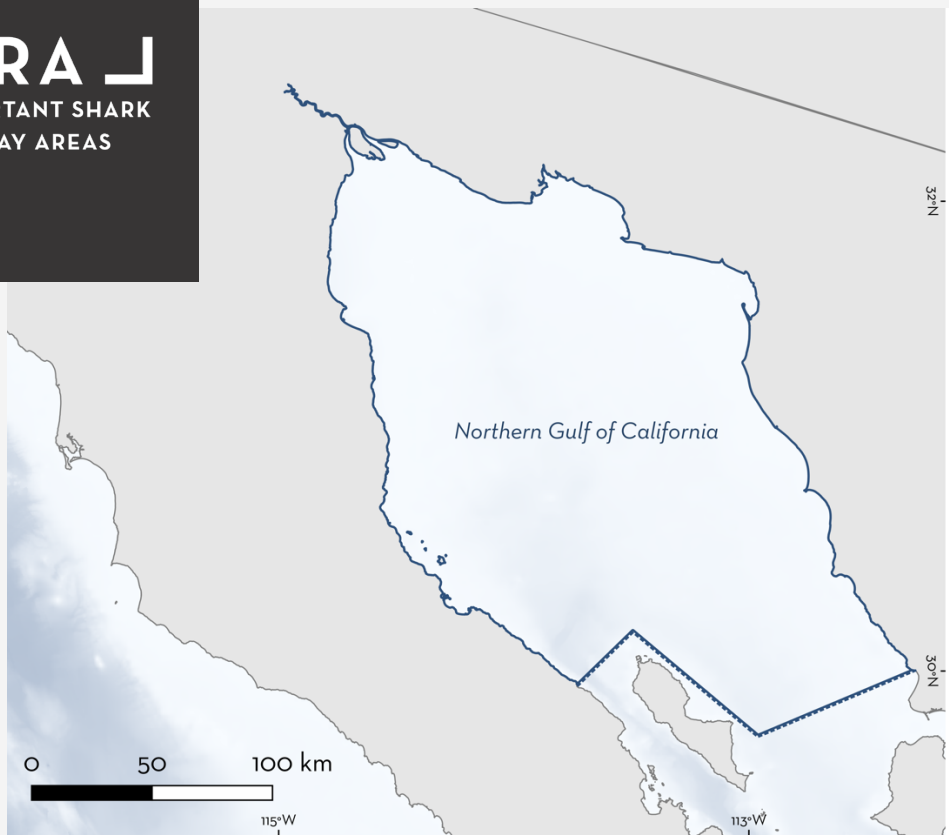
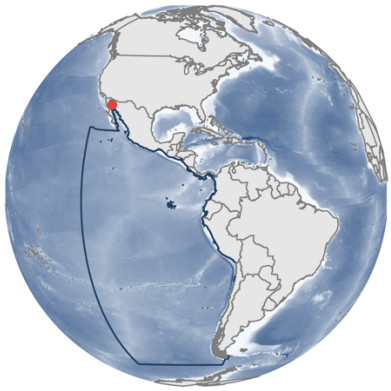
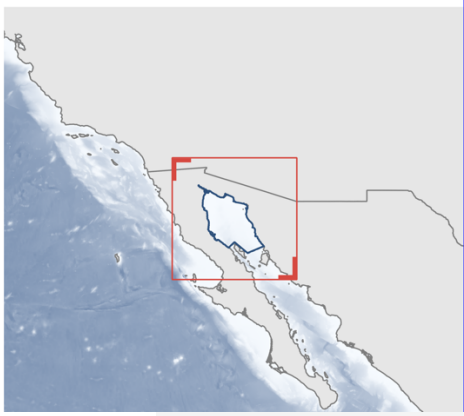
ISRA
IMPORTANT SHARK AND RAY AREAS







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

NORTHERN GULF OF CALIFORNIA ISRA

Central and South American Pacific Region

MEXICO

0–281 metres

37,900 km²

SUMMARY

Northern Gulf of California is located on the Pacific coast of Mexico. Situated at the northern end of the gulf, it extends from the Colorado River Delta in the north to the large islands of Tiburón and Angel de la Guarda in the south. The area overlaps with an Ecologically or Biologically Significant Marine Area and includes one protected area, three Ramsar sites, and three Key Biodiversity Areas. The area has a broad continental platform mostly composed of sandy substrates. The shallow waters are constantly influenced by extreme tides, strong winds, and upwellings to create the most productive region in the entire gulf. Within this area there are: **threatened species** (Whale Shark *Rhincodon typus*); **range-restricted species** (e.g., Peppered Catshark *Galeus piperatus*); **reproductive areas** (e.g., Brown Smoothhound *Mustelus henlei*); **feeding areas** (e.g., Shovelnose Guitarfish *Pseudobatos productus*); and areas important for **movement** (e.g., Whale Shark).

