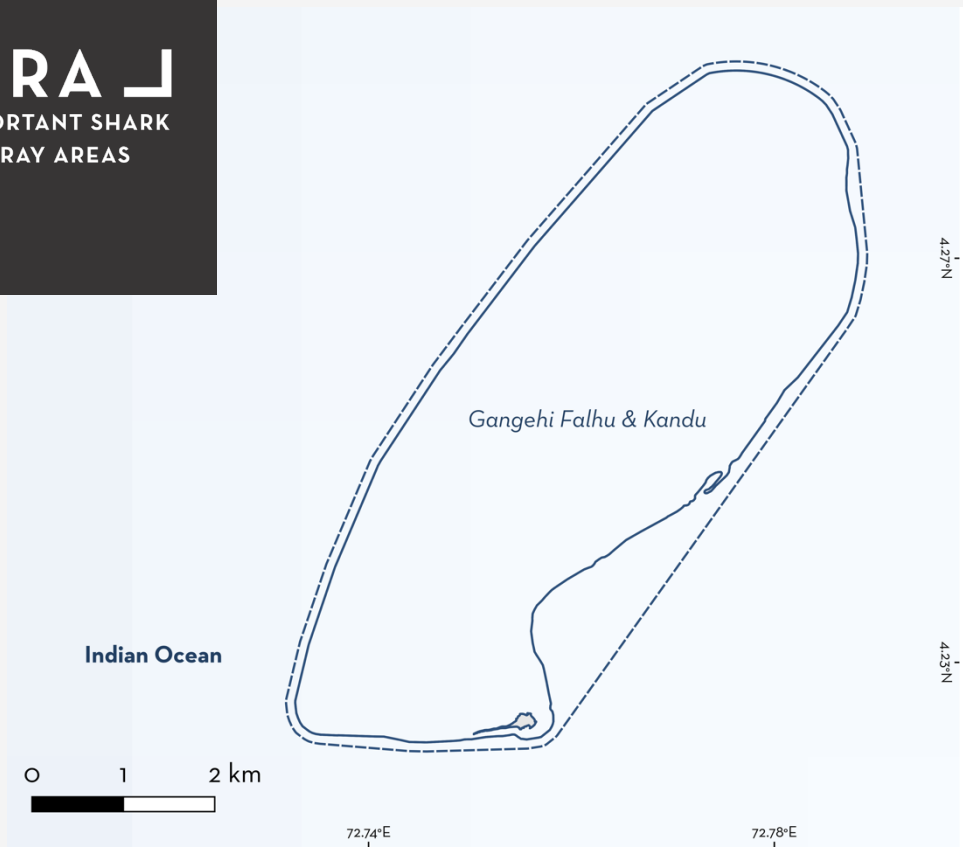
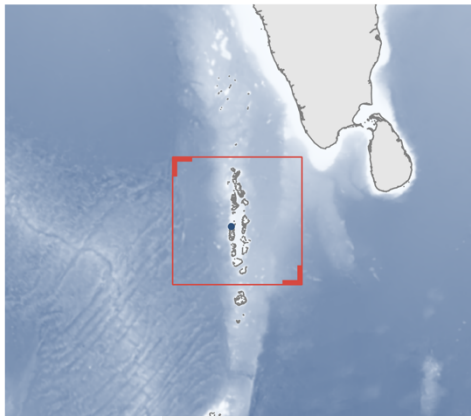
ISRA
IMPORTANT SHARK AND RAY AREAS





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

GANGEHI FALHU & KANDU ISRA

Western Indian Ocean Region

MALDIVES

0–35 metres

22.65 km²

SUMMARY

Gangehi Falhu & Kandu is located along the northwestern side of Ari Atoll in the western-central Maldives. This area is composed of two sites. Gangehi Falhu is a large lagoon situated along the inner-atoll margin of Gangehi Reef, constituting the outer barrier reef of Gangehi Island and located north of Mathiveri Island. Gangehi Kandu is the channel bordering the northern lagoon inlet and opens to the ocean at the atoll's northern tip. The inner basin of the area reaches a depth of ~10 m with a benthic cover of fine sand and scattered coral blocks. The geomorphology of this area coupled with tidal movements and ocean currents provides optimum conditions for concentrating zooplankton within Gangehi Falhu. Within the area there are: **threatened species**, **reproductive areas**, **feeding areas**, and **undefined aggregations** (Reef Manta Ray *Mobula alfredi*).

CRITERIA

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

DESCRIPTION OF HABITAT

Gangehi Falhu & Kandu is located along the northwestern tip of Ari Atoll in the western-central Maldives. Gangehi Falhu is a large lagoon situated along the inner-atoll margin of Gangehi Reef, constituting the outer barrier reef of Gangehi Island and located north of Mathiveri Island. Gangehi Kandu is the channel bordering the northern lagoon inlet and opens to the ocean at the atoll's northern tip. Gangehi Falhu is ~7.5 km in length and ~2 km wide, and Gangehi Kandu is ~0.5 km wide inside the atoll with the channel opening ~0.8 km wide. Gangehi Falhu inner basin reaches a depth of ~10 m with a benthic cover of fine sand and scattered coral blocks. It is enclosed by a shallow barrier reef of 2–10 m depth, with a primary northern access point along the Gangehi Kandu inlet, which has a maximum depth of ~25 m inside the atoll, dropping beyond 1,000 m outside the atoll. The plateau is relatively flat.

