

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

PANAMA MUERTOS BAY ISRA

Central and South American Pacific Region

SUMMARY

Panama Muertos Bay is a large estuarine and riverine area within the Gulf of Chiriquí in western Pacific Panama. It partially falls within the Eastern Tropical Pacific Marine Corridor Ecologically or Biologically Significant Marine Area (EBSA). The area has a diversity of marine, estuarine, and freshwater habitats including sandy beaches, mudflats, islands, rivers, and importantly, extensive mangrove forests in good ecological condition. The area is primarily shallow (<10 m depth) with large areas of exposed mudflats at low tide. Within this area there are: **threatened species** (e.g., Bonnethead Shark *Sphyrna tiburo*) and **reproductive areas** (e.g., Pacific Smalltail Shark *Carcharhinus cerdale*).

CRITERIA

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

— —
PANAMA
 — —
0-33 metres
 — —
304.41 km²
 — —





DESCRIPTION OF HABITAT

Panama Muertos Bay is a large estuarine and riverine system in the Gulf of Chiriquí, western Pacific Panama. Situated within the Pacific Central-American Coastal Large Marine Ecosystem, the area has a diversity of marine, estuarine, and freshwater habitats including sandy beaches, mudflats, islands, rivers, swamp forests, and importantly, extensive mangrove forests in good ecological condition. The broader Gulf of Chiriquí has >380 km² of mangroves, the second largest area of mangroves in Panama. Mangrove diversity is high and includes the Red Mangrove species *Rhizophora mangle* and *R. racemosa*, Button Mangrove *Conocarpus erectus*, Black Mangrove *Avicennia germinans*, and White Mangrove *Laguncularia racemosa*. The area includes most of the Refugio de Vida Silvestre Playa la Barqueta Agrícola and a small portion of the Parque Nacional Marino Golfo de Chiriquí. The area partially falls within the Eastern Tropical Pacific Marine Corridor Ecologically or Biologically Significant Marine Area (SCBD 2022) and partially overlaps with the David Mangroves Key Biodiversity Area (KBA 2022). The area is mostly shallow water (<10 m) but with deeper channels to 33 m depth (Navionics 2022).

This Important Shark and Ray Area is delineated from surface and inshore waters (0 m) to 33 m depth based on the bathymetry of the area (Navionics 2022).

ISRA CRITERIA

CRITERION A – VULNERABILITY

Four 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 Pacific Smalltail Shark (Pollom et al. 2020) and Scalloped Hammerhead (Rigby et al. 2019), Endangered Bonnethead Shark (Pollom et al. 2021), and Vulnerable Blacktip Shark (Rigby et al. 2021).

SUB-CRITERION C1 – REPRODUCTIVE AREAS

Panama Muertos Bay is an important reproductive area for four shark species. The area has been identified as a nursery area based on interviews with fishers and artisanal fishery monitoring (Robles et al. 2015; López-Angarita et al. 2021b).

Scalloped Hammerhead was the most recorded shark species in artisanal fisheries monitoring, representing 49.2% of the catch. Size ranged 33.5–256 cm total length (TL) with an average of 60.4 ± 19 cm (n = 705). Neonates and young-of-the-year (<75 cm TL), which represented most of the catch, were recorded in all sampling months (with a peak in March), supporting the use of the area as a nursery area (Robles et al. 2015). The reported size-at-birth of Scalloped Hammerhead in the Eastern Pacific includes 47–55 cm TL for Ecuador (Estupiñán-Montaña et al. 2021), although sizes captured in Panama Muertos Bay suggest a smaller size-at-birth locally.

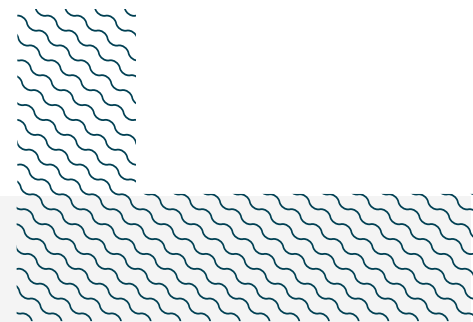
Pacific Smalltail Shark was the second most recorded shark, representing 33.1% of the catch. Size ranged 30.4–107.5 cm TL with an average of 43.7 ± 7.5 cm (n = 475). Only one adult was caught with the catch being dominated by small size classes representing neonates and young-of-the-year (Robles et al. 2015). The reported size-at-birth of Pacific Smalltail Shark is >30 cm TL (based on the size of near-term embryos; Castro 2011).