CRITERIA

Criterion A – Vulnerability; Criterion B – Range Restricted;
Sub-criterion C1 – Reproductive Areas; Sub-criterion C2 – Feeding Areas
Sub-criterion C4 – Movement

DESCRIPTION OF HABITAT

Northern Gulf of California is located along and off the coasts of Baja California and Sonora, Mexico. Situated within the Gulf of California Large Marine Ecosystem (LME), it extends from the Colorado River Delta in the north to the large islands of Tiburón and Angel de la Guarda in the south, with an average depth of 200 m (Morales-Zárate et al. 2004). The shallow waters of the Northern Gulf of California are constantly influenced by extreme tides, strong winds, and upwellings to create the most productive region in the entire gulf (Lavín & Marinone 2003). In this area, tidal mixing and turbulence occur year-round, advecting nutrients into the mixed layer and generating high productivity (Lavín & Marinone 2003). The area has high seasonality, with sea surface temperatures reaching 31–32°C in August and September, dropping to 15–17°C in January and February. The principal surface circulation of the Northern Gulf of California consists of a cyclonic (counterclockwise) gyre in the summer (June to September), and a weaker anticyclonic (clockwise) gyre from November to March. Currently, with a lack of direct input from the Colorado River to the Gulf of California (and overall high evaporation rates), the upper gulf is the equivalent of an inverse (negative) estuary, with salinities between 35–37 PSU (Lavín et al. 1998; Lavín & Marinone 2003).

This area includes one Ecologically or Biologically Significant Marine Area (EBSA), the Upper Gulf of California Region (CBD 2016). It also contains one protected area, the Biosphere Reserve Alto Golfo de California y Delta del Río Colorado (CONANP 2007), three Ramsar sites, Humedales de Bahía San Jorge, Humedales de Bahía Adair, and Humedales del Delta del Río Colorado (Ramsar 2002a, 2022b, 2022c). In addition, includes three Key Biodiversity Areas, Alto Golfo de California, Bahía e Islas de San Jorge, and Sistema San Luis Gonzaga (KBA 2022a, 2022b, 2022c).

This Important Shark and Ray Area is delineated from inshore and surface waters (0 m) to a depth of 281 m based on the depth ranges of Qualifying Species in 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 Whale Shark is assessed as Endangered (Pierce & Norman 2016).

CRITERION B – RANGE RESTRICTED

Northern Gulf of California holds the regular presence of Peppered Catshark, White-margin Fin Smoothhound, Grey Smoothhound, Cortez Skate, and California Butterfly Ray as resident range-restricted species. These species are commonly caught by artisanal and industrial fisheries in the area (Santana-Morales et al. 2005; Godínez-Padilla & Castillo-Géniz 2016; Saldaña-Ruiz et al. 2016, 2017). Both smoothhounds and California Butterfly Ray are restricted to the California Current LME and the Gulf of California LME, while Peppered Catshark and Cortez Skate are endemic to the Gulf of California LME.

SUB-CRITERION C1 – REPRODUCTIVE AREAS

Northern Gulf of California is an important reproductive area for two shark and one ray species.

Gravid Grey Smoothhound females have been reported with embryos in different stages of development. These gravid females were found during six non-consecutive months of the year, suggesting that the whole gestation occurs within the area. Terminal embryos ~30 cm total length (TL), which are closer to the reported size-at-birth (20–30 cm TL; Ebert et al. 2021), were present in March and April, suggesting that this is a pupping area with births occurring between April and May. Postpartum females (n = 6) were recorded during these latter months (Pérez-Jiménez & Sosa-Nishizaki 2010). This species is caught throughout the year in the region at depths between 6–265 m, but ~90% of sharks caught, including gravid females, were caught at depths <80 m in the northern part of the area. Based on an analysis of landings, this species is still one of the most abundant species in landings from the area (Godínez-Padilla & Castillo-Géniz 2016).

