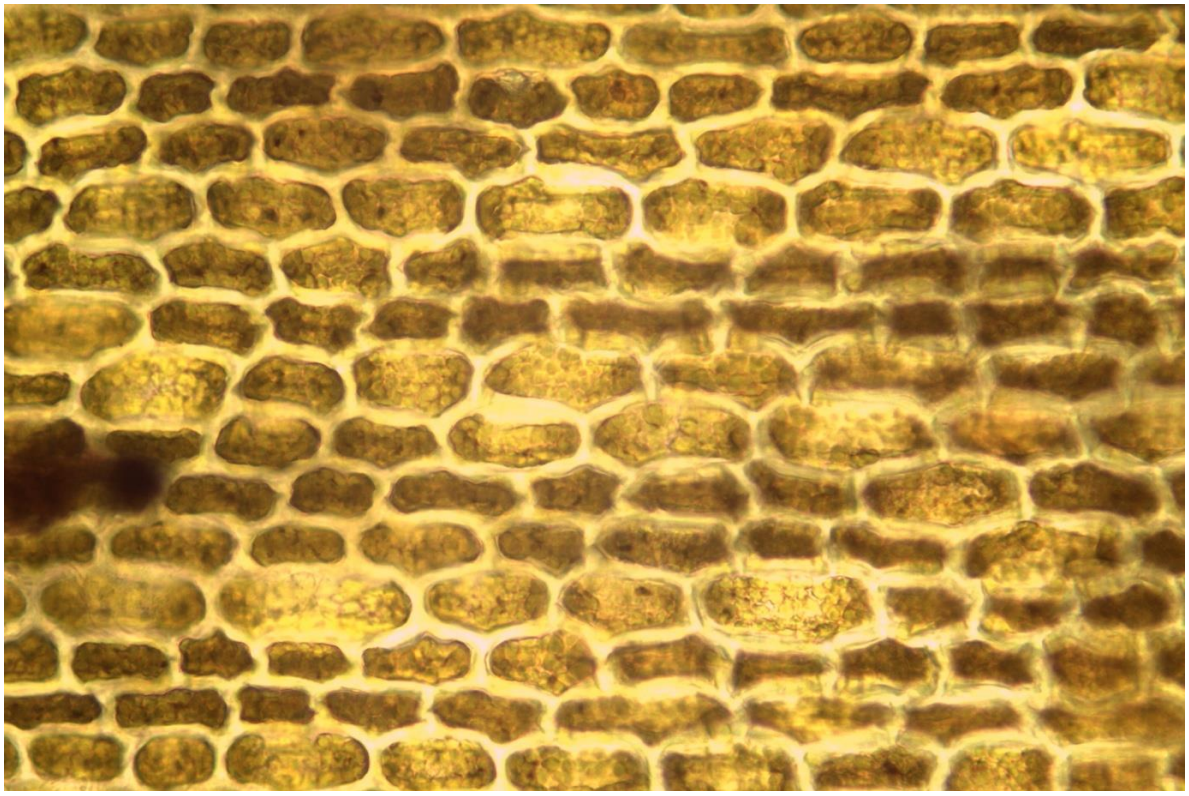

Fig 4. A blade of Halodule uninervis found in Agatti samples

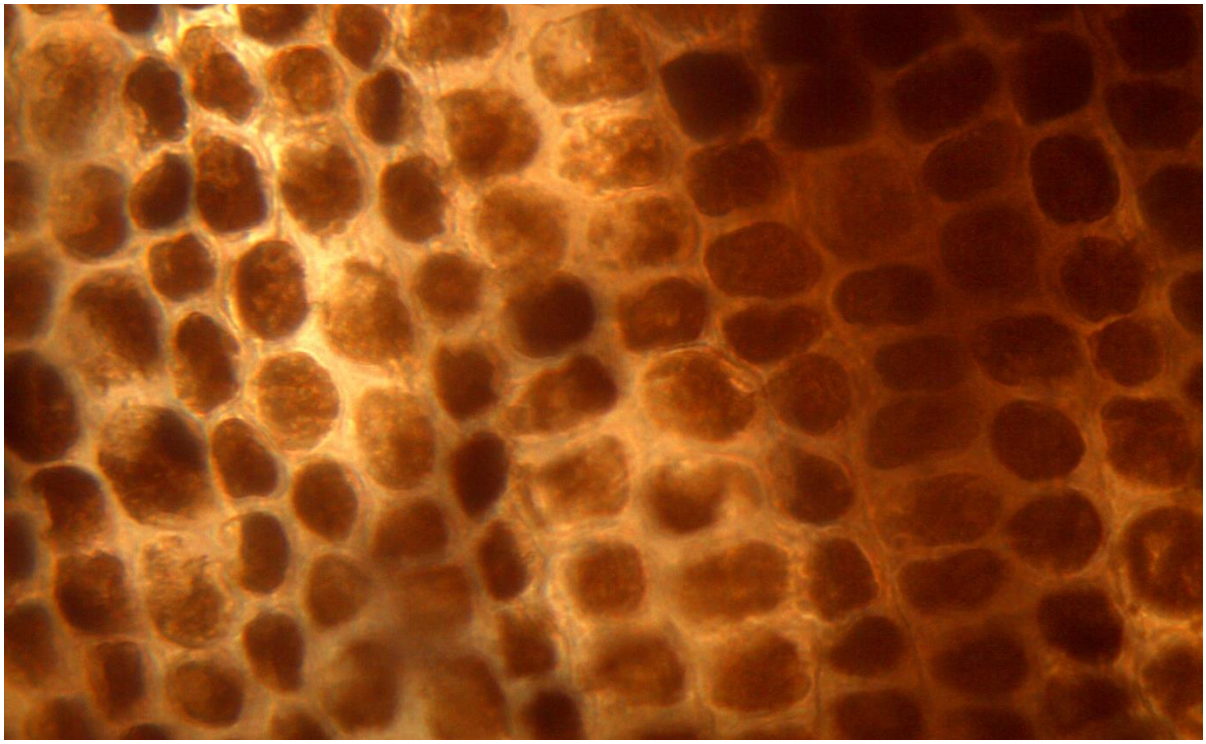

Fig 5. Thalassia leaf blade found in a faecal sample

Objective 3: To implement mitigation measures to reduce the fisher-turtle conflict
The method for this objective was altered as fishers were not comfortable having a female observer on-board while fishing. Moreover, having an observer could have affected or influenced their behaviour towards turtles on encounter. In order to understand their attitude towards turtles, a survey was conducted with 90 fishers [30 in each island]. The interviewees were selected using snowball sampling strategy.

