

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

MARO REEF ISRA

New Zealand & Pacific Islands Region

SUMMARY

Maro Reef is located in the middle part of the Northwestern Hawaiian Islands of the United States of America. It is a submerged atoll with the largest coral reef in that Hawaiian region and is formed by linear and reticulate reef complexes radiating from the centre. The area overlaps with the Northwestern Hawaiian Islands Key Biodiversity Area and with the Papahānaumokuākea Marine National Monument. Within this area there are: **undefined aggregations** (Galapagos Shark *Carcharhinus galapagensis*).

CRITERIA

Sub-criterion C5 - Undefined Aggregations

—	—
HAWAII	—
—	—
0-30 metres	—
—	—
51.07 km²	—
—	—





DESCRIPTION OF HABITAT

Maro Reef is located in the middle part of the Northwestern Hawaiian Islands of the United States of America. Maro is a submerged open atoll and is the largest coral reef in this region of Hawaii. It is formed by linear and reticulate reef complexes radiating from the centre (Kenyon et al. 2008). It is characterised by sandy lagoons to steep reef slopes, large coral heads, ocean pinnacles, and patch reefs (Papahānaumokuākea Marine National Monument 2024). Fronts bring an increase in productivity to the area and are present between December–April, with a peak in March (Desch et al. 2009). Sea surface temperatures range from ~23°C in the boreal winter to ~27°C in the boreal summer (Desch et al. 2009).

The area overlaps with the Northwestern Hawaiian Islands Key Biodiversity Area (KBA 2024) and with the Papahānaumokuākea Marine National Monument (UNEP-WCMC & IUCN 2024).

This Important Shark and Ray Area is pelagic and is delineated from inshore and surface waters (0 m) to 30 m based on the bathymetry of the area.

ISRA CRITERIA

SUB-CRITERION C5 – UNDEFINED AGGREGATIONS

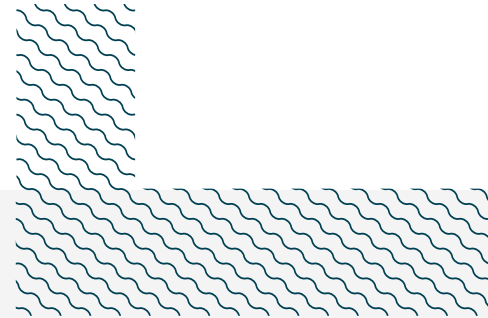
Maro Reef is an important area for undefined aggregations of one shark species.

Stationary point count surveys (25 m transect lines during a timed five minutes with four replicates) conducted during the month of September between 2000–2015 (n = 47), and towed dive surveys (undertaken up to 30 m depth and covering ~2.5 linear km in ten five-minute segments) conducted in September between 2000–2006 (n = 75), recorded the regular presence of Galapagos Shark aggregations (average = 5.6 individuals) in the area (Holzwarth et al. 2006; CREP-PIFSC 2017; ESD-PIFSC 2018, 2019).

Between 2000–2003, towed dive surveys were conducted at ten different sites across the Northwestern Hawaiian Islands and Maro Reef had the highest densities for sharks in all the banks from the Northwestern Hawaiian Islands and ranked fourth among all the sampled sites with Galapagos Shark being the most abundant shark species in the area (Holzwarth et al. 2006). Galapagos Sharks between 88–225 cm total length were observed in 17 of 59 towed dive surveys conducted in the area between 2001–2006. Aggregations were recorded in all years except for 2002 and ranged from three to 15 individuals (CREP-PIFSC 2017; ESD-PIFSC 2019). In 2016, aggregations of >20 Galapagos Sharks were reported anecdotally in a documentary (Ocean Futures Society 2016) and from Baited Remote Underwater Video Stations (BRUVS) surveys (Zill 2016). Galapagos Sharks were exclusively observed in exposed reef habitats in all the surveys conducted in the area (Holzwarth et al. 2006; CREP-PIFSC 2017; ESD-PIFSC 2018, 2019).

Historical records since the 1960s and 1970s indicate that Galapagos Shark was the most abundant shark species in the area (Papastamatiou et al. 2006). In stationary point count surveys conducted between 2000–2004, Galapagos Shark (n = 66) were observed in 16 of the 40 surveys (40%) with three aggregations of four individuals observed only in 2000 (ESD-PIFSC 2018). Further, in stationary point count surveys conducted in 2009, 2011 and 2015, Galapagos Sharks were observed in 24.3% of the surveys with aggregations observed in all years (National Oceanic and Atmospheric Administration [NOAA] unpubl. data 2024). These are small-scale surveys that cover small areas and where aggregations are not well captured (Brainard et al. 2019). The presence of Galapagos Sharks in these surveys confirms their contemporary presence and suggests that aggregations still occur in

the area. Since 2015, no additional surveys have been conducted in the area. Additional information is required to determine the nature and function of these aggregations.



Acknowledgments

Kaylyn McCoy (NOAA Pacific Islands Fisheries Science Center), Adel Heenan (Bangor University), Julia Hartl (Hawai'i Institute of Marine Biology), Yannis Papastamatiou (Florida International University), and Emiliano García-Rodríguez (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.

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. 2024. Maro Reef ISRA Factsheet. Dubai: IUCN SSC Shark Specialist Group.

