

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

GULF OF MANNAR ISRA

Asia Region

SUMMARY

Gulf of Mannar comprises coastal and continental shelf waters off Mandapam, Tamil Nadu, India. The Gulf of Mannar is a large bay located between southeast India and western Sri Lanka and the area includes the northwest part of the gulf. The area is characterised by coastal islands, fringing and patchy coral reefs, mangroves, and seagrass beds. Gulf of Mannar overlaps with the Gulf of Mannar Marine National Park and Biosphere Reserve and the Gulf of Mannar Marine Biosphere Reserve Ramsar Site. Within this area there are: **threatened species** (e.g., Mangrove Whipray *Urogymnus granulatus*); **range-restricted species** (e.g., Stripenose Guitarfish *Acroteriobatus variegatus*); **reproductive areas** (e.g., Javan Cownose Ray *Rhinoptera javanica*); and **feeding areas** (e.g., Bowmouth Guitarfish *Rhina ancylostomus*).

CRITERIA

Criterion A - Vulnerability; Criterion B - Range Restricted; Sub-criterion C1 - Reproductive Areas; Sub-criterion C2 - Feeding Areas

INDIA	—
0-120 metres	—
2,072.43 km ²	—





DESCRIPTION OF HABITAT

Gulf of Mannar comprises coastal and continental shelf waters off Mandapam, Tamil Nadu, India. The Gulf of Mannar is a large bay located between southeast India and western Sri Lanka and the area includes the northwest part of the gulf. The area encompasses a number of islands lying just off the coast at distances of 2-10 km offshore (Kumaraguru et al. 2006). Fringing and patchy coral reefs occur in shallow waters surrounding these islands (Thanilachalam & Ramachandran 1998). Low turbidity and an aerated sandy seafloor supports diverse coral growth (Jyothibabu et al. 2021). Coastal areas include a diversity of mangrove species (Kathiresan 2001; Balaji et al. 2012) and a diverse seagrass community dominated by *Halodule uninervis* which is extensively distributed in Gulf of Mannar and plays an important role in sediment accumulation and stabilisation (Sohom Seal et al. 2023). Substrates in the area are diverse including sandy, muddy, and rocky benthos (Sohom Seal et al. 2023).

The area is subject to a monsoonal climate with the southwest monsoon occurring during June-September and the northeast monsoon during November-February. The shelf in the area is narrow with a steep adjacent slope which causes oceanic waters to flow close to the coastline (Kumaraguru et al. 2006). Upwelled and plankton rich water from the southwest coast is moved into the Gulf of Mannar by an eastward flow during the southwest monsoon. A much weaker westward flow during the northeast monsoon from the Bay of Bengal brings relatively low saline and plankton-rich waters into the Gulf of Mannar through Palk Bay to the north (Rao et al. 2008; Jagadeesan et al. 2013; Jyothibabu et al. 2014; Amrutha & Sanil Kumar 2017). Unlike the adjacent Indian southwestern shelf in the Arabian Sea, oxygen deficiency associated with coastal upwelling does not occur in the Gulf of Mannar (Jyothibabu et al. 2014).

Gulf of Mannar overlaps with the Gulf of Mannar Marine National Park and Biosphere Reserve and the Gulf of Mannar Marine Biosphere Reserve Ramsar Site (Wetland of International Importance; Ramsar 2024).

This Important Shark and Ray Area is benthopelagic and is delineated from inshore and surface waters (0 m) to 120 m depth based on the bathymetry of the area.

ISRA CRITERIA

CRITERION A - VULNERABILITY

Nine Qualifying Species considered threatened with extinction according to the IUCN Red List of Threatened Species regularly occur in the area. Threatened sharks comprise one Endangered species and one Vulnerable species; threatened rays comprise three Critically Endangered species and four Endangered species (IUCN 2024).

CRITERION B - RANGE RESTRICTED

This area holds the regular presence of Stripenose Guitarfish, Sharpnose Guitarfish, and Bleeker's Whipray as resident range-restricted species. These species are regularly encountered and caught in local fisheries (Marichamy et al. 1999; Theivasigamani & Subbiah 2014; Joshi et al. 2016; Remya et al. 2021; Bineesh et al. 2023; Jena et al. 2023; L Remya unpubl. data 2023). Stripenose Guitarfish has a restricted geographic range in southern India and Sri Lanka (Last et al. 2016. Remya et al. 2021). Across this range, Gulf of Mannar represents the major fishing ground for the species where they are caught and landed at Thengapattinam and Kanyakumari (Remya et al. 2021; L Remya unpubl. data

