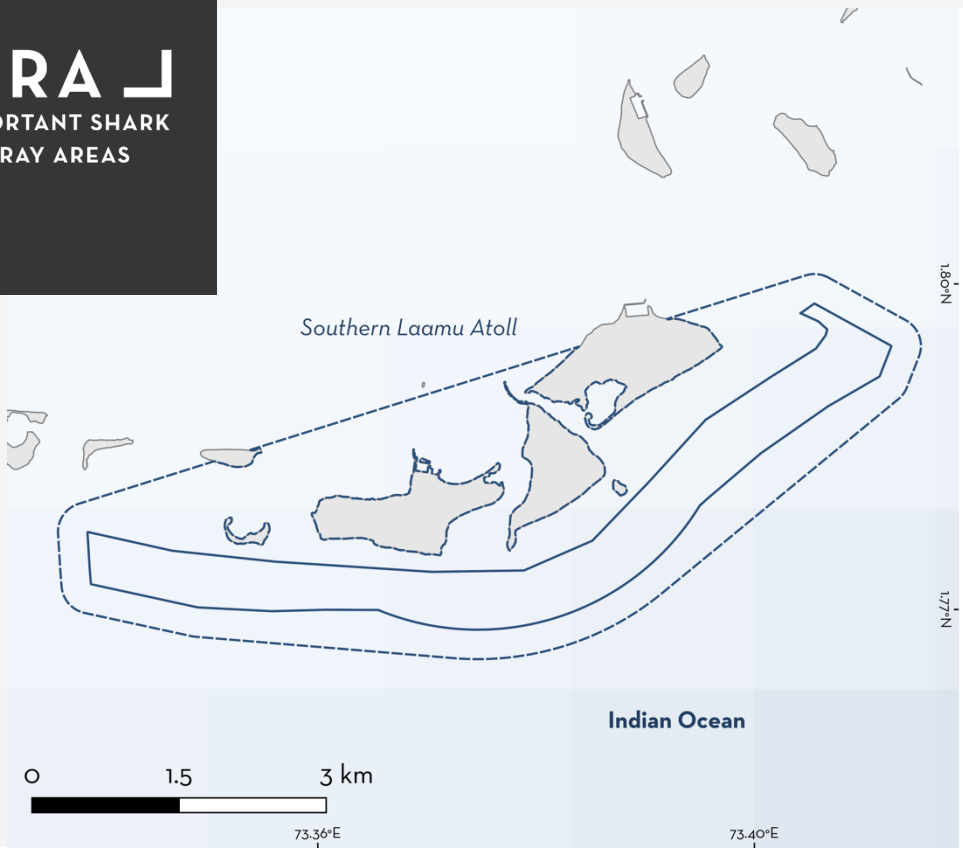
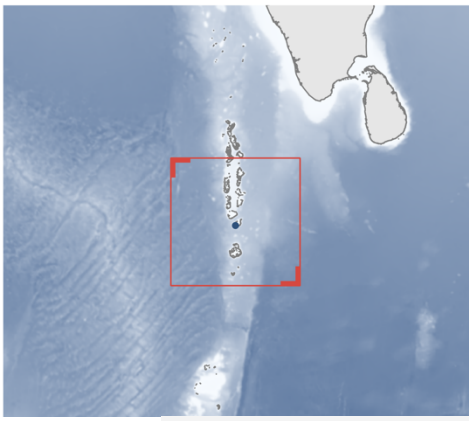
ISRA
IMPORTANT SHARK AND RAY AREAS





Blue lines indicate the area meeting the ISRA Criteria; dashed lines indicate the suggested buffer for use in the development of appropriate place-based conservation measures

