

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

NAVIDAD BAY ISRA

Central and South American Pacific Region

SUMMARY

Navidad Bay is located along the coast of Jalisco state, Mexico. This area includes two river mouths and is characterised by sandy substrates, permanent freshwater input, and seasonal input of nutrients and sediments in the river mouths. This produces turbid waters within the small bays and high-energy beaches of the area, which are seasonally connected to the sea. Within this area there are: **threatened species** (e.g., Grey-spotted Guitarfish *Pseudobatos glaucostigmus*); **range-restricted species** (e.g., California Butterfly Ray *Gymnura marmorata*); **reproductive areas** (Scalloped Hammerhead *Sphyrna lewini*); and **feeding areas** (e.g., Haller's Round Ray *Urobatis halleri*).

CRITERIA

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

MEXICO

0-73 metres

395.05 km²





DESCRIPTION OF HABITAT

Navidad Bay is located along the coast of Jalisco state in Mexico. Situated within the Pacific Central-American Coastal Large Marine Ecosystem (LME), the area extends from the El Tecuan estuary in Jalisco to the mouth of the Marabasco River in Colima. The area is composed of small bays and high-energy beaches along the coast and river mouths, which are seasonally connected to the sea (mostly during the rainy season). The area includes two main rivers (Marabasco and Purificación), the El Tecuan lagoon, and Navidad Bay. The Marabasco River is the largest in the area and up to three separate discharges open during rainy seasons. This river is surrounded by beaches with sandy bottoms. The Purificación River is the second largest in the area. The mouth is surrounded by beaches with sandy substrates and some rocky areas near the mouth of the El Tecuan lagoon (Flores-de la Hoya et al. 2018; Corgos & Rosende-Pereiro 2021).

Navidad Bay has an extension of 13 km² and includes a permanent coastal lagoon (Navidad lagoon) connected to the sea and a second basin of the Marabasco River. The area is dominated by sandy substrates, rocky areas, and coral reefs. Subtropical conditions produced by upwellings dominate from February to May, which are characterised by a decrease in water temperature and high salinities. Tropical conditions, characterised by an increase in temperatures and a decrease in salinity, are present in the boreal summer and autumn when the rainy season occurs (Ambriz-Arreola et al. 2012; Kozak et al. 2014).

This Important Shark and Ray Area is delineated from inshore and surface waters (0 m) to a depth of 73 m based on the depth range of Qualifying Species in the area (Corgos & Rosene-Pereiro 2021).

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. Threatened sharks comprise the Critically Endangered Scalloped Hammerhead (Rigby et al. 2019); threatened rays comprise the Vulnerable Cortez Numbfish (Pollom et al. 2020a) and Grey-spotted Guitarfish (Pollom et al. 2020b).

CRITERION B – RANGE RESTRICTED

Navidad Bay holds the regular presence of California Butterfly Ray, Munda Round Ray, and Banded Guitarfish as resident range-restricted species.

California Butterfly Ray and Banded Guitarfish are restricted to the California Current and the Gulf of California LME. Munda Round Ray is restricted to the Pacific Central-American Coastal LME (Valadez-González 2007). All three species are commonly caught year-round by artisanal fisheries in the area at depths between 20–60 m (Valadez-González 2007; Galván-Piña et al. 2018; Fernanda Reyes pers. comm. 2022).

SUB-CRITERION C1 – REPRODUCTIVE AREAS

Navidad Bay is an important reproductive area for one shark species. This area is considered a nursery area for Scalloped Hammerhead based on the presence of neonates with umbilical scars and juveniles (41.6–110.1 cm total length [TL]), mostly during the boreal summer. Popping occurs from May–December during the rainy, warmer season, and in areas close to river mouths. Most births



occur in June–August and tagged individuals were recorded moving from Marabasco and Rebalcito Rivers to Navidad Bay. Various data sources have been used to support the denomination of this nursery, such as fisheries data, independent sampling, stable isotope analysis, and acoustic tagging. The seasonal presence of these animals has been confirmed from 2013 to 2017 with the majority of neonates and young-of-the-year recorded mostly in depths less than 20 m, in sandy areas with high turbidity. Acoustically tagged neonates and young-of-the-year (n = 20), monitored from 2014–2016, showed high residency to areas between the mouth of the Purificacion River and El Tecuán estuary (Corgos & Rosende-Pereiro 2022).

SUB-CRITERION C2 – FEEDING AREAS

Navidad Bay is an important feeding area for one shark and seven ray species.

Based on stable isotope analysis, it has been reported that neonate and juvenile Scalloped Hammerhead (n = 117) feed in areas near the mouths of the rivers. The diet of neonate and young-of-the-year (<75 cm TL) is composed of small bony fishes and crustaceans. The diet of juveniles (>75 cm TL) is composed of larger fish, sharks, rays, and cephalopods. In addition, $\delta^{13}\text{C}$ values show that larger sharks reflect the isotopic signature of coastal habitats. This information and the spatial-temporal use of the species described with acoustic tagging, support this species feeding in the area (Rosende-Pereiro et al. 2019; Corgos & Rosende-Pereiro 2022).

