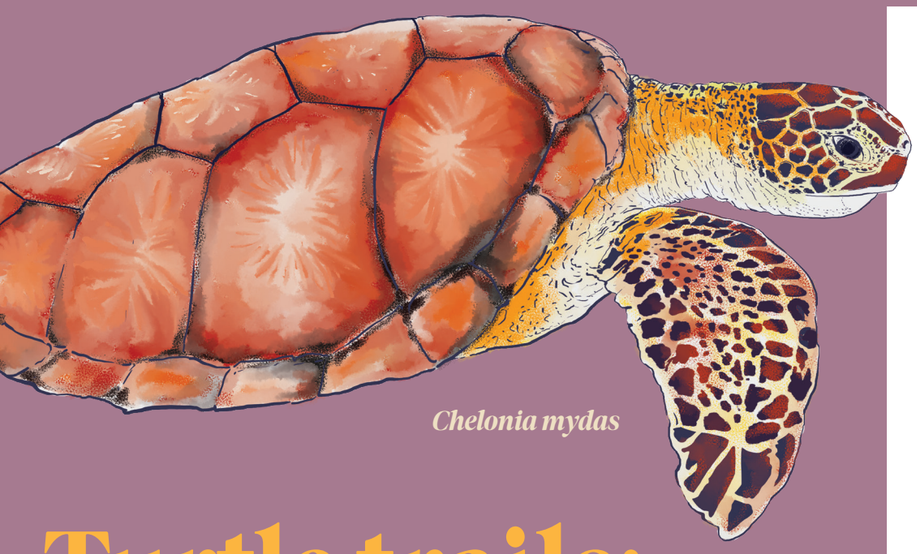
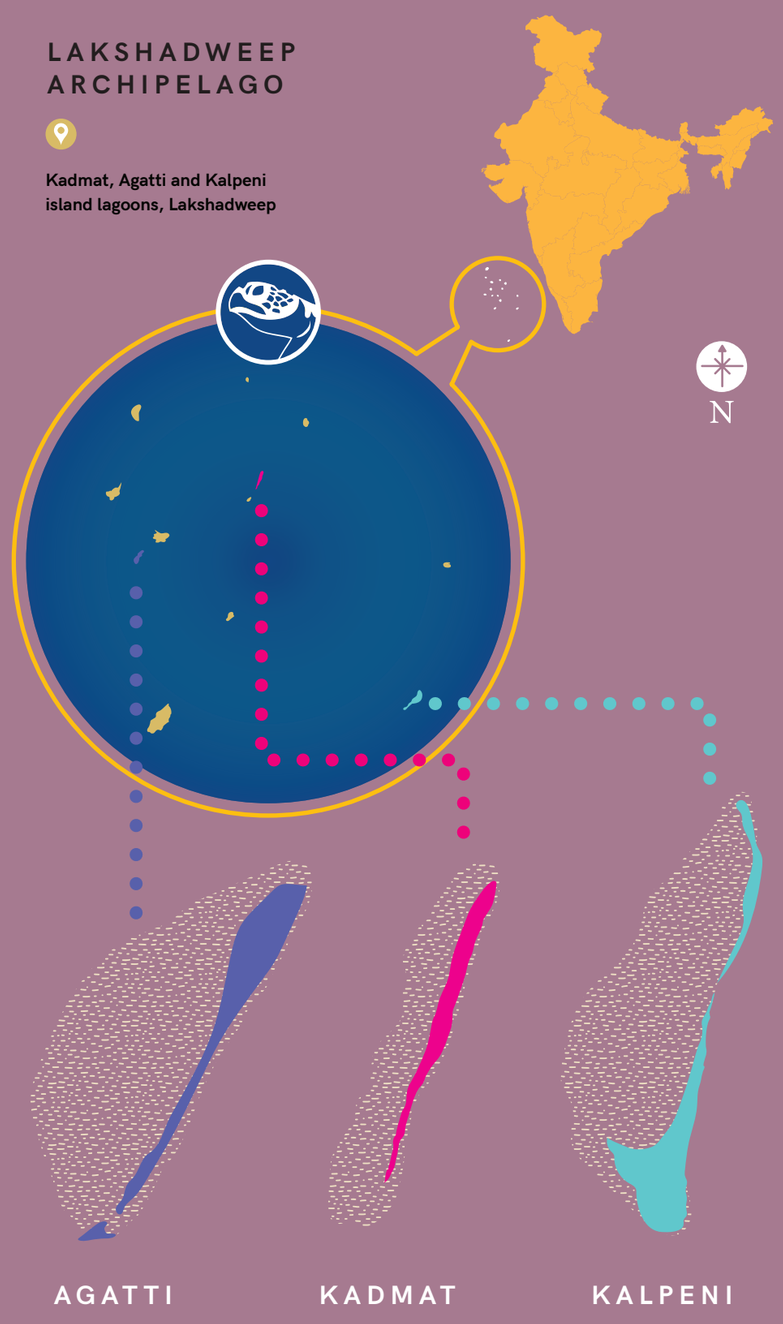


