

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 FUSHI KANDU ISRA

### Western Indian Ocean Region

#### SUMMARY

Laamu Fushi Kandu is a channel located on the eastern edge of Laamu Atoll, in the central-southern Maldives. The channel is ~850 m wide at the entrance, and 850 m long connecting the inside of the atoll to the open ocean. Laamu Fushi Kandu is characterised by live coral reef, rocky substrate, large coral blocks, and steep reef slopes with a strong upwelling on the outer edge of the channel. This area is designated as Fushi Kandu Marine Protected Area. Within this area there are: **threatened species** (e.g., Grey Reef Shark *Carcharhinus amblyrhynchos*); **reproductive areas** (Reef Manta Ray *Mobula alfredi*); and **undefined aggregations** (e.g., Spotted Eagle Ray *Aetobatus ocellatus*).

#### CRITERIA

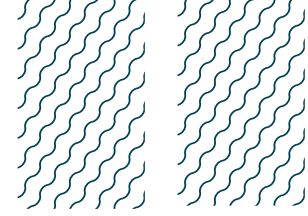
**Criterion A - Vulnerability; Sub-criterion C1 - Reproductive Areas; Sub-criterion C5 - Undefined Aggregations**

MALDIVES

0-60 metres

0.52 km<sup>2</sup>





## DESCRIPTION OF HABITAT

Laamu Fushi Kandu is located on the eastern edge of Laamu Atoll in the central-southern Maldives. Laamu Atoll is encircled by fringing reefs with a small number of atoll channels connecting the inner water of the atoll with the open ocean (Anderson et al. 1992; Sluka & Miller 2001). The area is situated in the channel between the islands L. Maabaidhoo and L. Kanuhuraa. This area encompasses a section of the channel, the channel entrance at the outside of the atoll, and sections of outer reef surrounding the channel including the drop off to the deeper open ocean.

The weather in the Maldives is strongly influenced by the South Asian monsoon, especially the northern and central atolls as these are closer to the Indian subcontinent (Anderson et al. 2011). Therefore, two monsoons annually occur in Maldives. The southwest monsoon (locally known as Hulhangu), from May to November, and the northeast monsoon (locally known as Iruvai), from January to March, with transitional periods in December and April (Shankar et al. 2002; Anderson et al. 2011). The southwest monsoon increases average rainfall and wind speeds, causing rougher seas and reduced visibility; in contrast, the northeast monsoon usually brings clear waters (Stevens & Froman 2019). The monsoonal winds generate oceanic currents mirroring the direction and intensity of the winds that interact with the geomorphology of the Maldivian archipelago generating upwellings through Island Mass Effect (Su 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 about 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, coral rubble substrate with multiple large *Porites* coral blocks rising above the rubble substrate. These coral blocks function as cleaning stations which provide opportunities for sharks and rays to be cleaned in often high current areas.

This area overlaps with Fushi Kandu Marine Protected Area (IUL-438-ENV/438/2021/371) designated and managed by the Maldives Ministry of Environment.

This Important Shark and Ray Area is benthopelagic and is delineated from surface waters (0 m) to 60 m based on the observations on 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 Reef Manta Ray (Marshall et al. 2022).

### SUB-CRITERION C1 – REPRODUCTIVE AREAS

Laamu Fushi Kandu is an important reproductive area for one ray species.

Reef Manta Ray mating behaviour and pregnant females have been recorded. This area is one of the main locations where Reef Manta Rays aggregate in Laamu Atoll. Between 2012–2022, a total of 528 surveys were conducted at this area (this includes dive and snorkel surveys as well as remote camera surveillance), of which 57% (n = 302) recorded Reef Manta Rays. Of the 142 individual Reef Manta

Rays recorded throughout Laamu Atoll, 47% (n = 66) were recorded at Fushi Kanduu. Since 2012, a total of 1,086 Reef Manta Ray sightings have been recorded at this site, of which 427 have been confirmed sightings through photo-identification. Reef Manta Ray sightings usually peak throughout the southwest monsoon from August to December (IDtheManta unpubl. data 2022).

Reef Manta Ray courtship behaviour has been recorded in 2018, 2021, and 2022, between October and November. The distinct courtship stages observed at Fushi Kanduu are initiation, endurance, evasion, and pre-copulation positioning (Stevens et al. 2018). Up to 11 individuals have been observed in a single courtship event, although more common are sightings of 5-7 individuals (IDtheManta unpubl. data 2022). Additionally, in 2018, four pregnant Reef Manta Rays were recorded, with most of them displaying cleaning behaviour (IDtheManta unpubl. data 2022). Females were determined pregnant by the presence of extended abdomens by trained researchers (Stevens 2016).

