

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

MAA KANDU ISRA

Western Indian Ocean Region

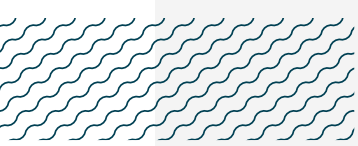
SUMMARY

Maa Kandu is a channel located in North Addu Atoll in the southern most atoll of the Maldives. This area is one of only four channels breaking the outer barrier reef of Addu Atoll. The channel stretches ~0.9 km in length and ~0.6–0.9 km in width and reaches a depth of ~30 m. This area consists of a benthic cover of fine sands and scattered coral blocks/rubble. The geomorphology of this channel coupled with the tidal movements create strong currents, especially on an incoming tide. This area overlaps with Addu Atoll UNESCO Biosphere Reserve and a marine protected area. Within this area there are: **threatened species** and **reproductive areas** (Reef Manta Ray *Mobula alfredi*).

CRITERIA

Criterion A - Vulnerability; Sub-criterion C1- Reproductive Areas

— —
MALDIVES
 — —
0-30 metres
 — —
0.7 km²
 — —





DESCRIPTION OF HABITAT

Maa Kanduu is located in the Maldives archipelago which sits centrally upon the Chagos-Laccadive Ridge (Stevens & Froman 2019). This area is located in North Addu Atoll in the southernmost atoll of the Maldives, representing the most isolated atoll in the archipelago. Maa Kanduu is a channel, or a pass entry, that connects the inner atoll to the open ocean. Channels, known locally as kanduu, are recognised by high current flow (Stevens & Froman 2019). This area is one of only four channels that break the outer barrier reef of Addu Atoll. Maa Kanduu is ~0.6 km wide in the inner side of the channel and on the outer side the mouth has an opening of ~0.9 km. The channel stretches ~0.9 km in length and reaches a depth of ~30 m. The channel substrate consists of a benthic cover of fine sand and scattered coral blocks/rubble which also cover the inner margins of the sloping channel walls. This area is characterised by a large coral outcrop with the top extending to 18 m below the ocean surface and the base situated on a sandy benthos at ~28 m.

Sea surface temperature fluctuates between 28–30°C with the lowest and highest average temperature recorded in January–February (28°C) and April (30°C), respectively (Weather Stats 2023). 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). Two monsoons occur annually in the Maldives. The southwest monsoon (locally known as Hulhan'gu), 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 Maldives archipelago disrupts the flow of the monsoon-driven North Equatorial Current as it crosses the Indian Ocean (Schott & McCreary 2001) which creates a current flow through the Maldives' channels (Sasamal 2006). The strongest lunar currents can overcome the prevailing monsoonal currents through the tidal suction mechanism along the channel's outer edges (Stevens 2016).

This area overlaps with Addu Atoll UNESCO Biosphere Reserve and a marine protected area.

This Important Shark and Ray Area is benthopelagic and is delineated from the inshore and surface waters (0 m) to 30 m based on the bathymetry of the area.

ISRA CRITERIA

CRITERION A – VULNERABILITY

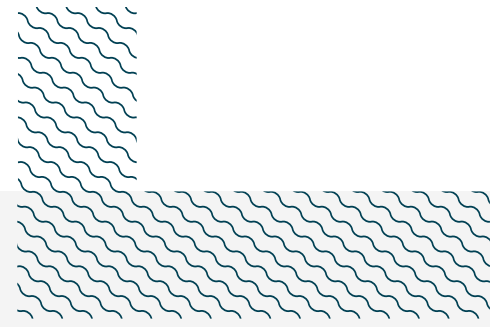
The one Qualifying Species within the area is considered threatened with extinction according to the IUCN Red List of Threatened Species™. The Reef Manta Ray is assessed as Vulnerable (Marshall et al. 2022).

SUB-CRITERION C1 – REPRODUCTIVE AREAS

Maa Kandu is an important reproductive area for one ray species.

Photo-identification (photo-ID) surveys (n = 335) were conducted between 2006–2022 in this area with 877 Reef Manta Ray sightings recorded (IDtheManta unpubl. data 2022). Of these, 92% (n = 806) involved individuals displaying cleaning behaviours. However, from 2009, nine surveys have recorded courtship behaviour involving 3–6 Reef Manta Rays on each occasion in this area (IDtheManta unpubl. data 2022). Moreover, six females were recorded as pregnant since 2006 (IDtheManta unpubl. data 2022). Females were determined pregnant by the presence of extended abdomens by trained researchers (Stevens 016). Using photo-ID, the pregnancy periods can be tracked for re-sighted Reef Manta Rays. Pregnancy in Reef Manta Rays has been verified in 2018–2019 using contactless ultrasound scanning in other sites of the Maldives (Froman et al. 2023). Individuals considered young-of-the-year (YOY; n = 12) have also been recorded. YOY are determined based on estimated sizes between 150–190 cm disc width (DW), length of tail, light ventral/spot pattern pigmentation, creases along pectorals, and often a light pink skin pigmentation on first sighting (Kashiwagi 2014; Stevens 2016; IDtheManta unpubl. data 2022). These records suggest that Maa Kandu has supported several (at least n = 12) independent pregnancies by different Reef Manta Rays over the survey period.

The Reef Manta Ray population in Addu Atoll is likely a regionally isolated population (n = 85 individuals), since 91% of the animals identified here (n = 77) are resident to the atoll and have not been recorded elsewhere. Between 2006–2022, 86% (n = 71) of the individuals recorded at Maa Kandu were sighted more than once in the area, with an average of 11 re-sightings per individual (IDtheManta unpubl. data 2022). Conducting long migrations, across deep channels to alternative atolls in search of more suitable habitats may be limited, not possible, or too costly to undertake for Reef Manta Rays (Whitney et al. 2023). This suggests that the habitat and resultant resources available within Addu Atoll including this area, are sufficient to sustain a healthy population of Reef Manta Rays.



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Tamaryn J Sawers (Manta Trust) and Adriana Gonzalez-Pestana (IUCN SSC Shark Specialist Group - ISRA Project) contributed and consolidated information included in this factsheet. We thank all participants of the 2023 ISRA Region 7 - Western Indian Ocean workshop for their contributions to this process.

This factsheet has undergone review by the ISRA Independent Review Panel prior to its publication.

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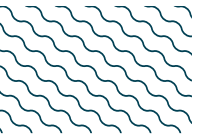
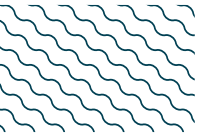
QUALIFYING SPECIES

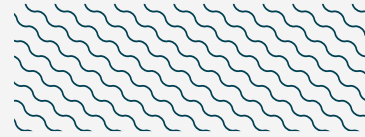
Scientific Name	Common Name	IUCN Red List Category	Global Depth Range (m)	ISRA Criteria/Sub-criteria Met									
				A	B	C1	C2	C3	C4	C5	D1	D2	
RAYS													
<i>Mobula alfredi</i>	Reef Manta Ray	VU	0-711	X		X							

SUPPORTING SPECIES

Scientific Name	Common Name	IUCN Red List Category
SHARKS		
<i>Carcharhinus amblyrhynchos</i>	Grey Reef Shark	EN
<i>Carcharhinus melanopterus</i>	Blacktip Reef Shark	VU
<i>Nebrius ferrugineus</i>	Tawny Nurse Shark	VU
<i>Triacnodon obesus</i>	Whitetip Reef Shark	VU

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.





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