Chelonia mydas

Turtle trails: Investigating green turtle movements in Lakshadweep

The once lush seagrass meadows of the Lakshadweep archipelago were mowed down to barren sand patches due to foraging by green turtles, which experienced a sudden population surge in the mid-2000s. Green turtles depleted seagrass resources in one lagoon before moving to the next, leaving ecological and socio-economic repercussions in their wake. Hence, it is crucial to understand the factors that trigger green turtle movement between foraging grounds. Towards this, Dakshin Foundation initiated a long-term monitoring programme in 2011 to track the movement of green turtles within the archipelago.



AVERAGE SEAGRASS AND GREEN TURTLE DENSITIES

Across the lagoons we monitored, there has been a decline in turtle densities as shoot densities are grazed down to low levels. By 2018, the once-dominant species of *Thalassia hemprichii* and *Cymodocea rotundata* had dwindled to very low shoot densities, confined to small patches. Pioneering, faster-growing species of seagrass, mainly *Halodule sp.* and *Halophila sp.*, have begun colonizing the available spaces.

GREEN TURTLE DENSITY

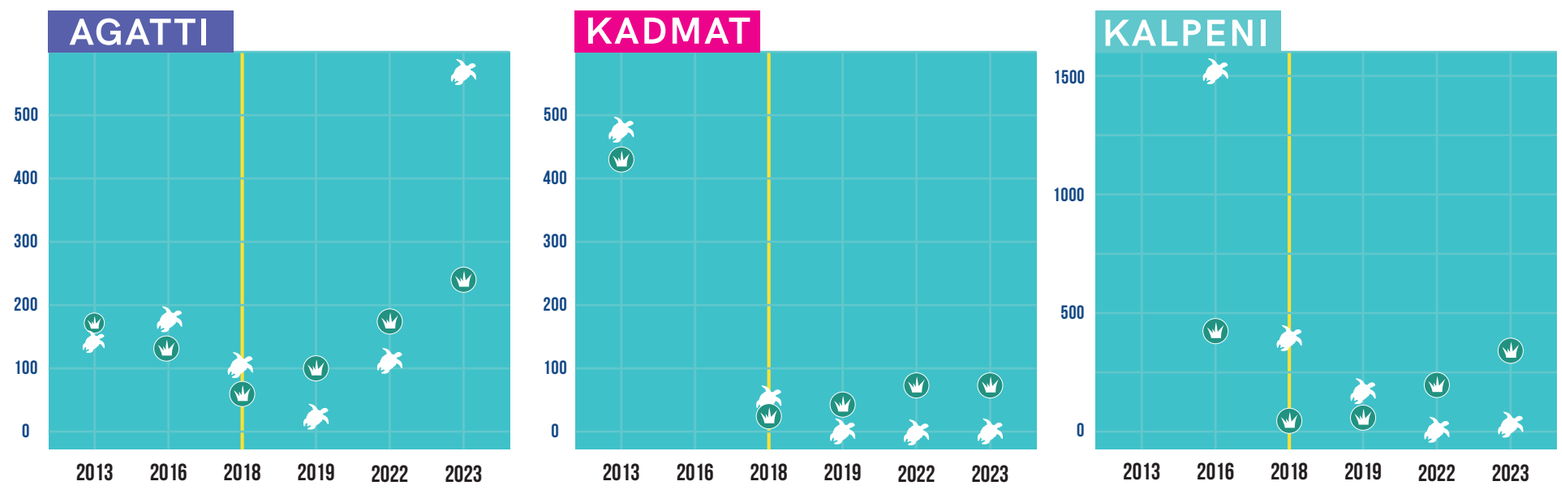
SEAGRASS DENSITY

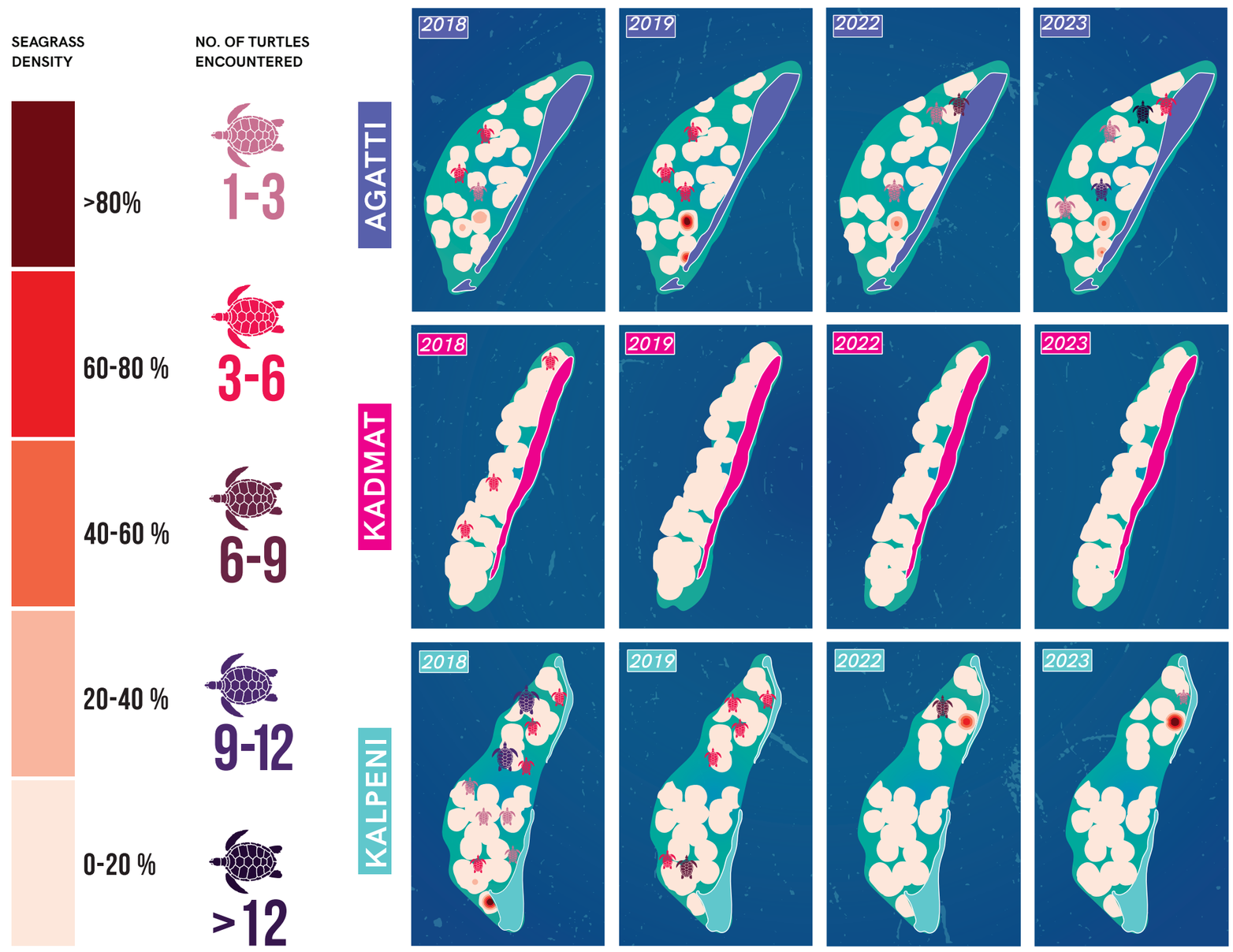
Average green turtle densities per km² observed in our study across islands and years

YEAR	AGATTI	KADMAT	KALPENI
2013	~155.5 km^{-2}	~485 km^{-2}	NA
2016	~166.6 km^{-2}	NA	~1516.6 km^{-2}
2018	~100 km^{-2}	41.6 km^{-2}	~400 km^{-2}
2019	33.3 km^{-2}	0 km^{-2}	91.6 km^{-2}
2022	~111 km^{-2}	0 km^{-2}	~8 km^{-2}
2023	566.6 km^{-2}	0 km^{-2}	25 km^{-2}