The rocky and sandy benthic areas in front of Navidad Bay has been reported as a feeding area for seven ray species based on stomach content analysis from 20 years ago (Valadez-González et al. 2001; Valadez-González 2007). Recent observations from ongoing studies showed that these species are still occurring in the area, suggesting that these processes persist (Galván-Piña et al. 2018; Fernanda Reyes pers. comm. 2022). The limited movements of these species along with fresh prey in stomachs supports that they feed in the area.

Stomach content analysis from 226 Cortez Numbfish (40% of stomachs full) (size range of 12–70 cm TL) showed that this species feeds mostly on polychaete worms at depths between 20–40 m, with larger rays also feeding on eels (Valadez-González 2007).

Stomach content analysis from 82 Vermiculate Numbfish (72% of stomachs full) (size range of 8–29 cm TL) showed that this species feeds mostly on polychaete worms in this area at depths between 0–20 m (Valadez-González 2007).

Seventy percent of sampled Grey-spotted Guitarfish (n = 139; 18–82 cm TL) had their stomachs full. The analysis showed that this species feeds mostly on crustaceans (decapods and stomatopods) at depths ~60 m (Valadez-González 2007).

Stomach content analysis from 332 Haller's Round Ray (8–35 cm disc width [DW]) revealed that half of sampled individuals had their stomachs full and the most important items in their diet were stomatopods and amphipods (Valadez-González et al. 2001; Valadez-González 2007).

Stomach content analysis from 545 Munda Round Ray (52% of stomachs full) (8–32 cm TL) showed that this species feeds on stomatopods and decapods in the area, at depths between 20–40 m. The importance of fishes in the diet increases in larger individuals (Valadez-González 2007).

Stomach content analysis from 154 Rogers' Round Ray (12–25 cm DW) showed that 63% of stomachs were full and that this species feeds mostly on decapods and stomatopods between 20–40 m depth, with larger individuals also feeding on demersal fishes (Valadez-González 2007).

Stomach content analysis from Banded Guitarfish (n = 63; 20–61 cm TL) caught in the area showed

that this species feeds on decapods and fishes. Forty one percent of individuals sampled had their stomachs full (Valadez-González 2007).

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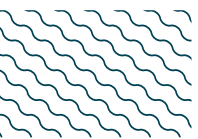
QUALIFYING SPECIES

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												
<i>Sphyrna lewini</i>	Scalloped Hammerhead	CR	0-1,043	X		X	X					
RAYS												
<i>Gymnura marmorata</i>	California Butterfly Ray	NT	1-95		X							
<i>Narcine entemedor</i>	Cortez Numbfish	VU	0-100	X			X					
<i>Narcine vermiculatus</i>	Vermiculate Numbfish	LC	0-100				X					
<i>Pseudobatos glaucostigmus</i>	Grey-spotted Guitarfish	VU	0-110	X			X					
<i>Urobatis halleri</i>	Haller's Round Ray	LC	15-91				X					
<i>Urotrygon munda</i>	Munda Round Ray	NT	5-50		X		X					
<i>Urotrygon rogersi</i>	Rogers' Round Ray	NT	2-235				X					
<i>Zapteryx exasperata</i>	Banded Guitarfish	DD	0-200		X		X					

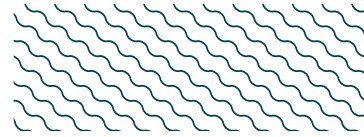
SUPPORTING SPECIES

Scientific Name	Common Name	IUCN Red List Category
RAYS		
<i>Diplobatis ommata</i>	Pacific Dwarf Numbfish	LC
<i>Hypanus longus</i>	Longtail Stingray	VU
<i>Rostroraja equatorialis</i>	Equatorial Skate	VU
<i>Urobatis concentricus</i>	Bullseye Round Ray	LC

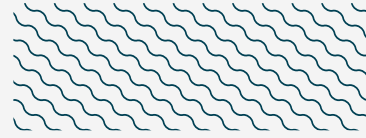
IUCN Red List categories: *CR*, Critically Endangered; *EN*, Endangered; *VU*, Vulnerable; *NT*, Near Threatened; *LC*, Least Concern; *DD*, Data Deficient.



SUPPORTING INFORMATION



There are additional indications that this area is important for the movement of Scalloped Hammerheads, particularly around the Purificación River and the Marabasco River. Neonates and young-of-the-year animals born near the river mouths move to the bay where freshwater input is permanent and there is a high prey availability. Seven individuals were tagged for 68 days between October–December 2014 within a 14 km² area. After spending the first months of their lives in the nursery, these sharks appear to move to deeper waters outside the area (Rosende-Pereiro & Corgos 2018; Corgos & Rosende-Pereiro 2022). However, more information regarding connectivity with other areas is needed.



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