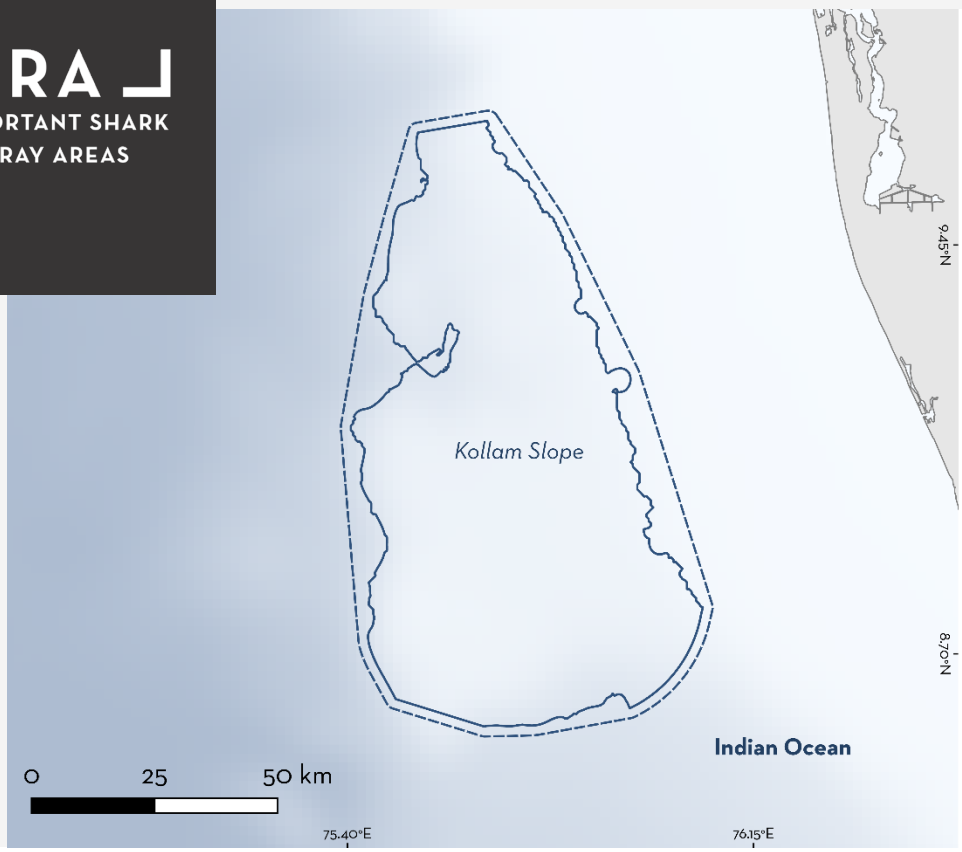
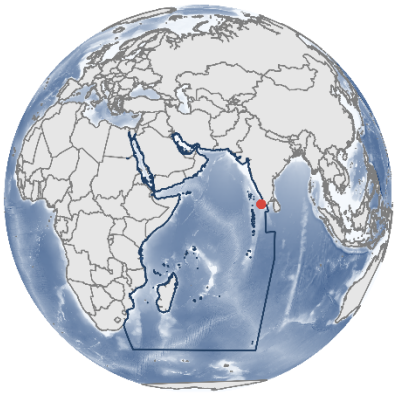
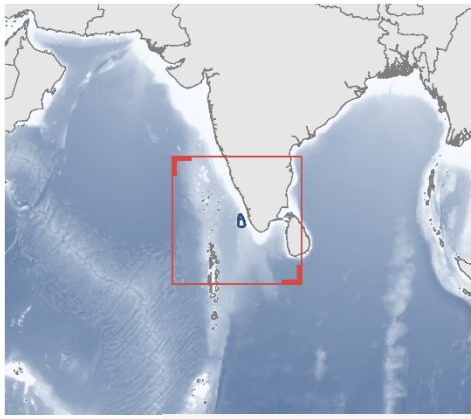
ISRA
IMPORTANT SHARK AND RAY AREAS







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

KOLLAM SLOPE ISRA

Western Indian Ocean Region

INDIA

200–1,000 metres

5,549.41 km²

SUMMARY

Kollam Slope encompasses deepwater habitat off Kerala, roughly between Kochi and Kollam, in southwest India. Substrates are varied with silty clay, muds, sand, and rocky substrates and outcrops. The area overlaps with the Arabian Sea Oxygen Minimum Zone Ecologically or Biologically Significant Marine Area. Within this area, there are: **threatened species** (e.g., Dwarf Gulper Shark *Centrophorus atromarginatus*); **range-restricted species** (e.g., Indian Swellshark *Cephaloscyllium silasi*); and **reproductive areas** (e.g., Bramble Shark *Echinorhinus brucus*).