2023). Stripenose Guitarfish is primarily encountered during July–September (Remya et al. 2021), Sharpnose Guitarfish during October–February (Theivasigamani & Subbiah 2014; Bineesh et al. 2023; Jena et al. 2023), and Bleeker’s Whipray occurs year-round (Marichamy et al. 1999; Theivasigamani & Subbiah 2014; Joshi et al. 2016; Bineesh et al. 2023; Jena et al. 2023; L Remya unpubl. data 2023). Bleeker’s Whipray represents the dominant ray species in the area where it comprised 34% of all ray landings from monitored trawl and gillnet fisheries operating in Gulf of Mannar during 1991–1996 (Marichamy et al. 1999). The species remains the dominant ray caught in the area (L Remya unpubl. data 2023). This species occurs at a higher proportion of the ray catch in Gulf of Mannar than in the adjacent Palk Bay to the north where it comprises 18% of all ray landings from monitored trawl and gillnet fisheries operating in Palk Bay during 2015 to 2023 (L Remya unpubl. data 2023). These species are restricted to the Arabian Sea Large Marine Ecosystem (LME) and the Bay of Bengal LME.

SUB-CRITERION C1 – REPRODUCTIVE AREAS

Gulf of Mannar is an important reproductive area for one shark and five ray species.

Specimens of these species were examined from landings of fisheries operating in the area, particularly at the Pamban and Mandapam Fish landing Centres adjacent to the area (L Remya unpubl. data 2023). Due to the large quantities of sharks and rays landed at this site, it is not possible to sample all animals from each species. Information provided below represents sub-samples of these landings.

Grey Bamboosharks lay egg cases in this area between September and January, according to data collected between 2019 and 2022 (L Remya unpubl. data 2023). Samples of Grey Bamboosharks caught by trawlers were collected biweekly from Mandapam Fish landing Centre adjacent to the area. Of 421 specimens examined (248 females; 173 males), 283 were mature, with 188 mature females (76% of females examined; 39.5–57.1 cm total length [TL]) having one or a pair of egg cases (1–2 embryos per female). Seventy-eight early life-stage individuals (neonates/young-of-the-year) were also observed during the same period within the size range 17.8–22.3 cm TL (CMFRI 2020; L Remya unpubl. data 2023). Size-at-hatching for this species is <12 cm TL (Ebert et al. 2021). A survey conducted among fishers and villagers in the area indicated that egg cases are frequently observed during December–January along the shallow coastal waters and beaches (L Remya unpubl. data 2023). Neonates of these species are seen in the shallow (0.4–2.0 m deep) habitats of the area, particularly on the seagrass beds, which is a preferred habitat for the species locally (L Remya unpubl. data 2023).

Stripenose Guitarfish appear to give birth in this area between July and September, according to data collected over the period 2021–2023 (L Remya unpubl. data 2023). Out of 24 specimens collected, 14 females examined (58% of the examined specimens; 63.5–79.8 cm TL) were either mature individuals with embryos (7–8 embryos per fish) or had recently given birth as evidenced by their post-partum state (uteri extended but without embryos; oviductal glands enlarged). Another pregnant female (76 cm TL) with seven uterine embryos which was caught in the area was also reported from Mandapam (Remya et al. 2021). Neonates were not observed in this area during the sampling period. This species has a restricted geographic range in southern India and Sri Lanka and reproductive areas are poorly defined for the species. Gulf of Mannar is one of the few areas with pregnant females reported and these not have not been documented from neighbouring Palk Bay or other parts of the Coromandel coast (Kizhakudan et al. 2018; Wilson et al. 2020; Remya et al. 2021).

Of 57 Sharpnose Guitarfish examined during October–February 2022–2023, 21 specimens (15 females; 6 males) were mature, with 14 females (93% of mature females; 87.8–147.6 cm TL) having

advanced-stage embryos (9–12 embryos per female) (L Remya unpubl. data 2023). Neonates (n = 29) were observed in the samples collected from the area during November–February.

Biological data collected over the period 2021–2023 (Remya et al. submitted) indicates that Bentfin Devil Ray appear to give birth in this area between July and September. All 46 females examined (73.5–194 cm disc width [DW]) were either individuals with full-term embryos (1 per female) or had recently given birth as evidenced by their post-partum state (developed extended trophonemata in the uteri). Neonates were not observed in the area.

