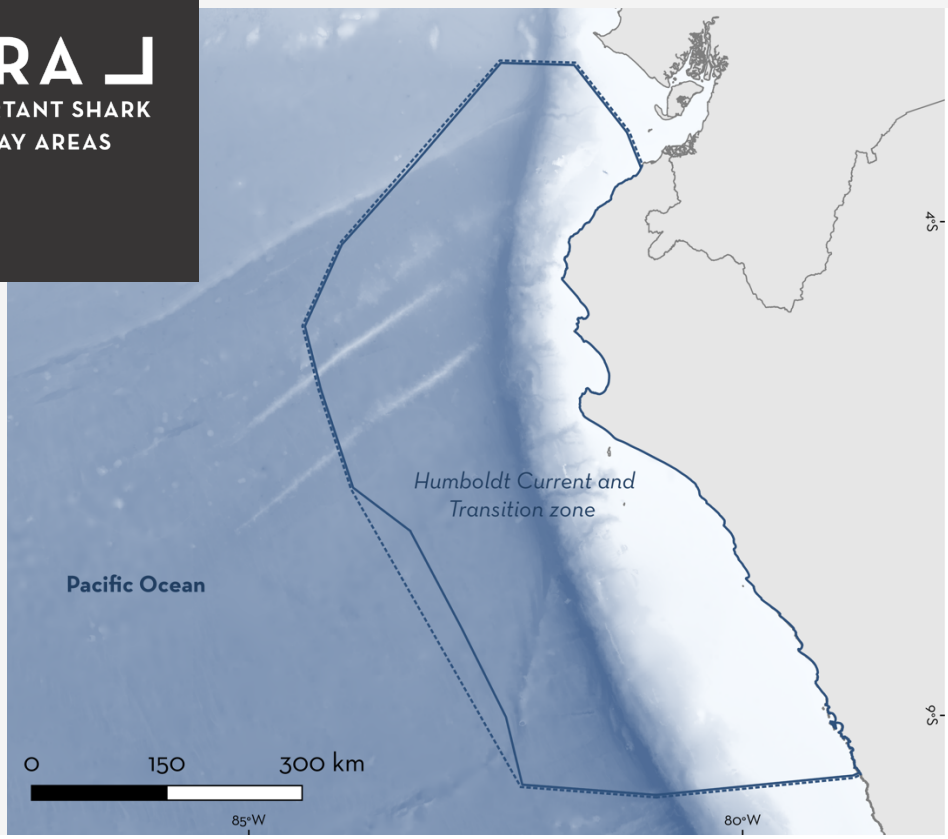
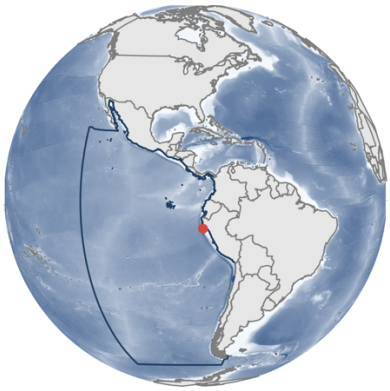
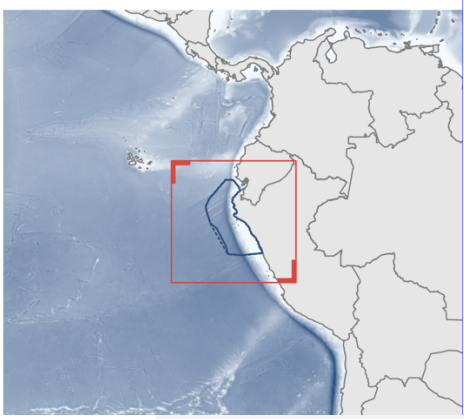
ISRA
IMPORTANT SHARK AND RAY AREAS







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

HUMBOLDT CURRENT AND TRANSITION ZONE ISRA

Central and South American Pacific Region

PERU

0–1,112 metres

261,539.7 km²

SUMMARY

Humboldt Current and Transition Zone extends from southern Ecuador to northern Peru. The area includes several oceanographic features, including the Equatorial Front and the Northern Humboldt Current System, in which major upwelling centres are located. It also overlaps with the Gulf of Guayaquil which constitutes the most important estuary associated to the largest fluvial system of the entire western slope of the Andes. Habitats include estuarine and oceanic waters that are characterised by exceptionally high marine productivity. Within this area there are: **threatened species** (e.g., Spinetail Devil Ray *Mobula mobular*); **reproductive areas** (Spinetail Devil Ray); and **feeding areas** (e.g., Common Thresher *Alopias vulpinus*).

