

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

## PAGAN ISLAND ISRA

### New Zealand & Pacific Islands Region

#### SUMMARY

Pagan Island is located on the volcanic Mariana Arch, in the northwestern Pacific Ocean. It is part of the Commonwealth of the Northern Mariana Islands, a self-governing commonwealth in association with the United States of America. The habitat is characterised by hard substrates and soft sediment. This area holds the greatest coral assemblage richness of the Northern Mariana Islands. Within this area there are: **threatened species** and **reproductive areas** (Grey Reef Shark *Carcharhinus amblyrhynchos*).

#### CRITERIA

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

**NORTHERN  
 MARIANA  
 ISLANDS**

**0-50 metres**

**23.19 km<sup>2</sup>**





## DESCRIPTION OF HABITAT

Pagan Island is located on the volcanic Mariana Arch, in the northwestern Pacific Ocean. It is part of the Commonwealth of the Northern Mariana Islands, a self-governing commonwealth in association with the United States of America. This uninhabited island, 52 km north of Alamagan and 65 km south of Agrihan, is isolated by steep slopes which extend to depths >3,000 m (Brainard et al. 2012). It is one of the most active volcanic islands in the Mariana Archipelago and is the fourth-largest island of the Northern Mariana Islands. Two large cone-shaped volcanoes formed this island, and a low-lying, narrow isthmus connects them (Brainard et al. 2012). The narrow isthmus that separates the two parts of this island is dominated by a narrow ridge with very steep slopes on either side. In general, habitats in the north and east regions consist of hard substrates supported by a moderate cover of live corals, and, in contrast, the south and west seabed is characterised by soft-sediment habitats that support very low levels of live coral cover (Brainard et al. 2012). Along with Agrihan Island, this area holds the greatest coral assemblage richness of the Northern Mariana Islands (Houk & Starmer 2009).

This Important Shark and Ray Area is delineated from surface waters (0 m) to 50 m based on the bathymetry of the area.

## ISRA CRITERIA

### CRITERION A - VULNERABILITY

One Qualifying Species considered threatened with extinction according to the IUCN Red List of Threatened Species regularly occurs in the area. This is the Endangered Grey Reef Shark (Simpfendorfer et al. 2020).

### SUB-CRITERION C<sub>1</sub> - REPRODUCTIVE AREAS

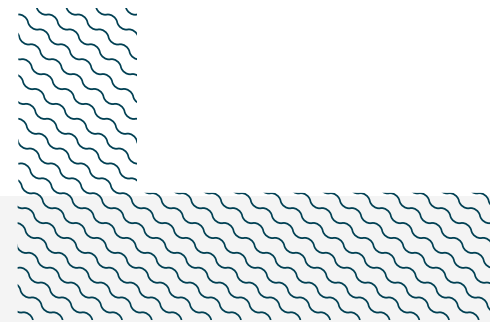
Pagan Island is an important reproductive area for one shark species.

Observations of Grey Reef Sharks have been made from historical and contemporary towed-diver surveys (TDS) and stationary point count (SPC) surveys conducted around the island. The TDS method involves two divers being towed behind a boat (~2.2 km track). The diver at ~15 m depth recorded the number, size (TL), and species of all fishes measuring >50 cm total length (TL) within a 20,000 km<sup>2</sup> area (Brainard et al. 2012). The SPC method involves two divers counting fish in 15-meter-diameter plots each, covering smaller areas (~350–600 m<sup>2</sup>). The SPC survey is a comprehensive small-scale survey approach, thus, aggregations, and rare and patchily distributed species are not well surveyed (Brainard et al. 2012). Aggregations of neonates and young-of-the-year (YOY) Grey Reef Sharks were recorded in the area. These were determined to be neonates and YOY based on the size-at-birth of this species (45–60 cm total length [TL]; Ebert et al. 2021).

Between 2009–2017, 59 TDS were conducted in the area (April 2009 = 15 dives; April 2011 = 14; April 2014 = 11; May 2017 = 5; June 2017 = 19) (CREP PIFSC 2017a, 2017b, 2017c). In 2017, a total of 58 Grey Reef Sharks were counted during the surveys (range 50–90 cm TL) of which the majority (n = 51) were part of three aggregations recorded in different dives. The first comprised 41 YOY (range 75–85 cm TL), and the other two were formed by five neonates and YOY each (range 50–75 cm TL, average 60.5 cm TL) (CREP PIFSC). During an SPC survey in 2017, an aggregation of 30 YOY Grey Reef Sharks (75–85 cm TL) was recorded (CREP PIFSC 2017d), and one additional aggregation of five

juveniles was recorded (range 130–150 cm TL) (CREP PIFSC 2017d). In 2009, two small juveniles (80 cm TL) were recorded together in one TDS (CREP PIFSC 2017a).

Only two Grey Reef Sharks larger than 150 cm TL were reported in the area, and except for one aggregation of larger juveniles in 2017, all other aggregations observed were formed by neonates or YOY (50–85 cm TL) (CREP PIFSC 2017a, 2017b, 2017c). Considering the depth range of the Grey Reef Shark, the coral reef association and the estimated 6.2 km<sup>2</sup> (1.4–10.8 km<sup>2</sup>) home range (Bonnin et al. 2021), aggregations of neonates and YOY in the area support the critical importance of the area the reproductive success of Grey Reef Sharks. However, further information is required to understand the timing of pupping in this area since all surveys were conducted between April–July (CREP PIFSC 2017a, 2017b, 2017c).