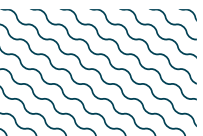
QUALIFYING SPECIES

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													
<i>Carcharhinus galapagensis</i>	Galapagos Shark	LC	0-528								X		

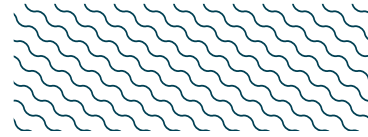
SUPPORTING SPECIES

Scientific Name	Common Name	IUCN Red List Category
SHARKS		
<i>Carcharhinus amblyrhynchos</i>	Grey Reef Shark	EN
<i>Galeocerdo cuvier</i>	Tiger Shark	NT
<i>Triaenodon obesus</i>	Whitetip Reef Shark	VU
RAYS		
<i>Aetobatus ocellatus</i>	Spotted Eagle Ray	EN

IUCN Red List of Threatened Species Categories are available by searching species names at 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 Maro Reef is an important area for undefined aggregations of one shark species.

Stationary point count surveys and towed dive surveys have recorded the presence of aggregations (~5 individuals) of Grey Reef Sharks in the area (Holzwarth et al. 2006; CREP-PIFSC 2017a, 2017b; ESD-PIFSC 2018; ESD-PIFSC 2019). Grey Reef Sharks were observed in insular reefs and more commonly on the southeast side. More information is needed to confirm the regularity of these aggregations, and the importance of the area compared to others in the region.

REFERENCES

Brainard R, Acoba T, Asher M, Asher J, Ayotte P, Barkley H, DesRochers A, Dove D, Halperin A, Hungtington B, et al. 2019. Johnston Atoll. In: Brainard R, Acoba T, Asher M, Asher J, Ayotte P, Barkley H, DesRochers A, Dove D, Halperin A, Hungtington B, et al. eds. *Coral reef ecosystem monitoring report for the Pacific Remote Islands Marine National Monument 2000- 2017. PIFSC Special Publication, SP-19-006f*. Honolulu: United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Pacific Islands Fisheries Science Center, 1-98. <https://doi.org/10.25923/xber-og95>

Coral Reef Ecosystem Program; Pacific Islands Fisheries Science Center (CREP-PIFSC). 2017. 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 O163744). NOAA National Centers for Environmental Information. Dataset. Available at: <https://www.ncei.noaa.gov/archive/accession/O163744> Accessed August 2024.

Desch A, Wynne T, Brainard R, Friedlander A, Christensen J. 2009. Oceanographic and Physical Setting. In: Friedlander A, Keller K, Wedding L, Clarke A, Monaco M, eds. *A Marine Biogeographic Assessment of the Northwestern Hawaiian Islands. NOAA Technical Memorandum NOS NCCOS 84*. Silver Spring: NCCOS's Biogeography Branch, Office of National Marine Sanctuaries Papahānaumokuākea Marine National Monument.

Ecosystem Sciences Division - NOAA Pacific Islands Fisheries Science Center (ESD-PIFSC). 2018. National Coral Reef Monitoring Program: stratified random surveys (StRS) of reef fish, including benthic estimate data of the Hawaiian Archipelago. NOAA National Centers for Environmental Information. Available at: <https://doi.org/10.7289/v59c6vr5>. Accessed August 2024.

Ecosystem Sciences Division - NOAA Pacific Islands Fisheries Science Center (ESD-PIFSC). 2019. Pacific Reef Assessment and Monitoring Program: sightings of marine species of interest during towed-diver surveys of the U.S. Pacific reefs from 2000-09-16 to 2017-06-20 (NCEI Accession O189253). [indicate subset used]. NOAA National Centers for Environmental Information. Dataset. Available at: <https://www.ncei.noaa.gov/archive/accession/O189253>. Accessed August 2024.

Holzwarth SR, DeMartini EE, Schroeder B, Zgliczynski BJ, Laughlin J. 2006. Sharks and jacks in the Northwestern Hawaiian Islands from towed-diver surveys 2000-2003. *Atoll Research Bulletin* 543: 257-279.

Kenyon JC, Wilkinson CB, Aeby GS. 2008. Community structure of hermatypic corals at Maro Reef in the Northwestern Hawaiian Islands: A unique open atoll. *Atoll Research Bulletin*: 1-24. <https://doi.org/10.5479/si.00775630.558.1>

Key Biodiversity Areas (KBA). 2024. Key Biodiversity Areas factsheet: Northwestern Hawaiian Islands. Available at: <https://www.keybiodiversityareas.org/site/factsheet/29587> Accessed September 2024

Ocean Futures Society. 2016. Maro Reef segment from voyage to Kure. Available at: <https://www.youtube.com/watch?v=odrb5xF56Sk> Accessed September 2024.

Papahānaumokuākea Marine National Monument. 2024. Maro Reef (Koʻanakoʻa). Available at: <https://www.C.gov/visit/maro.html> Accessed September 2024.

Papastamatiou Y, Wetherbee B, Lowe C, Crow G. 2006. Distribution and diet of four species of carcharhinid shark in the Hawaiian Islands: evidence for resource partitioning and competitive exclusion. *Marine Ecology Progress Series* 320: 239-251. <https://doi.org/10.3354/meps320239>

UNEP-WCMC & IUCN. 2024. Protected Planet: The World Database on Protected Areas (WDPA) and World Database on Other Effective Area-based Conservation Measures (WD-OECM) [Online], February 2024, Cambridge, UK: UNEP-WCMC and IUCN. Available at: www.protectedplanet.net. Accessed February 2024.

Zill J. 2016. Sharks investigate baited cameras at Maro Reef, Northwestern Hawaiian Islands. Available at: <https://www.youtube.com/watch?v=O9-vpmiucsE> Accessed September 2024.