CRITERIA

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

DESCRIPTION OF HABITAT

Kollam Slope encompasses deepwater habitat off Kerala, roughly between Kochi and Kollam, in southwest India. The west coast of India in this region is characterised by organic-rich sediments and organic matter (Paropkari et al. 1992; Damodaran 2010). Benthic sediments consist predominantly of silty clay, muds, biogenic calcareous sand, and rocky substratum/outcrops (Rao & Wagle 1997; Jayaraj et al. 2008; Damodaran 2010). The continental slope is relatively steep in the upper portion of the area to ~300 m and is characterised by hard substrates with occasional rocky and coral patches. Below 300 m, the gradient is less steep, and the benthos is softer. Between latitudes 8°N and 9°N, the steepness of the slope is interrupted by a flatter muddy area which is referred to as 'Quilon Bank/Kollam Bank'.

The area is under the influence of the broader oceanography and dynamics of the southeastern Arabian Sea. This region experiences significant seasonal variation in freshwater input from the land, particularly during the southwest monsoon (June–September), as well as the influx of major water and organic matter from Ashtamudi Lake, Kollam.

Seasonal wind patterns play a pivotal role in shaping the hydrography and oceanography of the upper water column in this region. The southwest monsoon (June–September) and the northeast monsoon (November–February) bring about a reversal of winds, significantly impacting the area (Johannessen et al. 1981; Smitha et al. 2008). During the southwest monsoon, coastal upwelling intensifies, resulting in the upward tilting of isotherms, typically beginning around April and going to the end of September (Gupta et al. 2016). This period is also characterised by a pole-ward undercurrent (Antony 1990; Smitha et al. 2008). Nutrient enrichment in the upper layers result in enhanced primary and secondary production (Banse 1959; Habeebrehman et al. 2008; Thomas et al. 2013). However, the high biological production and subsequent organic matter degradation lead to a rapid reduction in dissolved oxygen levels in the upwelled waters, creating oxygen-poor conditions. During the monsoon season, the formation of a low-saline film at the surface prevents oxygen from penetrating into the sub-surface waters, resulting in the development of intense seasonal sub-surface hypoxia over the continental shelf of the region (Naqvi et al. 2000, 2009; Jaleel 2012; Gupta et al. 2016).

This area overlaps with the Arabian Sea Oxygen Minimum Zone Ecologically or Biologically Significant Marine Area (EBSA) (CBD 2023).

This Important Shark and Ray Area is subsurface and benthopelagic and is delineated from 200–1,000 m based on 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 Critically Endangered Dwarf Gulper Shark (Rigby et al. 2020) and Indian Swellshark (Dulvy et al. 2020), and the Endangered Bramble Shark (Finucci et al. 2020).

CRITERION B – RANGE RESTRICTED

Kollam Slope holds the regular presence of the Indian Swellshark, Quagga Catshark, and Eastern Dwarf False Catshark as resident range-restricted species. These species are reported from the area

based on fishery port monitoring surveys and exploratory surveys (e.g., Akhilesh et al. 2011a, 2014; Akhilesh 2014; Bineesh KK unpubl. data 2023).

Kollam Slope, along with Wadge Bank, are the primary areas where Indian Swellsharks are regularly encountered in India (Akhilesh et al. 2014; Bineesh KK unpubl. data 2023).

Kollam Slope is the one area within the limited patchy Indian Ocean range of Quagga Catshark where it is encountered with any regularity (Akhilesh et al. 2011a; Bineesh KK unpubl. data 2023). The species is not recorded in any other deepsea fishery in India.

Eastern Dwarf Catshark are known only from three areas, one of which is Kollam Slope (which is also the only area it is encountered in India) (Ebert et al. 2019).

Quagga Catshark is known only from the Arabian Sea Large Marine Ecosystem (LME) while Indian Swellshark and Eastern Dwarf Catshark are restricted to the Arabian Sea LME and the Bay of Bengal LME.

SUB-CRITERION C1 – REPRODUCTIVE AREAS

Kollam Slope is an important reproductive area for five shark species. The primary data come from the monitoring of the major catch landing sites where fisheries operating in Kollam Slope land their catch (e.g., Akhilesh et al. 2011a, 2012, 2013a, 2013b; Akhilesh 2014).

Bristly Catsharks are bycatch of deepwater shrimp trawlers operating in the area (Akhilesh et al. 2013b). Landing site monitoring adjacent to Kollam Slope between September 2010 and February 2011 recorded 162 individuals (99 females; 63 males) with a size range of 12.0–36.6 cm total length (TL) (Akhilesh et al. 2013b). This included 38 pregnant females (38% of females examined). Examination of embryos of 4.0–12.2 cm TL from dissected females and free-swimming neonates of 12.0–13.2 cm TL with umbilical scars revealed a size-at-birth of ~12 cm TL (Akhilesh et al. 2013b). This area is the only location where reproductive activity has been documented for this species anywhere in its geographic range.