SOUTHERN LAAMU ATOLL ISRA

Western Indian Ocean Region

MALDIVES

0–60 metres

5.01 km²

SUMMARY

Southern Laamu Atoll is located in the Maldives. It encompasses a channel corner located within the boundary of the Laamu Hithadhoo Island and the outer reef along Hithadhoo, Medhoo, Kunahandhoo islands. The channel is located on the southern end of Laamu Atoll, which connects the atoll waters to Huvadhoo Kandu, the largest channel between the atolls of the Maldives. This area includes coral reefs, rocky substrates, and waters with strong currents. Within this area there are: **threatened species** (e.g., Grey Reef Shark *Carcharhinus amblyrhynchos*); **reproductive areas** (Reef Manta Ray *Mobula alfredi*); **feeding areas** (Reef Manta Ray); **undefined aggregations** (Grey Reef Shark); and **distinctive attributes** (e.g., Silvertip Shark *Carcharhinus albimarginatus*).

CRITERIA

Criterion A – Vulnerability; Sub-criterion C1 – Reproductive Areas; Sub-criterion C2 – Feeding Areas; Sub-criterion C5 – Undefined Aggregations; Sub-criterion D1 – Distinctiveness

DESCRIPTION OF HABITAT

Southern Laamu Atoll is located in the southern third of the Maldives atoll chain (Sluka & Miller 2001). The area encompasses the outer atoll rim from the channel corner in front of Laamu Hithadhoo Island and extends along the outer reef of Hithadhoo, Mendhoo, and Kunahandhoo islands.

Laamu Atoll is encircled by fringing reefs and has a relatively small number of atoll channels connecting the inner water of the atoll with the open ocean (Anderson et al. 1992; Sluka & Miller 2001). The tides in the Maldives are characterised by a semidiurnal microtidal regime with a tidal range of ~1 metre (Caldwell et al. 2015; Rasheed et al. 2021). Combined tidal and wind driven currents can exceed speeds of 2 m/s, and be very variable in speed and direction, especially though the channels between atolls, atoll rims, and channel gaps in the atoll rims (Ciarapica & Passeri 1993; Kuiter & Godfrey 2019; Rasheed et al. 2021).

The area is characterised by a reef with a zonation that includes reef flats, reef crest, and reef slope with a steep drop to ~30–50 m, followed by a gentle slope for ~0.5 km that continues and drops to the abyssal depths (Sluka & Miller 2001). It includes a mixture of healthy coral reef and coral rubble substrate with multiple large *Porites* coral blocks rising above the rubble substrate. There are multiple sites within the area with fish cleaning stations: Hithadhoo Kandu Kolhu (the channel corner), Boduhura Beyru, Mendhoo Beyru, and Kunahandhoo Beyru. Cleaning stations at Hithadhoo Kandu Kolhu are named Yellow Block, Shallo Block, Ridge, Turtle Block, and Split Block.

This Important Shark and Ray Area is benthopelagic and is delineated from surface waters (0 m) to 60 m based on the distribution of the Qualifying Species and the bathymetry of the area.

ISRA CRITERIA

CRITERION A – VULNERABILITY

Three Qualifying Species considered threatened with extinction according to the IUCN Red List of Threatened Species™ regularly occur in the area. These are the Endangered Grey Reef Shark (Simpfendorfer et al. 2020), and the Vulnerable Reef Manta Ray (Marshall et al. 2022) and Silvertip Shark (Rigby et al. submitted).

SUB-CRITERION C1 – REPRODUCTIVE AREAS

Southern Laamu Atoll is an important reproductive area for one ray species.

Between 2012–2022, a total of 3,915 surveys were conducted at the channel corner site (this includes dive and snorkel surveys as well as remote camera surveillance). Of these, 56% (n = 2,197 surveys) recorded Reef Manta Rays (IDtheManta unpubl. data 2022). A total of 7,523 Reef Manta Ray sightings were reported with 4,553 individuals confirmed through photo-identification.