Average seagrass shoot density per m² recorded in our study across islands and years

YEAR	AGATTI	KADMAT	KALPENI
2013	171.99 m^2	437.48 m^2	NA
2016	128.59 m^2	NA	426.16 m^2
2018	76.03 m^2	27.01 m^2	42.47 m^2
2019	99.09 m^2	35.25 m^2	20.11 m^2
2022	176.57 m^2	68.37 m^2	201.966 m^2
2023	239.86 m^2	71.46 m^2	332.48 m^2



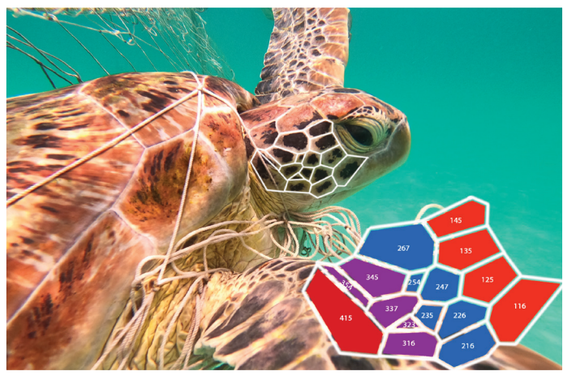


MOVEMENT ECOLOGY OBJECTIVES

Dakshin Foundation has been monitoring the shifting densities of green turtles in response to forage availability through boat surveys. However, to identify specific cues that trigger a green turtle to move to a new foraging ground, individual movement patterns must be examined. To achieve this objective, we initiated a photo-identification study in partnership with the local community to non-intrusively track individual turtles in the long term. Additionally, we have also supported the development and testing of an indigenously designed GPS LoRa radio telemetry system specifically tailored for deployment on green turtles in Lakshadweep.

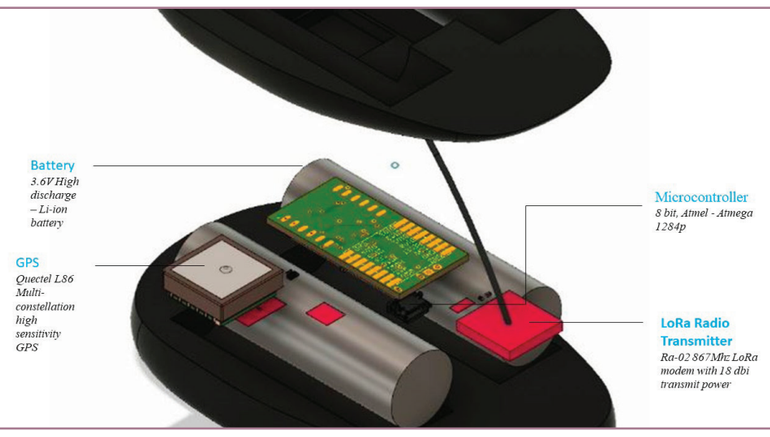
CITIZEN SCIENCE DRIVEN PHOTO IDENTIFICATION STUDY

We have partnered with dive professionals from the local community to non-intrusively document individual green turtles that inhabit Lakshadweep. The shape and arrangement of scutes on either side of a green turtle's face is unique to each individual. We hope to create a photo repository of individual green turtles in Lakshadweep, with the assistance of the local community, so their movements between islands can tracked.



GPS LORA RADIO TELEMETRY SYSTEM

The fidelity of green turtles to foraging grounds makes them ideal model animals to study using a radio telemetry system. The telemetry system developed by Arcturus Inc. comprises radio tags and receiver stations. The radio tags are equipped with a GPS logger, radio transmitter, and a submergence sensor. A network of receiver stations will be installed across all the islands identified as green turtle foraging grounds, enabling tracking of tagged green turtle movements in response to forage availability.



COMPOSITION OF GREEN TURTLE DIETS IN THE LAKSHADWEEP ISLANDS

Analysis of green turtle faeces reflected the shift in seagrass species composition in 2013, characterized by a higher prevalence of *Cymodocea rotundata* shoots. Subsequent analyses from 2019 also revealed rhizomes in addition to fragments of leaf sheaths in the faecal samples. This indicates an intensified foraging strategy likely prompted by high turtle densities and limited resource availability where green turtles consume underground biomass in addition to shoots.

ACKNOWLEDGEMENTS

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