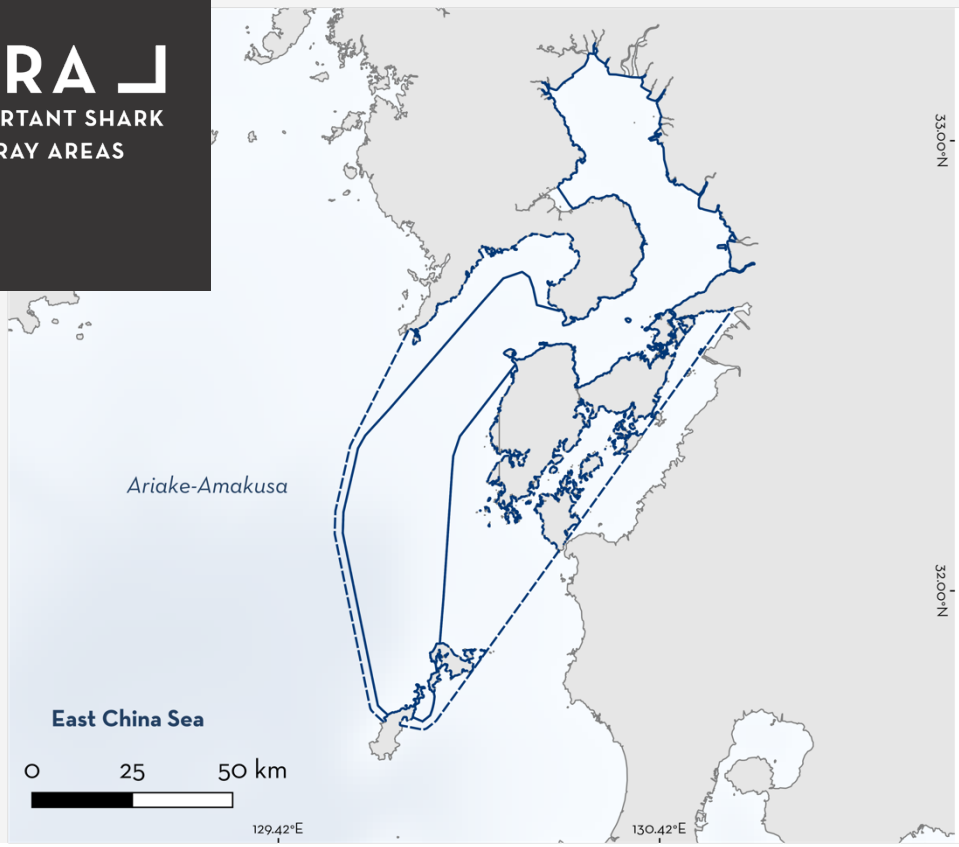
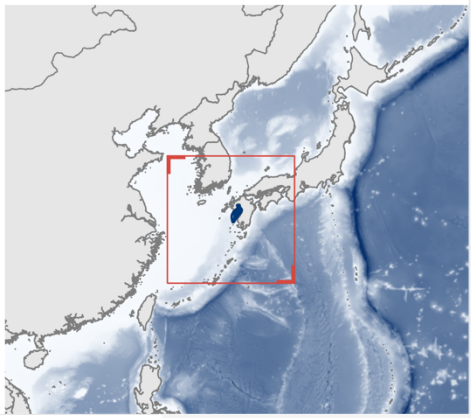
ISRA
IMPORTANT SHARK AND RAY AREAS





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

ARIAKE-AMAKUSA

Asia Region

JAPAN

0–200 metres

3,892.75 km²

SUMMARY

Ariake-Amakusa is located in northwest Kyushu Island, Japan. The area encompasses the unique ecosystem of Ariake Bay with a muddy substrate and the largest estuary in Japan, and the adjacent open water of the Amakusa Sea that borders the warm waters of the Kuroshio Current. The area overlaps with one Ecologically or Biologically Significant Marine Areas, five Key Biodiversity Areas, and three Wetlands of International Importance (Ramsar Sites). Within this area there are: **threatened species** and **areas important for movement** (Naru Eagle Ray *Aetobatus narutobiei*).

CRITERIA

Criterion A – Vulnerability; Sub-criterion C4 – Movement

DESCRIPTION OF HABITAT

Ariake–Amakusa is located in northwest Kyushu Island, Japan. It encompasses Ariake Bay and the Amakusa Sea. Ariake Bay is the largest bay on Kyushu Island covering an area of 1,700 km^2. The northern part of the bay is shallow (<20 m), while the southern part of the bay is relatively deep. The mouth of the bay is the deepest area in the southern bay, almost 200 m deep and very narrow, forming a bottleneck barrier or pseudo-closed bay where mixing with oceanic waters occurs (Furumitsu et al. 2019). Ariake Bay is fed by numerous rivers (Arifin et al. 2019) forming the largest estuary in Japan (Yamaguchi et al. 2021). The area encompasses the waters at the west of Amakusa Island extending until the waters surrounding Koshiki Islands.