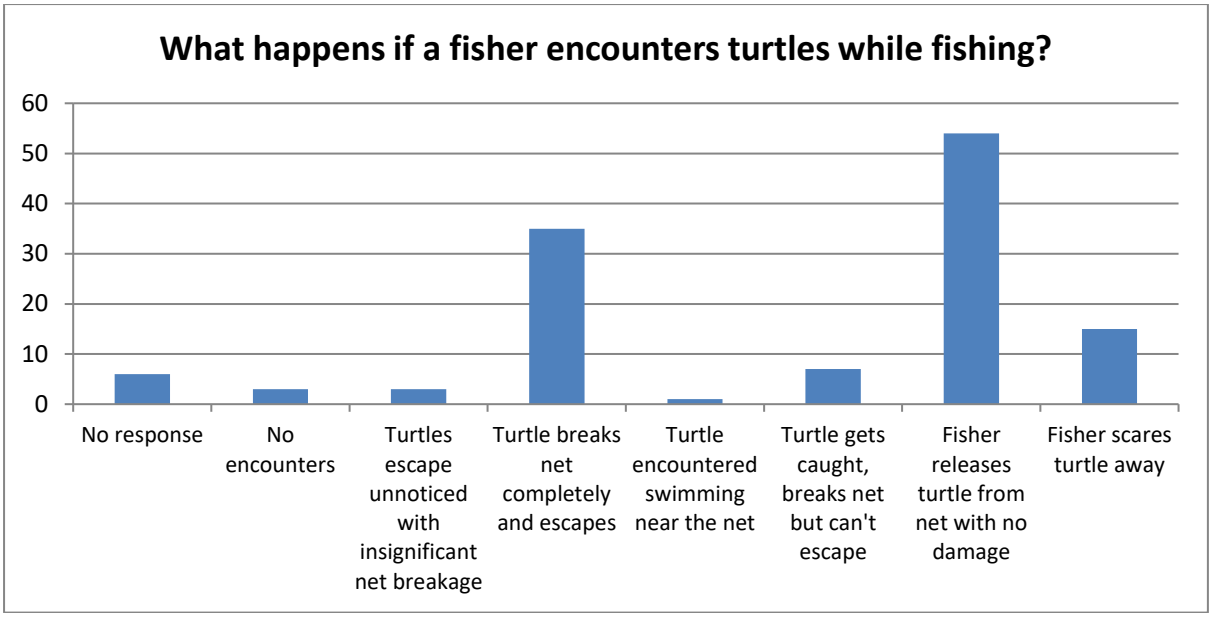

Fig 6. Responses provided by the fishermen for encounter with turtles

In these surveys, most fishers responded that they would release turtles by lifting the nets so the turtle could swim away, disentangling the turtle from the nets, or simply lifting them out by holding their carapace. Some fishers have also had to cut their net if the turtle's flippers got entangled in it. Other common responses were that turtles would break net and escape unseen or fishers would scare the turtles away. In order to scare turtles away, they would hit turtles with sticks on the carapace; make a sound in the water or on the boat or catch turtles and tie floats/plastic bottles to their flippers to keep them from swimming towards the net. Some fishers chose not to respond, elaborate on their reactions on encountering a turtle or gave multiple responses.

Most fishers mentioned that only when thin mesh sized nets were used and/or the nets were left overnight or for a long period of time, turtles would get caught and mostly break the nets. The bigger nets were sturdy and rarely broke so the fishers would just release the turtles. Moreover, due to strict laws in place, most fishers said that they resorted to removal of turtles from the net rather than other methods.

Using researcher observations as well as the areas marked by fishers indicating commonly used fishing and turtle sighting areas, maps of the lagoons were generated. These areas were then overlaid and few areas were observed to have an overlap of fishing and turtle sighting areas.

Due to reduction in turtle numbers, Kadmat had fewer areas where overlap was observed. However, due to the migratory nature of turtles, fishers still encountered turtles or turtles would get trapped in nets. Moreover, in recent times, more turtles were also observed on the eastern side of the island due to some seagrass presence, resulting in encounters with fishers mainly with those who used nets.

Fig 7. Areas marking fishing, turtle sightings and the overlap in Agatti, Kadmat and Kalpeni

More areas with overlaps in fishing and turtle sites were observed in Kalpeni and Agatti than Kadmat. In Kalpeni, the main reason for the overlap was the high density of turtles in the northern and southern region of the lagoon due to presence of seagrass. Moreover, as fishers use seagrass patches to catch fishes which are also used by turtles for foraging, it results in frequent encounters between turtles and fishers.

