

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

## NOSY BE ISRA

### Western Indian Ocean Region

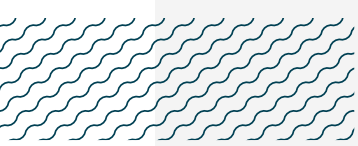
#### SUMMARY

Nosy Be is a bay located in the Antsiranana Province of northwest Madagascar. It is bordered by the islands of Nosy Be, Nosy Sakatia, and the mainland. The area is characterised by a diverse range of habitats including coral reefs, seagrass meadows, mangrove ecosystems, and pelagic waters. It is situated in shelf waters and partially overlaps with two marine protected areas: Ankarea and Ankivonjy. Nosy Be lies within the Mozambique Channel Ecologically or Biologically Significant Marine Area and overlaps with the Nosy Tanikely National Park Key Biodiversity Area. Within this area there are: **threatened species** (e.g., Spinetail Devil Ray *Mobula mobular*) and **feeding areas** (e.g., Whale Shark *Rhincodon typus*).

#### CRITERIA

**Criterion A - Vulnerability; Sub-criterion C2 - Feeding Areas**

— —  
**MADAGASCAR**  
 — —  
**0-100 metres**  
 — —  
**587.36 km<sup>2</sup>**  
 — —





## DESCRIPTION OF HABITAT

Nosy Be is a bay located in the Antsiranana Province of northwest Madagascar. It is bordered by the islands of Nosy Be, Nosy Sakatia, and the mainland. Nosy Be has a diverse range of habitats including coral reefs, seagrass meadows, mangrove ecosystems, and pelagic waters.

The water temperature of Nosy Be ranges between 25–30°C, with a warmer period after the austral winter from September to January. The area is sheltered by the mainland and neighbouring islands, meaning there is little wind. Due to the influence of the gyre in the northern part of the Mozambique Channel, there is upwelling activity to the north of Nosy Be (Pripp et al. 2014). The area is considered a zooplankton ‘hotspot’ in this region (Pripp et al. 2014). Some shallow banks are dotted around the bay, where reefs or seamounts of depths between 10–30 m are found, while the rest of the bay has depths of 40–100 m.

The area overlaps with the community-managed marine protected areas of Ankivonjy (1,394 km<sup>2</sup>, located 50 km southeast of Nosy Be) and Ankarea (1,356 km<sup>2</sup>, 50 km northeast of Nosy Be). Nosy Be lies within the Mozambique Channel Ecologically and Biologically Significant Important Marine Area (CBD 2023) and overlaps with the Nosy Tanihely National Park Key Biodiversity Area (KBA 2023).

This Important Shark and Ray Area is pelagic and is delineated from inshore and surface waters (0 m) to 100 m based on the bathymetry of the area.

## 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 Endangered Whale Shark (Pierce & Norman 2016), Oceanic Manta Ray (Marshall et al. 2022a), Shorthorned Pygmy Devil Ray (Rigby et al. 2022), and Spinetail Devil Ray (Marshall et al. 2022b).

### SUB-CRITERION C<sub>2</sub> – FEEDING AREAS

Nosy Be is an important feeding area for one shark and three ray species.

Boat-based surveys in northwest Madagascar revealed the seasonal occurrence of Whale Sharks, Oceanic Manta Rays, Shorthorned Pygmy Devil Rays, and Spinetail Devil Rays between September and December annually in Nosy Be.

A total of 405 surveys were conducted from September 2015 to December 2019, recording 1,397 Whale Shark encounters (Diamant et al. 2021). Animals were seen foraging in 98% of encounters, and across all months in each year of the surveys. A total of 408 individual Whale Sharks were photo-identified between 2015–2019. Sex was confirmed for most (92%) of these sharks, with 308 males (82% of sexed individuals) and 68 females. Whale Sharks were almost exclusively (98%) sighted foraging in association with bait balls created by mackerel tuna feeding on juvenile fishes (Diamant et al. 2021). Whale Sharks were sighted when swimming close to the surface, often in association with mackerel tuna *Euthynnus affinis* and seabirds (Diamant et al. 2018) indicating foraging behaviour. Sharks were frequently observed in a vertical orientation while feeding on bait fishes. Kernel

Utilisation Distributions (KUDs) of 34 acoustically tagged Whale Sharks also support their aggregative behaviour in the area (S Diamant unpubl. data 2023).

