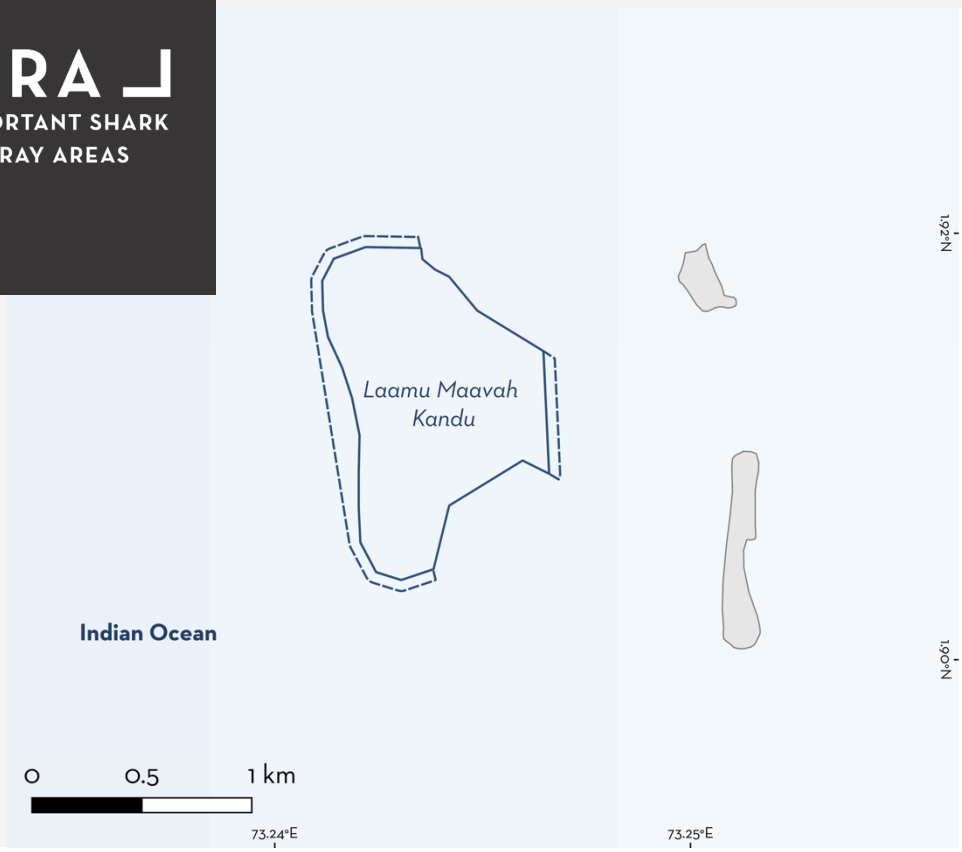
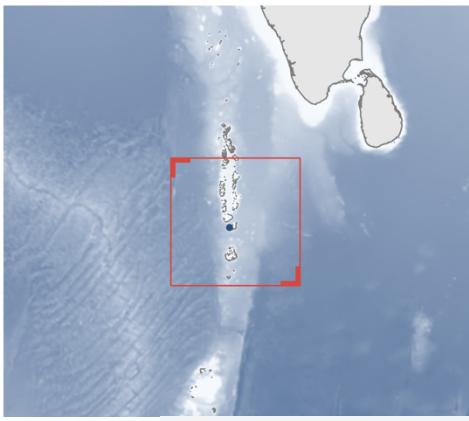
ISRA
IMPORTANT SHARK AND RAY AREAS





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

LAAMU MAAVAH KANDU ISRA

Western Indian Ocean Region

MALDIVES

0-60 metres

0.98 km²

SUMMARY

Laamu Maavah Kandu is a channel entrance located on the western edge of Laamu Atoll in the Maldives. This channel connects the inside of the atoll with the open ocean and is influenced by combined tidal and wind driven currents. This area is also characterised by healthy fringing coral reefs and rocky substrates. Within this area there are: **threatened species** (e.g., Grey Reef Shark *Carcharhinus amblyrhynchos*); **undefined aggregation** (e.g., Silvertip Shark *Carcharhinus albimarginatus*); and **distinctive attributes** (Grey Reef Shark).

CRITERIA

Criterion A – Vulnerability; Sub-criterion C5 – Undefined Aggregations; Criterion D1 – Distinctiveness

DESCRIPTION OF HABITAT

Laamu Maavah Kandu is located on the western edge of Laamu Atoll, in the southern Maldives (Sluka & Miller 2001). This area encompasses a section of the channel entrance between the islands of Laamu Maavah and Laamu Guraidhoo, and sections of outer reef surrounding the channel including the drop off to the deeper Indian Ocean.

The tides in the Maldives are characterised by a semidiurnal microtidal regime with a tidal range of ~1 m on average (Caldwell et al. 2015; Rasheed et al. 2021). Combined tidal and wind driven currents can exceed speeds of 2 m/s and be 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). Laamu Atoll is encircled by fringing reefs and has few atoll channels connecting the inner water of the atoll with open ocean resulting in intense currents (Anderson et al. 1992; Sluka & Miller 2001). Currents striking slopes in bottom topography can generate orographic updrafts (Papastamatiou et al. 2021) such as the chanel entrace of Laamu Maavah Kandu.