The Amakusa Sea is influenced by Kuroshio Current-derived warm waters (Yamaguchi et al. 2005). The Kuroshio Current is a western boundary current in the subtropical North Pacific, originating in the Philippines, moving northward along the west boundary of the Pacific Ocean (Zhang et al. 2012). This current is one of the most important routes for poleward heat transport, contributing to the development of rich marine ecosystems along coastal regions (Andres et al. 2015; Morioka et al. 2019; Lizarbe Barreto et al. 2021). The water temperature of the estuary and shallow areas of Ariake Bay oscillates seasonally with the minimum below 10°C during the boreal winter (December–February), increasing to 15°C in late April or May (Yamaguchi et al. 2005). The bay is subject to a large tidal range (maximum 6 m) generating fast currents and large tidal flats.

The area overlaps with the Inland Seas of Western Kyushu Ecologically or Biologically Significant Marine Areas (EBSA; CBD 2024), and includes five Key Biodiversity Areas (Isahaya Bay, Inner Ariake Bay, Ariake Bay-Marine, Shimabara Bay, and Shirakawa Estuary) (KBA 2024), One National Park (Unzen amakusa), one Prefectural Natural Park (Misumi oyano kaihen), three Prefectural Wildlife Protection Areas (Ariake, Honmyogawa, and Kumamotoko), two Protected Water Surface, one Quasi National Park (Koshikijima), and three Wetlands of International Importance (Ramsar Sites: Higashiyoka-Higata, Hizenkashima-Higata, and Arao-Higata) (UNEP-WCMC & IUCN 2024; Ramsar 2024).

This Important Shark and Ray Area is benthopelagic and is delineated from inshore and surface waters (0 m) to 200 m based on the depth range of the Qualifying Species in the area.

ISRA CRITERIA

CRITERION A – VULNERABILITY

One Qualifying Species within the area is considered threatened with extinction according to the IUCN Red List of Threatened Species. The Naru Eagle Ray is assessed as Vulnerable (Rigby et al. 2021).

SUB-CRITERION C4 – MOVEMENT AREAS

Ariake–Amakusa is an important movement area for one ray species.

Naru Eagle Rays move between Ariake Bay and the Amakusa Sea seasonally during the boreal spring and winter in a regular and predictable way. Based on telemetry data and local ecological knowledge, adult Naru Eagle Rays spend summer months inside Ariake Bay (A Yamaguchi unpubl. data 2023), where they reproduce and feed (Yamaguchi et al. 2021). During late autumn (late November and December) animals move from Ariake Bay and cross the strait to the Amakusa Sea, moving south towards the waters north of the Koshiki islands. Animals overwinter at this location in deep waters

between 100 and 200 m (A Yamaguchi unpubl. data 2023). Based on the examinations of Naru Eagle Rays captured between autumn 2001 to summer 2003, animals did not grow at the overwinter location where feeding activity is low during winter (Yamaguchi et al. 2005). The journey is reversed during spring, when they move back inside Ariake Bay for summer (A Yamaguchi unpubl. data 2023).

Between 2001 and 2023, similar patterns were observed in surveys of the total catches in the area (Yamaguchi at al. 2005; A Yamaguchi unpubl. data 2023). Naru Eagle Ray catches inside Ariake Bay increased from April and peaked during the summer months. None were captured during December and February when the water temperature was <17°C inside the bay. The rays reappeared in the bay in late March or April when the water temperatures increased. Naru Eagle Rays were never caught inside Ariake Bay during winter, although they were caught in the Amakusa Sea during winter. The Amakusa Sea abuts Kuroshio Current-derived warm waters and the water temperatures during winter are higher compared to Ariake Bay (Yamaguchi et al. 2005), linking the migration to fluctuations in water temperatures.

Finally, a study on the life history and reproductive biology of Naru Eagle Rays examined a total of 1,189 animals collected by commercial vessels (20 cm mesh size, 400 m length) at depths of 8–20 m in the northern part of Ariake Bay between August 2001 and November 2019 (Yamaguchi et al. 2021). Findings revealed that this species reproduces synchronously and annually with a reproductive strategy closely linked to its migration pattern, including a rapid embryonic development, parturition, and mating in Ariake Bay during late summer, and a long period of embryonic diapause in relation to seasonal migrations outside of Ariake Bay (Yamaguchi et al. 2021). The study showed that embryonic diapause is likely linked to prey abundance, water temperature, and predator presence. At the end of summer when Naru Eagle Rays give birth, bivalves are abundant in Ariake Bay's estuary and summer water temperature in Ariake Bay is high, but with the onset of autumn, water temperatures decline (Yamaguchi et al. 2021). Water temperature of the estuary and shallow areas of Ariake Bay is <10°C during winter, threatening the survival of Naru Eagle Rays (Yamaguchi et al. 2021). Therefore, in late October and November, when water temperature reaches 18–19°C, Naru Eagle Rays gradually move from the shallow regions to southern deeper habitat within Ariake Bay, before migrating to the open sea to overwinter (Yamaguchi et al. 2021).

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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
RAYS												
Aetobatus narutobiei	Naru Eagle Ray	VU	0–200	X					X			

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