Mature Javan Cownose Rays form schools in the area during November–February and large schools (130–540 individuals) have historically been caught in the area (James 1962, 1970). Data obtained between 2016 and 2022 indicate they give birth during these months (L Remya unpubl. data 2023). Of 252 specimens (198 females; 54 males) encountered, 84 were mature individuals, with 56 females (28% of females; 80–153 cm DW) having advanced-stage embryos (1–2 per female) (CMFRI 2021). Neonates (n = 140) were also observed during the same period within the size range of 34–42 cm DW (L Remya unpubl. data 2023). Published size-at-birth of the species is ~30 cm DW (Last et al. 2016). Shoaling neonates of these species were also seen in the shallow (2–25 m deep) habitats of the area, particularly near coral reefs off Mandapam (L Remya unpubl. data 2023).

Data collected over the period 2017–2023 (L Remya unpubl. data 2023) indicates that Mangrove Whipray give birth in this area particularly during April–December. All 32 females examined (67–153 cm DW) were mature with 10% having advanced embryos still with yolk sacs (July), 40% with full term embryos (April and December; n = 2–4 embryos/pups; 29.5–32.9 cm DW), and the remaining in a post-pupping stage (Remya et al. 2023). This species is found in shallow coastal waters in the area, including around mangroves (CMFRI 2021; Remya et al. 2023).

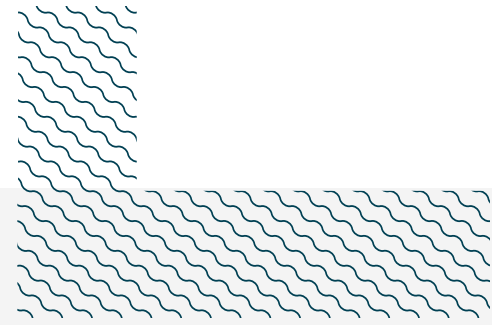
SUB-CRITERION C2 – FEEDING AREAS

Gulf of Mannar is an important feeding area for one shark and two ray species.

During the southwest monsoon (June–September) and northeast monsoon (November–February) zooplankton biomass has been shown to be higher in Gulf of Mannar compared to the neighbouring Palk Bay and Arabian Sea (Anjusha et al. 2013; Jagadeesan et al. 2013). Local ecological knowledge (LEK) for a period of eight years from 2015 from fishers operating in the area indicate that aggregations of 10–15 large Whale Sharks (estimated to be 4–5 t weight) visit the area each northeast monsoon (November–February) coinciding with periods of high zooplankton biomass (Anjusha et al. 2013; Jagadeesan et al. 2013). This is a predictable annual aggregation to feed during these months.

LEK from the period 2020–2023 from fishers operating in the area indicate that aggregations of 15–25 large (suspected mature) Bentfin Devil Rays occur in the area during July–September (L Remya unpubl. data 2023). This coincides with the occurrence of Needle Squid *Loligo singhalensis* in the area upon which the rays are feeding. This was confirmed by the examination of stomachs (n = 31) during these months where Needle Squid were the dominant prey item (Remya et al. submitted).

Bowmouth Guitarfish regularly occur seasonally in the area during June–September. Examination of landings from catches in the area over the period 2016–2022 comprised immature (n = 66; 75–92 cm TL) and mature (n = 35; 98–208 cm TL) animals but none of the 17 mature females examined were pregnant or in post-pupping stage (L Remya unpubl. data 2023). However, 52 specimens including all 17 mature females had full stomachs with Needle Squid being the dominant prey item (L Remya unpubl. data 2023). This coincides with the occurrence of Needle Squid in the area during these months (Mandapam Regional Centre 2010; Remya & Rajendran 2017) upon which the rays are feeding. These data indicate that this species occurs in the area during these months primarily for feeding rather than reproductive purposes.



Acknowledgments

Remya L (ICAR-Central Marine Fisheries Research Institute), Shoba Joe Kizhakudan (ICAR-Central Marine Fisheries Research Institute), Muktha M (ICAR-Central Marine Fisheries Research Institute), Swatipriyanka Sen (ICAR-Central Marine Fisheries Research Institute), Subal Kumar Roul (ICAR-Central Marine Fisheries Research Institute), Sujitha Thomas (ICAR-Central Marine Fisheries Research Institute), and Peter M Kyne (IUCN SSC Shark Specialist Group - ISRA Project) contributed and consolidated information included in this factsheet. We thank all participants of the 2024 ISRA Region 9 - Asia workshop for their contributions to this process.

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

This project was funded by the Shark Conservation Fund, a philanthropic collaborative pooling expertise and resources to meet the threats facing the world's sharks and rays. The Shark Conservation Fund is a project of Rockefeller Philanthropy Advisors.

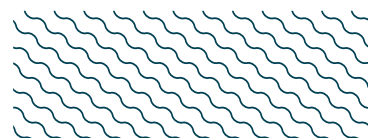
Suggested citation

IUCN SSC Shark Specialist Group. 2024. Gulf of Mannar ISRA Factsheet. Dubai: IUCN SSC Shark Specialist Group.