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 (May–November), and the northeast monsoon (January–March), with transitional periods in December and April (Anderson et al. 2011). 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). The location and geomorphology of this shallow lagoon coupled with the tidal movements and Langmuir Circulation acts as a zooplankton trap, especially during the northeast monsoon season (Hedley et al. 2018; Moloney et al. 2019; Harris et al. 2020; Harris & Stevens 2021).

This Important Shark and Ray Area is benthopelagic and is delineated from inshore and surface waters (0 m) to 35 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

Gangehi Falhu & Kandu is an important reproductive area for one ray species.

The area is important for young-of-the-year (YOY) and juvenile Reef Manta Rays. There were 59 surveys conducted at Gangehi Falhu between 2011–2022 (only 2% of all surveys conducted in Ari Atoll), and these revealed that 15 out of the 74 (20%) YOYs identified in Ari Atoll were first recorded in Gangehi Falhu. Assessment as YOY was based on individual estimated size of between 150–190 cm disc width (DW), length of tail, light ventral/spot pattern pigmentation, creases along pectoral fins, and often a light pink skin pigmentation at first sighting (Kashiwagi 2014; Stevens 2016; IDtheManta unpubl. data 2022). Size-at-birth for this species is 130–150 cm DW (Last et al. 2016). Shallow reef lagoons, like Gangehi Falhu, are hypothesised to serve as nursery sites for manta rays, as they provide calm conditions, safety from large predators, reliable food source, and opportunities for interaction with conspecifics (McCauley et al. 2014; Heupel et al. 2019; Setyawan et al. 2022).

Of the 1,418 Reef Manta Rays recorded throughout North and South Ari Atoll between 2011–2022 (IDtheManta unpubl. data 2022), 10% (n = 139) were observed in Gangehi Falhu. Seventy-five of these individuals were estimated to be immature (54%), with 80% of these deemed YOY. In addition, immature individuals are re-sighted in the area more commonly than adults (53% vs 35%, respectively), with 33 immature Reef Manta Rays (44%) being re-sighted within the area over consecutive years. The combination of (1) higher encounters with immature individuals, (2) immature individuals returning to the area, and (3) re-sightings over multiple years means Gangehi Falhu & Kandu meets the criteria of a nursery area (Heupel et al. 2007).

Lastly, there have been a limited number of reports of Reef Manta Ray courtship and mating interactions at Gangehi Kandu (S Scroglieri pers. comm. 2023).

SUB-CRITERION C2 – FEEDING AREAS

Gangehi Falhu & Kandu is an important feeding area for one ray species.

This is an important feeding area for Reef Manta Rays during the northeast monsoon when aggregations are more abundant due to the accumulation of zooplankton in the area (Harris et al. 2020). There were 57 snorkel surveys conducted at Gangehi Falhu between 2011–2022 (IDtheManta unpubl. data 2022). Reef Manta Rays displayed feeding behaviour during 55 (96%) of the surveys. Feeding aggregations of eight individuals or more (maximum = 22 individuals) occurred on 20 different occasions (35% of surveys). Individuals were observed actively feeding individually or organised in feeding chains. This is one of the most important and regular feeding locations recorded for Reef Manta Rays in North Ari Atoll (IDtheManta unpubl. data 2022). Reef Manta Rays aggregate in the area in a regular and predictable way when tidal movements and Langmuir Circulation concentrate zooplankton in the shallow lagoon (Harris et al. 2020; Harris & Stevens 2021), providing an ideal environment for planktivorous megafauna in the area (Harris et al. 2020).

There has been comparatively less survey effort at Gangehi Kandu (17 surveys between 2014–2022), however Reef Manta Rays have been recorded during every survey, and were observed displaying feeding behaviour during eight (47%) of the surveys (IDtheManta unpubl. data 2022).

SUB-CRITERION C5 – UNDEFINED AGGREGATIONS

Gangehi Falhu & Kandu is an important area for undefined aggregations of one ray species.

Gangehi Kandu has an important cleaning station for Reef Manta Rays (S Scroglieri pers. comm. 2023). Only 17 surveys were conducted at Gangehi Kandu between 2014–2022, and Reef Manta Rays were recorded on 100% of trips. Photo-identification has confirmed Reef Manta Ray cleaning activity of between 5–14 individuals on all occasions. It has been proposed that Reef Manta Rays use cleaning stations to thermoregulate and engage in social interactions (Stevens 2016). There have also been anecdotal reports of larger aggregations of Reef Manta Rays (>30) at this site (S Scroglieri pers. comm. 2023).

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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												
Mobula alfredi	Reef Manta Ray	VU	0–711	X		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
Rhincodon typus	Whale Shark	EN
Triaenodon obesus	Whitetip Reef Shark	VU
RAYS		
Aetobatus ocellatus	Spotted Eagle Ray	EN
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.

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