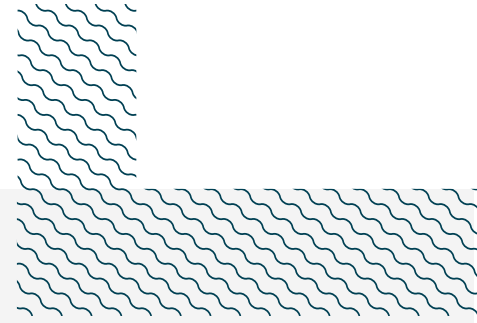
## SUB-CRITERION C5 – UNDEFINED AGGREGATIONS

Laamu Fushi Kanduu is an important aggregation site for one shark species and one ray species.

Laamu Fushi Kanduu is one of the most important aggregation sites in Laamu Atoll, together with Laamu Maavah Kanduu and Southern Laamu Atoll, where sharks tend to aggregate regularly and predictably year-round, during tidal incoming currents. Laamu Atoll has very few reef passes, with the few channels that exist becoming important areas for shark aggregations. Between October 2017 to August 2023, recreational and research divers conducted 401 surveys obtaining high abundances for Grey Reef Sharks and Spotted Eagle Rays (Maldives Underwater Initiative by Six Senses Laamu unpubl. data 2023).

Grey Reef Sharks are observed aggregating in the upwelling currents generated at the channel entrance. Encounter data were collected by recreational and research divers between 2017 and 2023. A total of 4,736 Grey Reef Sharks were observed at this location in over 401 surveys during the daytime when aggregations are common. Maximum aggregations encountered were 70 individuals but aggregations of between 10-50 are most commonly seen (Maldives Underwater Initiative by Six Senses Laamu unpubl. data 2023). The strong tidal currents at this channel and the nearby drop off to deeper waters creates an upwelling of current in which the negatively buoyant Grey Reef Sharks may be able to rest (Papastamatiou et al. 2021).

Spotted Eagle Rays aggregate in the upwelling currents generated at the channel entrance. Encounter data were collected by recreational and research divers between 2017 and 2023. A total of 2,602 individuals have been observed at this location over 401 surveys, with an average of 6.5 individuals per survey and a maximum of 34 individuals (Maldives Underwater Initiative by Six Senses Laamu unpubl. data 2023). Spotted Eagle Rays also hover in the current, possibly resting (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.



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## **Suggested citation**

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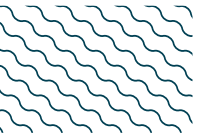
## QUALIFYING SPECIES

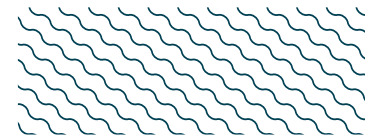
Scientific Name	Common Name	IUCN Red List Category	Global Depth Range (m)	ISRA Criteria/Sub-criteria Met									
				A	B	C1	C2	C3	C4	C5	D1	D2	
<b>SHARKS</b>													
<i>Carcharhinus amblyrhynchos</i>	Grey Reef Shark	EN	0-280	X							X		
<b>RAYS</b>													
<i>Aetobatus ocellatus</i>	Spotted Eagle Ray	EN	0-60	X							X		
<i>Mobula alfredi</i>	Reef Manta Ray	VU	0-711	X		X							

## SUPPORTING SPECIES

Scientific Name	Common Name	IUCN Red List Category
<b>SHARKS</b>		
<i>Carcharhinus albimarginatus</i>	Silvertip Shark	VU
<i>Carcharhinus melanopterus</i>	Blacktip Reef Shark	VU
<i>Stegostoma tigrinum</i>	Indo-Pacific Leopard Shark	EN
<i>Triaenodon obesus</i>	Whitetip Reef Shark	VU
<b>RAYS</b>		
<i>Mobula birostris</i>	Oceanic Manta Ray	EN
<i>Mobula kuhlii</i>	Shorthorned Pygmy Devil Ray	EN
<i>Pastinachus sephen</i>	Cowtail Ray	NT
<i>Pateobatis fai</i>	Pink Whipray	VU
<i>Taeniurops meyeri</i>	Blotched Fantail Ray	VU
<i>Urogymnus asperrimus</i>	Porcupine Ray	EN
<i>Urogymnus granulatus</i>	Mangrove Whipray	EN

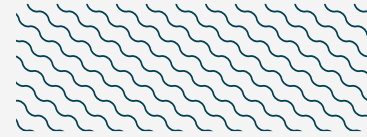
IUCN Red List of Threatened Species Categories are available by searching species names at [www.iucnredlist.org](http://www.iucnredlist.org) Abbreviations refer to: CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; DD, Data Deficient.