A high abundance of pregnant females have been recorded visiting the cleaning stations in Hithadhoo Kandhu Kolhu. Females were determined pregnant by the presence of extended abdomens by trained researchers as described by Stevens (2016), a technique which has more recently verified the foetus presence using contactless ultrasound scanning of free-swimming Reef Manta Rays in Laamu, Baa, and Raa Atolls (Froman et al. 2023). Photo-identification data suggest that 149 sightings were of pregnant Reef Manta Rays at the channel corner, of which 99% (n = 147)

displayed cleaning behaviour (IDtheManta unpubl. data 2022). Of these, 29 individual Reef Manta Rays were identified at Hithadhoo Kandu Kolhu, with 38% (n = 11) animals with more than one pregnancy in non-consecutive years (reported gap of two and a half years on average between pregnancies) (IDtheManta unpubl. data 2022). The regular occurrence of pregnant Reef Manta Rays using the cleaning stations in this area, suggests that this site is key to maintaining health during gestation.

Hithadhoo Kandu Kolhu also has the second highest record of recorded courtship events of Reef Manta Rays in the Maldives (after Lankan Beyru in North Male Atoll) (Stevens et al. 2018). Courtship at this channel corner has been recorded every year between 2013–2022 (IDtheManta unpubl. data 2022). The distinct courtship stages that have been observed are initiation, endurance, evasion, pre-copulation positioning, and copulation (Stevens et al. 2018). Courtship was observed during 132 surveys at this site, with 58 individual Reef Manta Rays identified through photo-identification (IDtheManta unpubl. data 2022). Laamu Atoll supports a bi-annual courtship season (May–June and October–November) (IDtheManta unpubl. data 2022). In addition, between 2014–2022, 19 female Reef Manta Rays were sighted 48 times with mating scars on their pectoral fins (Stevens 2016; IDtheManta unpubl. data 2022).

Overall, the area is the most important reproductive area for Reef Manta Rays in Laamu Atoll by number of pregnant females and and one of the most important reproductive site in the Maldives by number of courtship events.

SUB-CRITERION C2 – FEEDING AREAS

Southern Laamu Atoll is an important feeding area for one ray species.

This area is particularly important to Reef Manta Rays as it is one of the few areas within Laamu Atoll in which Reef Manta Rays are observed feeding. Feeding mantas are rarely sighted in Laamu Atoll, however when sighted, 46% of all sightings happen within this area, indicating the importance of this site as a feeding location within this atoll. Between 2015–2023, 56 sightings of feeding Reef Manta Rays have been recorded in this area.

SUB-CRITERION C5 – UNDEFINED AGGREGATIONS

Southern Laamu Atoll is an important aggregation site for one shark species.

Regular and predictable aggregations of Grey Reef Sharks occur at Hithadhoo Kandu Kolhu channel entrance during incoming currents. Encounter data were collected by recreational and research divers between 2017–2023, with 2,762 Grey Reef Sharks observed over 1,391 surveys (59% of surveys; Maldives Underwater Initiative by Six Senses Laamu unpubl. data. 2023). Maximum aggregations encountered were of 50 individuals but aggregations of between 2–10 were most common. During the day, when observers are present, the primary location where these aggregations are found is the steeper section of the channel. The strong tidal currents at this channel and the nearby drop-off to deeper waters can potentially generate an upwelling of current in which the negatively buoyant Grey Reef Sharks may be able to rest (e.g., Papastamatiou et al. 2021). This area is of particular significance as it is one of the few sites in Laamu Atoll where aggregations of this size can be observed. As Laamu only has six channels, this highlights the ecological importance of this area, likely linked to the regular and predictable high current incoming tides and the upwelling it creates. Further information is however needed to understand the nature and function of these aggregations.

SUB-CRITERION D1 – DISTINCTIVENESS

Within Southern Laamu Atoll two shark species show distinct attributes.