Dwarf Gulper Shark are caught in both targeted fisheries and as bycatch in the area (Akhilesh 2014). During landing site monitoring across 2018–2023, a total of 345 individuals with a size range of 35–85 cm TL were examined including 22 pregnant females (6.4% of individuals examined) and neonates of 30–35 cm TL (Bineesh KK unpubl. data 2023). Size-at-birth for the species is 28–36 cm TL (Ebert et al. 2021). Kollam Slope is the only area in the world where pregnant females have been encountered in any numbers. The only other indication of reproductive activity comes from fish landing site monitoring in Indonesia which recorded 93 Dwarf Gulper Shark from 21 survey trips between April 2001 and March 2006 (White & Dharmadi 2010). Of these, four pregnant females were documented (4.3% of individuals examined), however, spatial information on the location of catches is not available to delineate important areas.

Indian Swellshark has been recorded from the area during both exploratory surveys and during port landing site monitoring (Talwar 1974; CMFRI 2007; Akhilesh et al. 2014; Bineesh KK unpubl. data 2023). During landing site monitoring across 2018–2023, a total of 92 individuals with a size range of 18–46 cm TL (juveniles and adults) were examined including 28 females carrying egg cases (30% of individuals examined) (Bineesh KK unpubl. data 2023). The two egg cases (one in each uterus) of a 45 cm TL female examined by Akhilesh et al. (2014) each contained a late-stage embryo (8.5, 8.6 cm TL), although still with external yolk-sacs. This area is the only location where reproductive activity has been documented for this species anywhere in its geographic range.

Bramble Sharks are caught as bycatch of deepwater longlines, gillnets, and trawlers operating in the area. Landing site monitoring at Kochi Fisheries Harbour (Cochin) between January 2008 and December 2011 recorded 5,318 individuals of which 431 were examined with a size range of 46–318 cm TL (Akhilesh et al. 2013a). This included 80 pregnant females (19% of individuals examined) which were recorded in all months (Akhilesh et al. 2013a). Examination of late-term embryos of 35–42 cm TL from dissected females and free-swimming neonates revealed a size-at-birth of 42–46 cm TL (Akhilesh et al. 2013a). The size class 45–80 cm TL, which represents the early life stages including neonates and young-of-the-year, comprised 35 individuals (8% of individuals examined) (Akhilesh et al. 2013a). This is the only area in the world where sufficient Bramble Sharks have been sampled to allow examination of life history.

Pygmy Ribbontail Catshark are caught as bycatch of deepwater shrimp trawlers in the area (Akhilesh et al. 2012). Landing site monitoring at Sakthikulangara Fishing Harbour (Quilon) adjacent to Kollam Slope between September 2010 and March 2011 and during January 2012 recorded 549 individuals (284 females; 218 males; 47 unsexed) with a size range of 10.6–25.7 cm TL (Akhilesh et al. 2012). This included 136 pregnant females (50% of examined females) which were recorded in all months that surveys were undertaken, but with a peak in December and January when 76–87% of females were pregnant (Akhilesh et al. 2012). Examination of embryos of 8.0–12.8 cm TL from dissected females and free-swimming neonates from 10.6–13.6 cm TL with umbilical scars revealed a size-at-birth of 10.5–12.8 cm TL (Akhilesh et al. 2012).

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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												
Bythaelurus hispidus	Bristly Catshark	NT	200–800			X						
Centrophorus atromarginatus	Dwarf Gulper Shark	CR	100–540	X		X						
Cephaloscyllium silasi	Indian Swellshark	CR	100–500	X	X	X						
Echinorhinus brucus	Bramble Shark	EN	10–900	X		X						
Eridacnis radcliffei	Pgymy Ribbontail Catshark	LC	71–766			X						
Halaelurus quagga	Quagga Catshark	DD	45–300		X							
Planonasus indicus	Eastern Dwarf False Catshark	DD	200–1,000		X							

SUPPORTING SPECIES

Scientific Name	Common Name	IUCN Red List Category
SHARKS		
Centrophorus granulosus	Gulper Shark	EN
Centrophorus moluccensis	Smallfin Gulper Shark	VU
Centrophorus squamosus	Leafscale Gulper Shark	EN
Centroselachus crepidater	Longnose Velvet Dogfish	NT
Deania profundorum	Arrowhead Dogfish	NT
Heptranchias perlo	Sharpnose Sevengill Shark	NT
Hexanchus griseus	Bluntnose Sixgill Shark	NT
Iago omanensis	Bigeye Houndshark	LC
RAYS		
Acroteriobatus variegatus	Stripenose Guitarfish	CR
Benthobatis moresbyi	Indian Blind Numbfish	LC
Dipturus johannisdavisi	Travancore Skate	DD
Hexatrygon bickelli	Sixgill Stingray	LC
Orbiraja powelli	Indian Ring Skate	NT
Plesiobatis daviesi	Giant Stingaree	LC
CHIMAERAS		
Neoharriotta pinnata	Sicklefin Chimaera	NT

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 this area may be important for reproduction of other deepwater species including Gulper Shark, Smallfin Gulper Shark, Leafscale Gulper Shark, Quagga Catshark, and Sicklefin Chimaera, and for feeding in these species and others including Bristly Catshark, Bramble Shark, and Pygmy Ribbontail Catshark. Further information is required on these activities in the area.

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