The habitat of this area is composed of healthy coral reefs, and coral rubble substrate with several large *Porites* coral blocks rising above the rubble substrate (JM Hodge pers. obs. 2023). These coral blocks function as cleaning stations which provides opportunities for sharks and rays to be cleaned in often high current areas.

This Important Shark and Ray Area is benthopelagic and is delineated from surface waters (0 m) to 60 m based on the observations recorded, the habitat use 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 Spotted Eagle Ray (Finucci et al. submitted), and the Vulnerable Silvertip Shark (Rigby et al. submitted).

SUB-CRITERION C5 – UNDEFINED AGGREGATIONS

Laamu Maavah Kandu is an important area for undefined aggregations of two sharks and one ray species.

Laamu Atoll has very few reef passes, with the few channels that exist becoming important areas for shark aggregation. Sharks aggregate regularly and predictably in this area during incoming currents which generate updraft zones (Papastamatiou et al. 2021).

Encounter data have been collected by recreational and research divers on 344 surveys between 2017–2023. A total of 6,324 Grey Reef Sharks (average = 18.4 individuals/survey, maximum = 100 individual in one survey), 166 Silvertip Reef Sharks (average = 0.5 individuals/survey, maximum = 20 individuals in one survey), and 2,595 Spotted Eagle Rays (average = 7.5 individuals/survey, maximum = 50 individuals in one survey) have been observed aggregating in this area (Maldives Underwater Initiative by Six Senses Laamu unpubl. data 2023).

Grey Reef Sharks, Silvertip Sharks, and Spotted Eagle Rays are observed cruising in circles at the outer side of the channel entrance. The strong tidal currents at this channel and the nearby drop off to deeper waters may create updraft currents through orographic deflection in which the negatively buoyant Grey Reef Sharks and Silvertip Sharks may be able to rest (e.g., Papastamatiou et al. 2021). Observations have also seen the same behaviour displayed by Spotted Eagle Rays, although the scientific literature on this topic is scarce (Lauder & Di Santo 2015).

This area is of particular significance as it is one of the few sites in Laamu Atoll at which aggregations of this size can be observed. As Laamu has only 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.

SUB-CRITERION D1 – DISTINCTIVENESS

Within this area, one shark species shows distinct attributes.

Grey Reef Sharks regularly visit cleaning stations in this area, the cleaning stations lie at depths of around 20 m. Grey Reef Sharks cleaning at this particular section are observed year-round by scuba divers, individually or in groups of up to five individuals (Y Ibrahim pers. obs. 2021; M Staiger pers. obs. 2021–2023; G Holder pers. obs. 2022). The animals at this location display a cleaning behaviour in which they swim at an angle slowly over cleaning stations whilst cleaner wrasse pick off parasites from inside the gills (Y Ibrahim pers. obs. 2021; M Staiger pers. obs. 2021–2023; G Holder pers. obs. 2022). This area is especially relevant as it is one of the only few known cleaning stations for Grey Reef Sharks within Laamu Atoll and the 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												
Aetobatus ocellatus	Spotted Eagle Ray	EN	0–40	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
Stegostoma tigrinum	Indo-Pacific Leopard Shark	EN
Triaenodon obesus	Whitetip Reef Shark	VU
RAYS		
Mobula alfredi	Reef Manta Ray	VU
Mobula birostris	Oceanic Manta Ray	EN
Pastinachus sephen	Cowtail Ray	NT
Pateobatis fai	Pink Whipray	VU
Taeniurops meyeni	Blotched Fantail Ray	VU
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 Laamu Maavah Kandu is an important feeding area. This is the location of a multi-species grouper spawning aggregation primarily during the new moon with peaks during the months of June & October (Blue Marine Foundation unpubl. data 2018). This grouper spawning aggregation is regular and predictable, has been observed multiple times a year based on diver observations and fisher knowledge. Nine roving grouper spawning surveys conducted in June 2017 recorded a total of 260 groupers of two main species, Squaretail Coral Grouper *Plectropomus areolatus*, and Blacksaddled Coral Grouper *Plectropomus laevis,* with a lower abundance of Brown-marbled Grouper *Epinephelus fuscoguttatus* (Blue Marine Foundation unpubl. data 2018). In addition to the grouper spawning aggregations, this is a well-known area where large schools of Bigeye Trevally *Caranx sexfasciatus* regularly occur (Y Ibrahim pers. obs. 2021; M Staiger pers. obs. 2021–2023; G Holder pers. obs. 2022). This type of aggregations and has been shown to be an important source of nutrition for reef associated shark species elsewhere in the world (Mourier et al. 2016; Robbins & Renaud 2016). Silvertip Shark, 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 this species qualify under Criterion C2 Feeding Areas.

Whitetip Reef Sharks are abundant in the area. Encounter data have been collected by recreational and research divers on 344 surveys between 2017–2023. Whitetip Reef Sharks show a mean abundance of 10 individuals, with a maximum of 15 individuals in one survey and a total of 3,291 over 343 surveys. Additional information is required to highlight the importance of the area for this species.

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