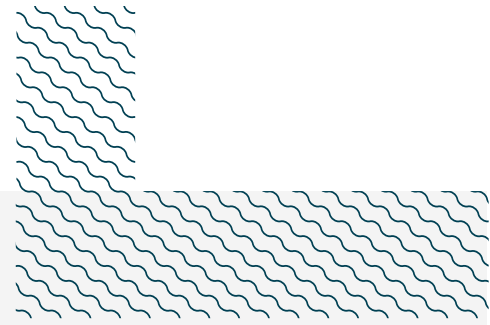
Oceanic Manta Rays were recorded between 2017–2019 (~200 surveys annually). Twenty-seven animals were observed over this period, with the majority (78%) engaged in surface feeding behaviour (S Diamant unpubl. data 2023).

Shorthorned Pygmy Devil Rays were recorded between 2017–2019 (~200 surveys annually). Eighteen individuals were observed over this period, with the majority (56%) engaged in surface feeding behaviour (S Diamant unpubl. data 2023).

Spinetail Devil Rays were recorded between 2017–2019 (~200 surveys annually). Ninety-seven animals were observed over this period, with the majority (53%) engaged in surface feeding behaviour (S Diamant unpubl. data 2023).

The predictable presence of foraging Whale Sharks, and their co-occurrence with other large planktivores, including mantas and devil rays, and Omura's Whale (*Balaenoptera omurai*) (Diamant et al. 2021), supports the productive nature of this area for foraging. Animals were sighted in association with bait balls of mackerel tuna feeding on juvenile fishes. Prey species included sardines (*Sardinella longiceps*) and scad (*Selar boops* and *Selar crumenophthalmus*) (Diamant et al. 2021). Surface orientated, aggregative behaviour in mantas and devil rays is generally associated with foraging behaviour (Stevens 2016). This area hosts high concentrations of zooplankton (Stephen et al. 1992; Bava et al. 2022), to support the diets of these large planktivores (Armstrong et al. 2016; Rohner et al. 2017).

In addition, contemporary survey effort in other regions of Madagascar has seldom reported devil rays from landing sites, in-water surveys, or Baited Remote Underwater Video Surveys (BRUVS) (Wildlife Conservation Society unpubl. data 2023). For example, only one individual was recorded from both Antongil Bay in the northeast and one individual from Soriake in the southwest between 2017–2023 (species identification not confirmed).



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## **Suggested citation**

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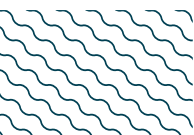
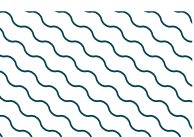
## QUALIFYING SPECIES

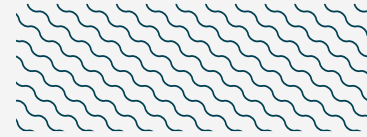
Scientific Name	Common Name	IUCN Red List Category	Global Depth Range (m)	ISRA Criteria/Sub-criteria Met									
				A	B	C1	C2	C3	C4	C5	D1	D2	
<b>SHARKS</b>													
<i>Rhincodon typus</i>	Whale Shark	EN	0-1,928	X			X						
<b>RAYs</b>													
<i>Mobula birostris</i>	Oceanic Manta Ray	EN	0-1,000	X			X						
<i>Mobula kuhlii</i>	Shorthorned Pygmy Devil Ray	EN	0-50	X			X						
<i>Mobula mobular</i>	Spinetail Devil Ray	EN	0-1,112	X			X						

## SUPPORTING SPECIES

Scientific Name	Common Name	IUCN Red List Category
<b>SHARKS</b>		
<i>Carcharhinus amblyrhynchos</i>	Grey Reef Shark	EN
<i>Carcharhinus plumbeus</i>	Sandbar Shark	EN
<i>Hemipristis elongata</i>	Snaggletooth Shark	VU
<i>Loxodon macrorhinus</i>	Sliteye Shark	NT
<i>Sphyrna mokarran</i>	Great Hammerhead	CR
<i>Stegostoma tigrinum</i>	Indo-Pacific Leopard Shark	EN
<i>Triacodon obesus</i>	Whitetip Reef Shark	VU
<b>RAYS</b>		
<i>Acroteriobatus andysabini</i>	Malagasy Blue-spotted Guitarfish	EN
<i>Aetobatus ocellatus</i>	Spotted Eagle Ray	EN
<i>Himantura uarnak</i>	Coach Whipray	EN
<i>Neotrygon caeruleopunctata</i>	Bluespotted Maskray	LC
<i>Pastinachus ater</i>	Broad Cowtail Ray	VU
<i>Taeniura lymma</i>	Bluespotted Lagoon Ray	LC
<i>Taeniurops meyeri</i>	Blotched Fantail Ray	VU
<i>Urogymnus granulatus</i>	Mangrove Whipray	EN

IUCN Red List of Threatened Species Categories are available by searching species names at [www.iucnredlist.org](http://www.iucnredlist.org) Abbreviations refer to: CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; DD, Data Deficient.





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