QUALIFYING SPECIES

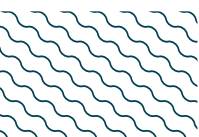
Scientific Name	Common Name	IUCN Red List Category	Global Depth Range (m)	ISRA Criteria/Sub-criteria Met								
				A	B	C1	C2	C3	C4	C5	D1	D2
SHARKS												
<i>Chiloscyllium griseum</i>	Grey Bambooshark	VU	0-100	X		X						
<i>Rhincodon typus</i>	Whale Shark	EN	0-1,928	X			X					
RAYS												
<i>Acroteriobatus variegatus</i>	Stripenose Guitarfish	CR	0-366	X	X	X						
<i>Glaucostegus granulatus</i>	Sharpnose Guitarfish	CR	0-120	X	X	X						
<i>Mobula thurstoni</i>	Bentfin Devil Ray	EN	0-100	X		X	X					
<i>Pateobatis bleekeri</i>	Bleeker's Whipray	EN	0-40	X	X							
<i>Rhina ancylostomus</i>	Bowmouth Guitarfish	CR	0-70	X			X					
<i>Rhinoptera javanica</i>	Javan Cownose Ray	EN	0-50	X		X						
<i>Urogymnus granulatus</i>	Mangrove Whipray	EN	0-85	X		X						

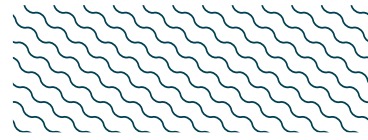
SUPPORTING SPECIES



Scientific Name	Common Name	IUCN Red List Category
SHARKS		
<i>Rhizoprionodon acutus</i>	Milk Shark	VU
<i>Sphyrna lewini</i>	Scalloped Hammerhead	CR
RAYS		
<i>Aetobatus flagellum</i>	Longhead Eagle Ray	EN
<i>Aetobatus ocellatus</i>	Spotted Eagle Ray	EN
<i>Hemirhynchus bennetti</i>	Bennett's Stingray	VU
<i>Himantura leoparda</i>	Leopard Whipray	EN
<i>Himantura uarnak</i>	Coach Whipray	EN
<i>Himantura undulata</i>	Honeycomb Whipray	EN
<i>Maculabatis gerrardi</i>	Whitespotted Whipray	EN
<i>Maculabatis pastinacoides</i>	Round Whipray	EN
<i>Mobula eregoodoo</i>	Longhorned Pygmy Devil Ray	EN
<i>Mobula kuhlii</i>	Shorthorned Pygmy Devil Ray	EN
<i>Mobula mobular</i>	Spinetail Devil Ray	EN
<i>Pastinachus ater</i>	Broad Cowtail Ray	VU
<i>Pateobatis fai</i>	Pink Whipray	VU
<i>Pateobatis jenkinsii</i>	Jenkins' Whipray	EN
<i>Plesiobatis daviesi</i>	Giant Stingaree	LC
<i>Rhinoptera jayakari</i>	Oman Cownose Ray	EN
<i>Rhynchobatus australiae</i>	Bottlenose Wedgefish	CR
<i>Rhynchobatus laevis</i>	Smoothnose Wedgefish	CR
<i>Taeniurops meyeri</i>	Blotched Fantail Ray	VU
<i>Urogymnus asperrimus</i>	Porcupine Ray	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.





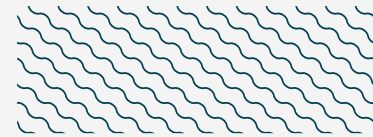
SUPPORTING INFORMATION

There are indications that Gulf of Mannar may be an important reproductive area for additional species.

A single pregnant Longhorned Pygmy Devil Ray of 125 cm DW was recorded from off Pamban in November 2016. This female was carrying one full-term embryo of 33.3 cm DW (Remya et al. submitted).

Data collected over the period 2021-2023 (L Remya unpubl. data 2023) shows that the area may be important for reproduction of Oman Cownose Rays. Biological data revealed that of 750 samples encountered, 36 were mature females (68-96.2 cm DW) with full-term embryos (1-2 per female) observed during July-September. Smaller life-stages of 41.2-53.7 cm DW with 85% male dominance were caught in schools (102-130 individuals) during the same period.

Twenty-two specimens of Smoothnose Wedgefish were recorded from the area during November-March 2021-2022. All 16 females examined (60.3-92.1 cm TL) were mature and without uterine embryos, but with mature ova of 3.1-4.5 cm diameter. Neonates were not observed (L Remya unpubl. data 2023).



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