The whole reproductive cycle of the Brown Smoothhound occurs in the area. Two hundred and nineteen pregnant Brown Smoothhounds were examined between 2002–2004 confirming their regular presence in the area. These individuals originated from bycatch of artisanal fisheries, where they are caught year-round. Embryos in the first stages of development were found between April and June, embryos in the middle of their development between November–March, while terminal embryos were found between February and March, with births occurring from the end of February to May. Terminal embryos (25.5–28 cm TL) were close to the reported size-at-birth for the species (19–30 cm TL; Ebert et al. 2021). Females with terminal embryos were recorded at depths >80 m (Pérez-Jiménez 2006). Based on fisheries monitoring, this species is still one of the most abundant in landings from the area (Godínez-Padilla & Castillo-Géniz 2016; Saldaña-Ruiz et al. 2017).

Shovelnose Guitarfish use the area for pupping, and the whole gestation occurs within the area. Pregnant females (n = 650) with embryos in different stages of development are targeted by fisheries year-round with higher catches occurring April-June. From August to March, uterine eggs are commonly found with no embryonic growth, followed by a fast embryonic growth during April-July, suggesting embryonic diapause of nine months. Terminal embryos (15.2–19.2 cm TL) around the reported size-at-birth (17.5 TL; Márquez-Farías 2007) are found in June when pupping occurs (Romo-Curiel 2007; Romo-Curiel et al. 2016). This is the most abundant species in landings from the area, according to recent studies (Saldaña-Ruiz et al. 2016; Medina-Trujillo 2021).

SUB-CRITERION C2 – FEEDING AREAS

Northern Gulf of California is an important feeding area for one shark and one ray species.

Whale Sharks predictably aggregate in San Luis Gonzaga Bay each year from May to October. The aggregation is composed of juveniles that are constantly feeding on the surface, mainly on seasonally abundant copepods (Ramírez-Macías et al. 2012, 2016; SEMARNAT 2018).

Stomach content analysis (with samples taken from 2002–2007), showed that 77% of stomachs from Shovelnose Guitarfish were full. Individuals analysed fed mostly on crustaceans (order Decapoda and family Caridea) and small fishes (family Mictophidae; De la Rosa-Meza 2012).

SUB-CRITERION C4 – MOVEMENT

Northern Gulf of California is an important area for the movement of one shark species. Whale Sharks move into the Northern Gulf of California as part of their migration route from other areas inside the Gulf of California. Based on photo-identification of 23 individuals, movement between San Luis Gonzaga and Bahía de los Ángeles has been confirmed. Furthermore, 133 individuals moved between all the aggregation sites within the Gulf of California: San Luis Gonzaga Bay, Bahía de los Ángeles, La Paz Bay, and Nayarit (Ramírez-Macías et al. 2012, 2016; Whitehead et al. 2019; SEMARNAT 2018; Pancaldi et al. 2019).

Acknowledgments

Oscar Sosa-Nishizaki (CICESE), Emiliano García-Rodríguez (IUCN SSC Shark Specialist Group - ISRA Project), Luz Erandi Saldaña-Ruiz (CICESE), Carmen Rodríguez-Medrano (CICESE), Javier Tovar-Ávila (Instituto Nacional de Pesca y Acuacultura), Felipe Galván-Magaña (CICIMAR), and Frida Lara-Lizardi (MigraMar; Orgcas) 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. Northern Gulf of California 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												
Galeus piperatus	Peppered Catshark	LC	275–1,326		X							
Mustelus albipinnis	White-margin Fin Smoothhound	LC	30–281		X							
Mustelus californicus	Grey Smoothhound	LC	0–281		X	X						
Mustelus henlei	Brown Smoothhound	LC	1–281			X						
Rhincodon typus	Whale Shark	EN	0–1,928	X			X		X			
RAYS												
Beringraja cortezensis	Cortez Skate	LC	15–90		X							
Gymnura marmorata	California Butterfly Ray	NT	1–95		X							
Pseudobatos productus	Shovelnose Guitarfish	NT	1–90			X	X					