## SUPPORTING INFORMATION

There are additional indications that Laamu Fushi Kandu is an important feeding area for two shark species. The 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. During seven Roving Grouper spawning surveys conducted in May 2017, a total of 241 grouper sightings were recorded identifying three grouper species: Brown-marbled Grouper *Epinephelus fuscoguttatus*, Squaretail Coral Grouper *Plectropomus areolatus*, and Blacksaddled Coral Grouper *Plectropomus laevis* (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 White tip 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 feeding behavior.



## REFERENCES

- Anderson RC, Waheed Z, Arif A, Rasheed M. 1992. Reef fish resources survey in the Maldives, phase II. BOBP/WP 80. Madras: Bay of Bengal Program.
- Anderson RC, Adam MS, Goes JI. 2011. From monsoons to mantas: Seasonal distribution of *Manta alfredi* in the Maldives. *Fisheries Oceanography* 20: 104–113. <https://doi.org/10.1111/j.1365-2419.2011.00571.x>
- Finucci B, Rigby C, Armstrong A, Rezaie-Atagholipour M. Submitted. *Aetobatus ocellatus*. *The IUCN Red List of Threatened Species*.
- Lauder GV, Di Santo V. 2015. Swimming mechanics and energetics of elasmobranch fishes. *Fish Physiology* 34(Part A): 219–253. <https://doi.org/10.1016/B978-0-12-801289-5.00006-7>
- Marshall A, Barreto R, Carlson J, Fernando D, Fordham S, Francis MP, Herman K, Jabado RW, Liu KM, Pacoureau N, et al. 2022. *Mobula alfredi* (amended version of 2019 assessment). *The IUCN Red List of Threatened Species* 2022: e.T195459A214395983. <https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T195459A214395983.en>
- Mourier J, Maynard J, Parravicini V, Ballesta L, Clua E, Domeier ML, Planes S. 2016. Extreme inverted trophic pyramid of reef sharks supported by spawning groupers. *Current Biology* 26: 2011–2016. <https://doi.org/10.1016/j.cub.2016.05.058>
- Papastamatiou YP, Iosilevskii G, Di Santo V, Huveneers C, Hattab T, Planes S, Ballesta L, Mourier J. 2021. Sharks surf the slope: Current updrafts reduce energy expenditure for aggregating marine predators. *Journal of Animal Ecology* 90: 2302–2314. <https://doi.org/10.1111/1365-2656.13536>
- Robbins WD, Renaud P. 2016. Foraging mode of the grey reef shark, *Carcharhinus amblyrhynchos*, under two different scenarios. *Coral Reefs* 35: 253–260. <https://doi.org/10.1007/s00338-015-1366-z>
- Shankar D, Vinayachandran PN, Unnikrishnan AS. 2002. The monsoon currents in the north Indian Ocean. *Progress in Oceanography* 52: 63–120. [https://doi.org/10.1016/S0079-6611\(02\)00024-1](https://doi.org/10.1016/S0079-6611(02)00024-1)
- Simpfendorfer C, Fahmi, Bin Ali A, D, Utzurrum JAT, Seyha L, Maung A, Bineesh KK, Yuneni RR, Sianipar A, et al. 2020. *Carcharhinus amblyrhynchos*. *The IUCN Red List of Threatened Species* 2020: e.T39365A173433550. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T39365A173433550.en>
- Sluka RD, Miller MW. 2001. Herbivorous fish assemblages and herbivory pressure on Laamu Atoll, Republic of Maldives. *Coral Reefs* 20: 255–262. <https://doi.org/10.1007/s003380100166>
- Stevens GMW. 2016. Conservation and population ecology of manta rays in the Maldives. Unpublished PhD Thesis, University of York. York.
- Stevens GM, Froman N. 2019. The Maldives Archipelago. In: Sheppard C, ed. *World seas: an environmental evaluation, second edition*. London: Academic Press, 211–236. <https://doi.org/10.1016/B978-0-08-100853-9.00010-5>
- Stevens GMW, Hawkins JP, Roberts CM. 2018. Courtship and mating behaviour of manta rays *Mobula alfredi* and *M. birostris* in the Maldives. *Journal of Fish Biology* 93: 344–359. <https://doi.org/10.1111/jfb.13768>
- Su D, Wijeratne S, Pattiaratchi CB. 2021. Monsoon influence on the Island Mass Effect around the Maldives and Sri Lanka. *Frontiers in Marine Science* 8: 645672. <https://doi.org/10.3389/fmars.2021.645672>