In Agatti, despite of low turtle density, the main reason for these encounters was because fishers left their nets overnight or for extended periods of time. Such nets end up catching turtles that are swimming through the area or resting on the lagoon floor.

As turtles move extensively within the lagoon, these encounters cannot be avoided completely especially if there is seagrass present. Moreover, due to varying densities, the number of encounters tends to vary too. Fishers also stated that the type of net plays a role in this where a thin net can be easily broken by turtles causing losses to the fishers, while a thick nets result in turtles getting caught but not tearing it.

Towards the end of this field season, these maps were distributed to fishers- starting with those who participated in the survey- to check if avoiding areas with usage overlap reduces encounters with turtles. The success of these maps will be tested by conducting follow-up interviews in the following year.

Objective 4: To explore techniques for recovery of seagrass communities and dependent fauna

Snorkelling surveys were carried out to locate sites of natural exclusion where coral colonies served as a protective barrier for seagrass shoots. Multiple surveys were carried out in Agatti and Kalpeni; however, we could not detect any site that provided exclusion. One site in Kadmat was identified as a natural exclosure but the seagrass shoots at the site were not found in 2019.

Fig 8. Thalassia shoots growing under the protection of coral in Kadmat

Artificial 0.5x0.5m exclosures were set up in the lagoons to preserve seagrass species that were observed to form green turtle diet. These exclosures were set-up with the intention to protect the seagrass from green turtle grazing but to allow fishes to enter and exit the cages. These cages were mainly put over *Thalassia* and *Cymodocea* species as they were commonly observed in green turtle faecal matter.

Due to the short period of time of the exclosure casting (2 months/year), there was no change in length or density in the seagrass shoots observed. However, the density of shoots was maintained within the exclosure while it changed over time in the designated control regions.

Fig 9. A seagrass exclosure placed on the eastern side of Agatti

Site	Exclosure density (February)	Exclosure density (May)	Control density (February)	Control density (May)
Agatti- Eastern jetty	47	47	34	20
Agatti- lagoon (point 3)	17	17	10	7

Fig 10. Differences in seagrass densities between exclosure and control setups