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Kaylyn McCoy (NOAA Pacific Islands Fisheries Science Center), Adel Heenan (Bangor University), and Vanessa Bettcher Brito (IUCN SSC Shark Specialist Group – ISRA Project) contributed and consolidated information included in this factsheet. We thank all participants of the 2024 ISRA Region 10 – New Zealand and Pacific Islands workshop for their contributions to this process.

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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>Carcharhinus amblyrhynchos</i>	Grey Reef Shark	EN	0-280	X		X							

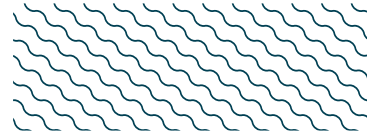
## SUPPORTING SPECIES

Scientific Name	Common Name	IUCN Red List Category
<b>SHARKS</b>		
<i>Nebrius ferrugineus</i>	Tawny Nurse Shark	VU
<i>Triaenodon obesus</i>	Whitetip Reef Shark	VU
<b>RAYS</b>		
<i>Pateobatis fai</i>	Pink Whipray	VU

*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.*

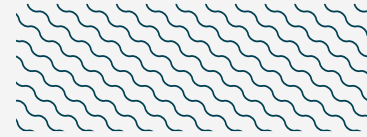


## SUPPORTING INFORMATION



There are additional indications that this area is important for aggregation purposes for one shark species.

Aggregations of juvenile Tawny Nurse Sharks were recorded during TDS and SPC surveys. In 2003, an aggregation of four individuals (125-175 cm TL) was recorded on TDS (CREP PIFSC 2017a). In 2017, an aggregation of three Tawny Nurse Sharks (~180 cm TL) was recorded during an SPC survey, and on TDS two Tawny Nurse Sharks (140-150 cm TL) were recorded together (CREP PIFSC 2017c, 2017d). Size-at-maturity varies from ~225 cm TL in males to 230 cm TL in females (Ebert et al. 2021), indicating these observations are of juvenile individuals. This species is known to rest during the day inside crevices, under reef patches, so the survey methods used might not cover the species' habitat use in the area. Additional temporal data are required to determine the function and importance of this area.



## REFERENCES

- Bonnin L, Mouillot D, Boussarie G, Robbins WD, Kiszka JJ, Dagorn L, Vigliola L. 2021. Recent expansion of marine protected areas matches with home range of grey reef sharks. *Scientific Reports* 11. <https://doi.org/10.1038/s41598-021-93426-y>
- Brainard RE, Asher J, Blyth-Skyrme V, Coccagna EF, Dennis K, Donovan MK, Gove JM, Kenyon J, Looney EE, Miller JE, et al. 2012. Coral reef ecosystem monitoring report of the Mariana Archipelago: 2003-2007. Honolulu: NOAA Fisheries.
- Coral Reef Ecosystem Program; Pacific Islands Fisheries Science Center (CREP PIFSC). 2017a. Pacific Reef Assessment and Monitoring Program: Towed-diver Surveys of Large-bodied Fishes of the U.S. Pacific Reefs from 2000-09-09 to 2012-05-19 (NCEI Accession 0163744). NOAA National Centers for Environmental Information. Dataset. <https://www.ncei.noaa.gov/archive/accession/0163744> Accessed August 2024.
- Coral Reef Ecosystem Program; Pacific Islands Fisheries Science Center (CREP PIFSC). 2017b. National Coral Reef Monitoring Program: Towed-diver Surveys of Large-bodied Fishes of the Marianas from 2014-03-25 to 2014-05-06 (NCEI Accession 0157554). NOAA National Centers for Environmental Information. Dataset. <https://www.ncei.noaa.gov/archive/accession/0157554> Accessed August 2024.
- Coral Reef Ecosystem Program; Pacific Islands Fisheries Science Center (CREP PIFSC). 2017c. National Coral Reef Monitoring Program: Towed-diver Surveys of Large-bodied Fishes of the Mariana Archipelago from 2017-05-04 to 2017-06-20 (NCEI Accession 0166382). NOAA National Centers for Environmental Information. Dataset. <https://www.ncei.noaa.gov/archive/accession/0166382> Accessed August 2024.
- Coral Reef Ecosystem Program; Pacific Islands Fisheries Science Center (CREP PIFSC). 2017d. National Coral Reef Monitoring Program: Stratified Random Surveys (StRS) of Reef Fish, including Benthic Estimate Data of the Mariana Archipelago from 2017-05-03 to 2017-06-20 (NCEI Accession 0166381). NOAA National Centers for Environmental Information. Dataset. <https://www.ncei.noaa.gov/archive/accession/0166381> Accessed August 2024.
- Ebert DA, Dando M, Fowler S. 2021. *Sharks of the world: A complete guide*. Princeton: Princeton University Press.
- Houk P, Starmer J. 2009. Constraints on the diversity and distribution of coral-reef assemblages in the volcanic Northern Mariana Islands. *Coral Reefs*, 29: 59-70. <https://doi.org/10.1007/s00338-009-0545-1>
- Simpfendorfer C, Fahmi, Bin Ali A, Dharmadi, Utzurrum JAT, Seyha L, Maung A, Bineesh KK, Yuneni RR, Sianipar A, et al. 2020. *Carcharhinus amblyrhynchos*. *The IUCN Red List of Threatened Species* 2020: e.T39365A173433550. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T39365A173433550.en>