Blacktip Shark represented 5.6% of the catch. Size ranged 43.0–78.2 cm TL with an average of 68.7 cm TL (n = 80) (Robles et al. 2015). Panama Muertos Bay catches of Blacktip Shark were dominated



by neonate and young-of-the-year with their sizes mostly within the size-at-birth range of 38–72 cm TL (Ebert et al. 2021).

Bonnethead Shark represented 6.4% of the catch. Size ranged 34.0–118.5 cm TL with an average of 60.8 cm TL (n = 92) and the highest catch frequency in the size range 45–70 cm TL. A gravid female was caught in April (although data are not available for all months to fully understand the seasonality of reproduction in the area) (Robles et al. 2015). Bonnethead Shark size-at-birth is 22–30 cm TL (Lombardi-Carlson et al. 2003) and 23–24 cm TL (Ulrich et al. 2007), both from the Western Atlantic and young-of-the-year range in size 31–55 cm TL (Western Atlantic; Carlson & Parsons 1997). While no neonate sized animals were caught during the Panama Muertos Bay study, there was considerable overlap with reported young-of-the-year size.



Acknowledgments

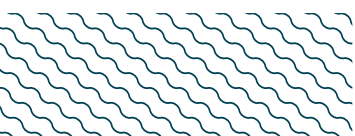
Peter M. Kyne (IUCN SSC Shark Specialist Group - ISRA Project), Jorge Manuel Morales-Saldaña (Smithsonian Tropical Research Institute), Yehudi N. Rodríguez-Arriatti (Universidad Marítima Internacional de Panamá), Ángel J. Vega (Universidad de Panamá-Sede Veraguas), Juan Camilo Cubillos-M. (University of Oldenburg), and Juliana López-Angarita (Fundación Talking Oceans) contributed and consolidated information included in this factsheet. We thank the participants of the 2022 ISRA Region 12 – Central and South American Pacific 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. 2023. Panama Muertos Bay ISRA Factsheet. Dubai: IUCN SSC Shark Specialist Group.



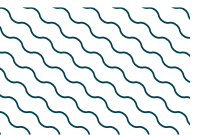
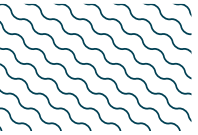
QUALIFYING SPECIES

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
SHARKS											
<i>Carcharhinus cerdale</i>	Pacific Smalltail Shark	CR	0-40	X		X					
<i>Carcharhinus limbatus</i>	Blacktip Shark	VU	0-140	X		X					
<i>Sphyrna lewini</i>	Scalloped Hammerhead	CR	0-1,043	X		X					
<i>Sphyrna tiburo</i>	Bonnethead Shark	EN	0-90	X		X					

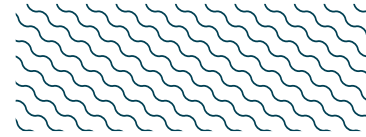
SUPPORTING SPECIES

Scientific Name	Common Name	IUCN Red List Category
SHARKS		
<i>Carcharhinus leucas</i>	Bull Shark	VU
<i>Rhizoprionodon longurio</i>	Pacific Sharpnose Shark	VU
<i>Sphyrna corona</i>	Scalloped Bonnethead	CR
<i>Sphyrna media</i>	Scoophead Shark	CR
RAYS		
<i>Pristis pristis</i>	Large-tooth Sawfish	CR

IUCN Red List categories: *CR*, Critically Endangered; *EN*, Endangered; *VU*, Vulnerable; *NT*, Near Threatened; *LC*, Least Concern; *DD*, Data Deficient.