SUPPORTING SPECIES

Scientific Name	Common Name	IUCN Red List Category
SHARKS		
Alopias pelagicus	Pelagic Thresher	EN
Alopias superciliosus	Bigeye Thresher	VU
Alopias vulpinus	Common Thresher	VU
Apristurus nasutus	Largenose Catshark	LC
Beringraja inornata	California Skate	LC
Carcharhinus altimus	Bignose Shark	NT
Carcharhinus cerdale	Pacific Smalltail Shark	CR
Carcharhinus limbatus	Blacktip Shark	VU
Carcharhinus obscurus	Dusky Shark	EN
Carcharodon carcharias	White Shark	VU
Cephaloscyllium ventriosum	Swellshark	LC
Cephalurus cephalus	Lollipop Catshark	LC
Echinorhinus cookei	Prickly Shark	DD
Heterodontus francisci	Horn Shark	DD
Heterodontus mexicanus	Mexican Hornshark	LC
Hexanchus griseus	Bluntnose Sixgill Shark	NT
Mustelus lunulatus	Sicklefin Smoothhound	LC
Parmaturus xaniurus	Filetail Catshark	LC
Rhizoprionodon longurio	Pacific Sharpnose Shark	VU
Sphyrna lewini	Scalloped hammerhead	CR
Squatina californica	Pacific Angelshark	NT
RAYS		
Beringraja rhina	Longnose Skate	LC
Diplobatis ommata	Pacific Dwarf Numbfish	LC
Hypanus dipterurus	Diamond Stingray	VU
Hypanus longus	Longtail Stingray	VU
Mobula mobular	Spinetail Devil Ray	VU
Mobula munkiana	Munk's Pygmy Devil Ray	EN
Myliobatis californica	Bat Ray	LC
Myliobatis longirostris	Longnose Eagle Ray	VU

Narcine entemedor	Cortez Numbfish	VU
Pseudobatos buthi	Spadenose Guitarfish	VU
Rhinoptera steindachneri	Pacific Cownose Ray	NT
Rostroraja velezi	Rasptail Skate	VU
Urobatis concentricus	Bullseye Round Ray	LC
Urobatis halleri	Haller's Round Ray	LC
Zapteryx exasperata	Banded Guitarfish	DD
CHIMAERAS		
Hydrolagus colliei	Whitespotted Chimaera	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 reproductive and aggregation purposes. Landings data suggest that Sicklefin Smoothhound uses the area to give birth. Pregnant females with terminal embryos have been reported between February and March. Females with signs of recent pupping were found up until April (Pérez-Jiménez & Sosa-Nishizaki 2010).

Pregnant White Sharks (n = 2), tagged with satellite transmitters in Guadalupe Island, Mexico, travel to offshore areas near Hawaii to carry out gestation after which they come to coastal areas in California and Mexico. Two individuals tagged entered the area to presumably give birth (Domeier & Nasby-Lucas 2013). The reports of neonates caught as bycatch by artisanal fisheries in the area near San Luis Gonzaga Bay suggest that the area could serve as a pupping area (Santana-Morales et al. 2005; Oscar Sosa-Nishizaki pers. obs. 2022). Some White Sharks born within the gulf may spend their entire life cycle within the area, according to preliminary results from microchemical analysis in vertebra. However, more evidence is needed to confirm that this is an important reproductive area for the species (Mohan et al. 2022).

Female California Skate (50–62 cm TL) with egg cases were reported as bycatch in the North Pacific Hake *Merluccius productus* fishery year-round, with greatest occurrence during September-November at depths of 84–249 m (Castillo-Géniz 2007; Castillo-Géniz et al. 2007). However, more information is needed to confirm that this species lays its eggs within the area.

Mexican Hornsharks (27–75 cm TL) and Pacific Angelshark (25–112 cm TL) are commonly caught by artisanal and industrial fisheries. This area could be an aggregation site for the species, but further information is needed on the regularity of these aggregations (Santana-Morales et al. 2005; Medellín-Ortiz 2006; Godínez-Padilla & Castillo-Géniz 2016; Saldaña-Ruiz et al. 2017).

Pacific Cownose Ray (41–93 cm disc width [DW]) and Bat Ray (44–122 cm DW) are captured at various life-stages in the area by artisanal fisheries when aggregations supposedly occur. Bat Rays are caught all year, with a higher catch in July-August (Santana-Morales et al. 2005; Aguirre-García 2009; Simental-Anguiano 2011; Godínez-Padilla & Castillo-Géniz 2016; Saldaña-Ruiz et al. 2016). However, more information confirming the regular presence of these aggregations is needed.

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