CRITERIA

Criterion A – Vulnerability; Sub-criterion C1 – Reproductive Areas; Sub-criterion C2 – Feeding Areas

DESCRIPTION OF HABITAT

Humboldt Current and Transition Zone is a transboundary area extending from the waters of southern Ecuador (El Oro, Guayas, and Santa Elena regions) to northern Peru (Tumbes, Piura, Lambayeque, La Libertad, and Ancash regions). Situated within the Pacific Central-American Coastal Large Marine Ecosystem (LME) and Humboldt Current LME, the area overlaps with four Ecologically or Biologically Significant Marine Areas (EBSAs): Equatorial Front, Gulf of Guayaquil, Northern Humboldt Current System (NHCS), and Major Upwelling Centers Associated with the NHCS (CBD 2020). It also overlaps with Lobos de Tierra and Lobos de Afuera Islands, a marine protected area system, and three Key Biodiversity Areas (i.e., Isla Foca, Isla Lobos de Tierra, Isla Lobos de Afuera).

The Equatorial Front is a transition zone between the water masses transported by the El Niño and Humboldt currents. Unique hydrography features of the Equatorial Front enhance the high biomass of zooplankton (i.e., copepods and euphausiids) associated to the southern part of the front (Jimenez & Bonilla 1980). The highest level of primary production occurs during the austral summer and autumn (Pennington et al. 2006).

The Gulf of Guayaquil is the largest and most important estuary on the southeast Pacific coast (Stevenson 1981). It is characterised by a great biological productivity due to the oceanographic conditions associated with the Equatorial Front, and interaction of various types of water (i.e., oceanic and freshwater) (CBD 2020). In the gulf, 23 hydrographic basins discharge and the Guayas River Basin constitutes the most important fluvial system of the Andes western slope. The area contains high phytoplankton diversity and fish eggs and larvae abundance (Jimenez & Bonilla 1980).

Globally, the NHCS is one of the most productive systems due to a marine-coastal upwelling that produces high zooplankton abundance (Pennington et al. 2006). The endemic Humboldt Krill *Euphausia mucronata* plays a keystone role in the food web of the Humboldt Current System as a principal prey for filter-feeding fishes (Antezana 2010; Massing et al. 2022). Within the NHCS, six major upwelling centers have been identified which together represent an EBSA (CBD 2020). The upwellings tend to be associated with coastline irregularities (Chavez & Messie 2009). These centres are crucial for the NHCS to re-establish itself after an El Niño event and serve as a refuge to marine organisms, given the persistence of the upwelling (CBD 2020). In this area, two of the six major upwelling centres are located (i.e., Punta Illescas and Chimbote). Punta Illescas represents the northern most upwelling centre with unique coastal topography and contains the narrowest part of the continental shelf (Jacox & Edwards 2011). Along the Peruvian continental margin, the area between -5.25 to -7.5 has the highest number and the largest size of marine canyons (Gutierrez et al. 2009) which enhances local production causing pelagic predators to aggregate for feeding (Fernandez-Arcaya et al. 2017).

This Important Shark and Ray Area is pelagic and is delineated from surface waters (0 m) to a depth of 1,112 m based on the global depth range of Qualifying Species.

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 Endangered Spinetail Devil Ray (Marshall et al. 2022), the Endangered Pelagic Thresher (Rigby et al. 2019), and the Vulnerable Common Thresher (Rigby et al. 2022).

SUB-CRITERION C1 – REPRODUCTIVE AREAS

Humboldt Current and Transition Zone is an important reproductive area for one ray species. In the Eastern Pacific, northern Peru has been identified as one of the three most important habitats for Spinetail Devil Ray (Lezama-Ochoa et al. 2019a, 2019b, 2020). Peruvian fisheries that operate along the coast of this area captured and landed 98% of Spinetail Devil Rays between 1997–2015 (Alfaro-Cordova et al. 2017; Gonzalez-Pestana et al. in press). A total of 1,444 individuals were sampled between 2012–2016 and 2018 (IMARPE 2015; Rojas 2016; Alfaro-Cordova et al. 2017; MINAM 2021; Córdova-Zavaleta 2022; Gonzalez-Pestana et al. 2022). Throughout the years, the catch was mostly composed of neonates, young-of-the-year, and juveniles (sex ratio: 1:1). The smallest individuals measured 60 cm disc width (DW) while, over that period, the average size ranged between 143 to 185 cm DW. Size-at-birth has been reported as 70–85 cm DW (Notarbatolo-di-Sciara 1988) or 90–160 cm DW (Marshall et al. 2022). Based on national landing statistics and interviews with fishers and merchants, the catch reportedly increases in the austral summer (Gonzalez-Pestana et al. 2016; MINAM 2021). Data indicate that this area functions as a seasonal nursery area during the summer (Gonzalez-Pestana et al. 2016; MINAM 2021).

SUB-CRITERION C2 – FEEDING AREAS

Humboldt Current and Transition Zone is an important feeding area for two shark and one ray species.