SUPPORTING INFORMATION



There are additional indications that Panama Muertos Bay is important for reproductive purposes of two shark and one ray species.

The capture of small size classes of Scoophead Shark and Scalloped Bonnethead suggests that this area may be important for reproduction, however there is limited information on the regular presence of neonates or on reproductive activities.

Scoophead Shark size ranged 39.8-127.0 cm TL with an average of 65.9 cm TL ($n = 59$) (Robles et al. 2015). Scoophead Shark size-at-birth is 23 cm TL with samples primarily from the Eastern Pacific (Gilbert 1967).

Scalloped Bonnethead size ranged 34.7-73.5 cm TL with an average of 50.6 cm TL ($n = 15$) (Robles et al. 2015). Scalloped Bonnethead size-at-birth is 28 cm TL in the Eastern Pacific (Gilbert 1967) and 22-23 cm TL in Colombia (Orozco Guarín et al. 2015).

Largetooth Sawfish are locally extinct from much of the Eastern Tropical Pacific (Kyne et al. 2013; López-Angarita et al. 2021a; Yan et al. 2021). Even a small number of contemporary records in areas across this region might indicate the presence of a regionally significant area, especially if large expanses of suitable sawfish habitat is present like in Panama Muertos Bay.

Within Panama Muertos Bay, there are two records from the year 2000 (from Chorchá and Boca Chica; López-Angarita et al. 2021a). An additional record comes from San Lorenzo, just outside the area in 2013. These records originate from interviews with local fishers who were able to provide location-specific details of where sawfish were caught. Largetooth Sawfish is the only sawfish species occurring in the Eastern Pacific, is distinctive from other shark and ray species, and recognisable based on its elongated, tooth-studded rostrum.

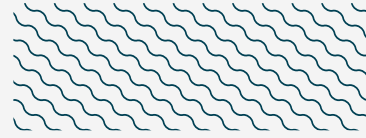
This is too few records to determine the regularity of contemporary occurrence in Panama Muertos Bay. However, other sites in Pacific Panama and Costa Rica have been identified as bright spots for Largetooth Sawfish (Valerio-Vargas & Espinoza 2019; López-Angarita et al. 2021a). These include (1) the Gulf of San Miguel and Tuira River of Darién Province in eastern Panama with $n = 10$ records from six sites since the year 2000 with the recent capture and release of a neonate in 2022; (2) the Gulf of Montijo to the east of Panama Muertos Bay with $n = 11$ records from eight sites since the year 2000; and (3) the Térraba-Sierpe area in southern Costa Rica (to the west of Panama Muertos Bay) where sawfish sightings (<5 years ago) were more common than in other areas of Costa Rica (Chicas-Batres, 1995; Angulo et al. 2013; Valerio-Vargas & Espinoza 2019; López-Angarita et al. 2021a; Instagram 2022).

Both Gulf of San Miguel and Tuira River and Térraba-Sierpe have contemporary records of neonates and small juveniles supporting these as nursery areas for the species. The habitat within these areas, the Gulf of Montijo, and Panama Muertos Bay is the expected nursery area habitat of Largetooth Sawfish. Outside of the Eastern Pacific, it has been documented that Largetooth Sawfish spend the first 4-5 years in freshwater environments before moving to estuarine and coastal marine waters (except for the unique but depleted Lake Nicaragua population where individuals may have spent their whole life-cycle in freshwater; Thorson 1976, 1982; Thorburn et al. 2007). Apart from Lake Nicaragua, pupping is generally thought to occur around estuaries and river mouths (Kyne et al. 2021).

Nestled between these sites in Costa Rica and Panama, and despite the lack of further detail on the size classes of contemporary Largetooth Sawfish records in the area (i.e., if these were neonates, juveniles, or adults), several factors suggest that Panama Muertos Bay may be an important area for

the species: (1) a small number of contemporary records; (2) known life-cycle; and (3) known habitat preferences with extensive areas of core mangrove and riverine habitat in the area.

Combined, these factors suggest Panama Muertos Bay may act as a nursery area for Largetooth Sawfish, but further information is required on the persistence of the species in the area and its function as an important reproductive area.



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