Grey Reef Sharks and Silvertip Sharks regularly visit cleaning stations located at 15–30 m depth. Animals are observed displaying cleaning behaviour individually or in groups of up to five individuals, where sharks open their mouths and hover in an upwards swimming motion over the cleaning stations (IDtheManta unpubl. data 2023; G Stevens pers. comm. 2023; M Staiger pers. obs. 2023). Yellow Block in Hitadhoo Kandhu Holhu is a known cleaning station for Grey Reef Sharks, where the animals can be observed cleaning almost every dive (G Stevens pers. comm. 2023, M Staiger pers. obs. 2023). The area was surveyed with remote underwater video (RUV) from 2018–2023 and cleaning behaviour was regularly recorded (IDtheManta unpubl. data. 2023). Silvertip Sharks have been recorded regularly visiting cleaning stations at Boduhura Beyru based on RUV surveys between 2022–2023 (IDtheManta unpubl. data 2023).

This area is especially important as it is one of the few known cleaning stations for Grey Reef Sharks and Silvertip Sharks within Western Indian Ocean.

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QUALIFYING SPECIES

Scientific Name	Common Name	IUCN Red List Category	Global Depth Range (m)	ISRA Criteria/Sub-criteria Met								
				A	B	C1	C2	C3	C4	C5	D1	D2
SHARKS												
Carcharhinus albimarginatus	Silvertip Shark	VU	0–800	X							X	
Carcharhinus amblyrhynchos	Grey Reef Shark	EN	0–280	X						X	X	
RAYS												
Mobula alfredi	Reef Manta Ray	VU	0–711	X		X	X					

SUPPORTING SPECIES

Scientific Name	Common Name	IUCN Red List Category
SHARKS		
Carcharhinus melanopterus	Blacktip Reef Shark	VU
Nebrius ferrugineus	Tawny Nurse Shark	VU
Triaenodon obesus	Whitetip Reef Shark	VU
RAYS		
Aetobatus ocellatus	Spotted Eagle Ray	EN
Mobula kuhlii	Shorthorned Pygmy Devil Ray	EN
Pastinachus sephen	Cowtail Ray	NT
Pateobatis fai	Pink Whipray	VU
Pateobatis jenkinsii	Jenkins' Whipray	EN
Taeniurops meyeni	Blotched Fantail Ray	VU
Urogymnus asperrimus	Porcupine Ray	EN
Urogymnus granulatus	Mangrove Whipray	EN

IUCN Red List of Threatened Species Categories are available by searching species names at www.iucnredlist.org Abbreviations refer to: CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; DD, Data Deficient.

SUPPORTING INFORMATION

There are additional indications that Southern Laamu Atoll is important feeding purposes. Hithadhoo Kandu Kolhu channel corner is the location of a multi-species grouper spawning aggregation primarily during the new moon with peaks during the months of June and October (Blue Marine Foundation unpubl. data 2018). Personal observations and local fisher knowledge have confirmed that these aggregations occur multiple times each year. A survey in September–November 2022 recorded 851 grouper observations (total number of individuals) at this location (Blue Marine Foundation unpubl. data 2022). Prior to this, during a 20-day period in August–September 2016, a total of 501 grouper sightings were recorded in this area, with the abundance of some species quadrupling on the new moon (Blue Marine Foundation unpubl. data 2018). The presence of Grey Reef Sharks, Blacktip Reef Sharks, and Whitetip Reef Sharks were recorded during these specific surveys, but no direct feeding evidence was recorded (Blue Marine Foundation unpubl. data 2018). These events have shown to be an important source of nutrition for reef associated shark species elsewhere in the world (Mourier et al. 2016; Robbins & Renaud 2016). Grey Reef Sharks and Whitetip Reef Sharks are abundant in the area but further evidence, such as direct observations of feeding behaviour or correlation between spawning events and shark abundance, are required to demonstrate that this area is important for feeding purposes.

There are additional indications that this area is an important reproductive area for Spotted Eagle Rays. Diver and researcher observations have highlighted this area for courtship behaviours, with the recording of Spotted Eagle Ray courtship documented in 2023 (two events involving n = 8 and n = 5 individuals). Courtship behaviour included rolling, flipping, and breaching. This behaviour is expected to be seasonal and has previously been observed in March-April. More information is needed to confirm the regular occurrence of this behaviour and to confirm the reproductive importance of the area for this species.

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