In the Eastern Pacific, northern Peru has been identified as one of the three most important habitats for Spinetail Devil Ray (Lezama-Ochoa et al. 2019a, 2019b, 2020). Peruvian fisheries operate along the coast of this area captured and landed 98% of Spinetail Devil Rays between 1997–2015, representing the second most captured ray species by Peruvian fisheries (Alfaro-Cordova et al. 2017; Gonzalez-Pestana et al. in press). The species' distribution is associated with productive upwelling systems in which Peru contains one of the largest aggregations (Alfaro-Cordova et al. 2017; Lezama-Ochoa et al. 2019a, 2019b, 2020). The most important prey of Spinetail Devil Ray is the endemic euphausiid Humboldt Krill during the austral summer and winter (90–92% IRI) and copepods during the spring (47% Index of Relative Importance [IRI]) (Coasaca-Cespedes 2019). This euphausiid concentrates in the coastal upwelling of the Northern Humboldt Current System with an outstanding abundance (specially between 5°–13°S) (Antezana 2010) overlapping with the southern part of this area. Also, the northern part of this area has high zooplankton biomass (Arones et al. 2019). Macro-zooplankton abundance (includes euphausiids and copepods) seems highly resilient to El Niño events (Alegre et al. 2015). The NHCS is important for filter-feeding fishes, as the Peruvian Anchoveta *Engraulis ringens*, as well as other pelagic species, get most of their caloric energy from zooplankton (for Peruvian Anchoveta it is mostly euphausiids, followed by copepods) when compared with small pelagic fish in other upwelling ecosystems (Espinoza & Bertrand 2008; Espinoza et al. 2009). This might be one of the key factors why Peru produces more fish per surface unit than any other marine ecosystem (Chavez et al. 2008). Therefore, the highly productive waters within this area represent an important feeding area for filter-feeding species.

Within this area, adult Common and Pelagic Threshers feed mainly on Humboldt Squid *Dosidicus gigas* (64–65% Prey Specific Index of Relative Importance [PSIRI]) (Elliot et al. 1996; Gonzalez-Pestana et al. 2019). Results indicate that 85% of the stomachs analysed included food items. In one thresher shark stomach captured in this area, twenty beaks of Humboldt Squid were found (Adriana Gonzalez-Pestana pers. obs. 2022). In the Eastern Pacific (Ecuador and Mexico), thresher sharks feed mainly on cephalopods in which Humboldt Squid is one of the most important preys (Polo-Silva et al. 2009; Galván-Magaña et al. 2013; Calle-Morán et al. 2022). The Humboldt Squid represents one

of the most abundant marine resources as this is the most caught invertebrate species worldwide in which Peru presents the largest volumes captured (FAO 2022). Within Peru, historically the largest fishery has been concentrated in northern Peru (Csirke et al. 2018) located within this area. During warm periods (El Niño events or summers), Humboldt Squid aggregates in the most northern Major Upwelling Centers Associated with the NHCS EBSA (located in the central area of this area; traditional ecological knowledge from fishers), as these centres serve as a refuge, given the persistence of upwelling in them (CBD 2017, Jian et al. 2020). Therefore, this area represents an important feeding area for these species in the Eastern Pacific, as their main prey is exceptionally abundant. Common Thresher and Pelagic Thresher have been the fourth most captured shark species by Peruvian fisheries and the second most frequently captured shark species off northern Peru between 1997–2010 (Gonzalez-Pestana et al. 2014). Until 2020, the most important landing points for these species overlapped with this area (up to 89% of total landings).

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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												
Alopias pelagicus	Pelagic Thresher	EN	0–300	X			X					
Alopias vulpinus	Common Thresher	VU	0–650	X			X					
RAYS												
Mobula mobular	Spinetail Devil Ray	EN	0–1,112	X		X	X					

SUPPORTING SPECIES

Scientific Name	Common Name	IUCN Red List Category
SHARKS		
Megachasma pelagios	Megamouth Shark	LC
Prionace glauca	Blue Shark	NT
Rhincodon typus	Whale Shark	EN
Sphyrna zygaena	Smooth Hammerhead	VU
RAYS		
Mobula birostris	Oceanic Manta Ray	EN
Mobula munkiana	Munk's Pygmy Devil Ray	VU
Mobula tarapacana	Sicklefin Devil Ray	EN
Mobula thurstoni	Bentfin Devil Ray	EN
Myliobatis chilensis	Chilean Eagle Ray	VU
Myliobatis peruvianus	Peruvian Eagle Ray	VU
Pteroplatytrygon violacea	Pelagic Stingray	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 reproduction of one shark species. Catch composition of Pelagic Thresher is mostly adults (Gonzalez-Pestana et al. 2019; Córdova-Zavaleta 2022) and pregnant females have been documented in an advanced pregnancy state between November and January 2015, 2017, and 2018 (Torres 2018; Adriana Gonzalez-Pestana pers. obs. 2022). The embryos of sixteen pregnant females measured 42–118 cm total length (TL) (Torres 2018). Size-at-birth is 158–190 cm TL (Rigby et al. 2019) indicating that females might be using this area for reproductive purposes.

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