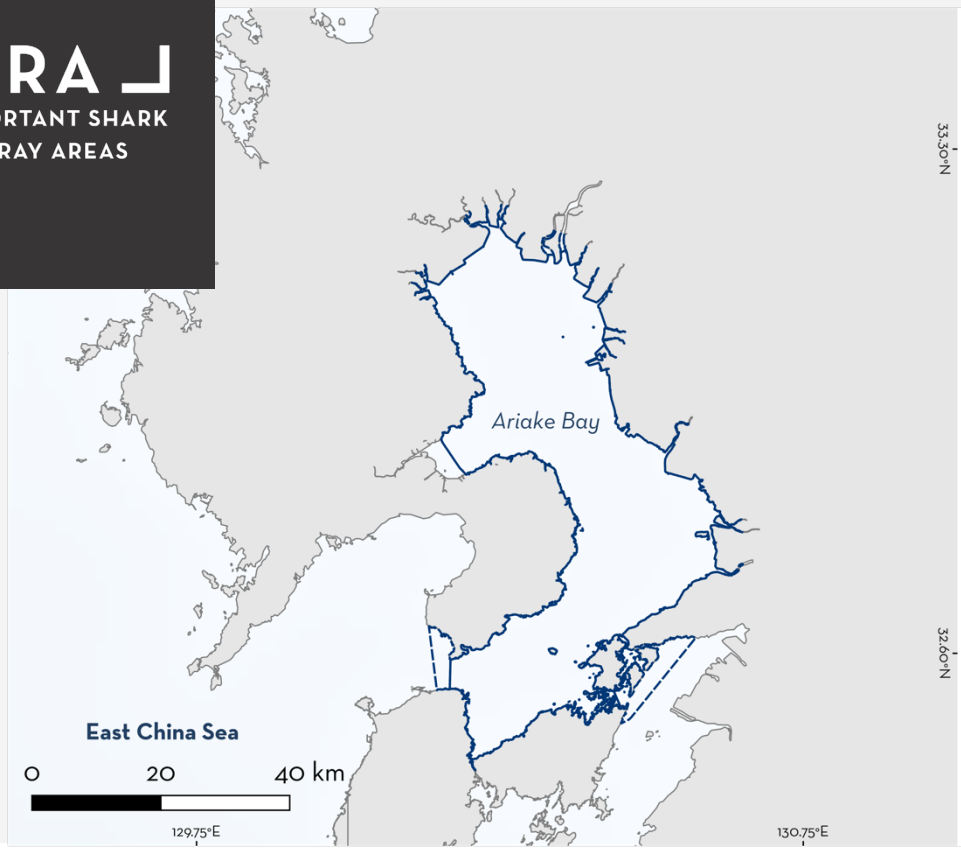
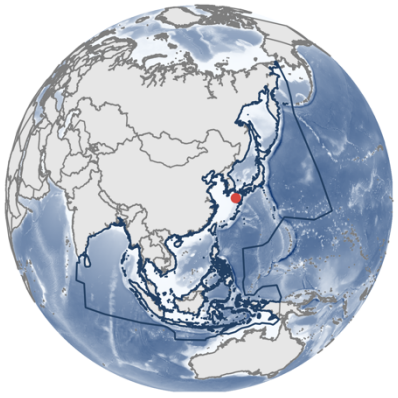
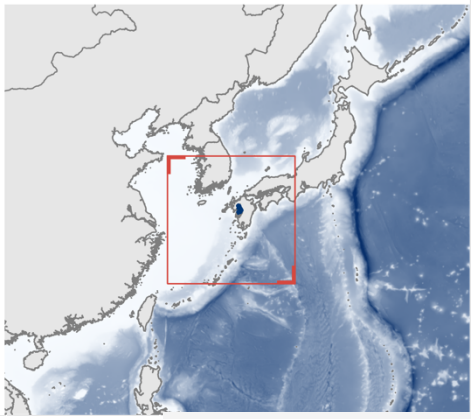
ISRA
IMPORTANT SHARK AND RAY AREAS







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 BAY ISRA

Asia Region

JAPAN

0–200 metres

1,627.67 km²

SUMMARY

Ariake Bay is the largest bay on Kyushu Island, Japan. The area is fed by numerous rivers forming the largest estuary in Japan and encompasses large tidal flats. The area overlaps with two Ecologically or Biologically Significant Marine Areas, five Key Biodiversity Areas, and three Ramsar Sites. Within this area there are: **threatened species** (e.g., Ringed Guitarfish *Rhinobatos hynnicephalus*); **range-restricted species** (Sharpnose Ray *Telatrygon acutirostra*); **reproductive areas** (e.g., Indonesian Whaler Shark *Carcharhinus tjutjot*); and **feeding areas** (Naru Eagle Ray *Aetobatus narutobiei*).

CRITERIA

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

DESCRIPTION OF HABITAT

Ariake Bay is the largest bay on Kyushu Island, and is located between the prefectures of Nagasaki, Saga, Fukuoka, and Kumamoto in Japan. The area is fed by numerous rivers forming the largest estuary in Japan (Arifin et al. 2020; Yamaguchi et al. 2021). Mixing with oceanic waters occurs at the mouth of the bay (Furumitsu et al. 2019). 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 (Furumitsu et al. 2019). The water temperature of the estuary and shallow waters oscillates seasonally with a minimum of <10°C during the boreal winter between December and February, increasing to 15°C in late April or May (Yamaguchi et al. 2005). Ariake Bay is subject to a relatively large tidal range (maximum 6 m) generating fast currents and large tidal flats. The tidal flats are highly productive.

The area overlaps with the Inland Seas of Western Kyushu Ecologically or Biologically Significant Marine Area (EBSA) and the Intertidal Areas of East Asian Shallow Seas EBSA (CBD 2024a, 2024b), five Key Biodiversity Areas (Isahaya Bay, Inner Ariake Bay, Ariake Bay-Marine, Shimabara Bay, and Shirakawa Estuary) (KBA 2024a, 2024b, 2024c, 2024d, 2024e), and three Ramsar Sites (Wetlands of International Importance; Higashiyoka-Higata, Hizenkashima-Higata, and Arao-Higata) (Ramsar 2024; UNEP-WCMC & IUCN 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 bathymetry of the area.

ISRA CRITERIA

CRITERION A – VULNERABILITY

Five Qualifying Species considered threatened with extinction according to the IUCN Red List of Threatened Species regularly occur in the area. Threatened sharks comprise one Vulnerable species; threatened rays comprise one Endangered species and three Vulnerable species (IUCN 2024).

CRITERION B – RANGE RESTRICTED

This area holds the regular presence of Sharpnose Rays as a resident range-restricted species. This species occurs year-round in the area and is regularly encountered and caught in local fisheries including in gillnets, trawls, and setnets (A Yamaguchi unpubl. data 2024). There have been almost no records of this species outside of the Ariake Sea despite monitoring of fisheries. This species occurs primarily in the East China Sea Large Marine Ecosystem (LME) and Kuroshio Current LME, and only marginally into the Yellow Sea LME and Sea of Japan LME.

SUB-CRITERION C1 – REPRODUCTIVE AREAS

Ariake Bay is an important reproductive area for one shark and four ray species.

Based on data collected from between 2003 and 2019, 26% of catches comprise Indonesian Whaler Shark neonates and young-of-the-year (YOY). These were close to the known size-at-birth of this species (34–38 cm TL; Ebert et al. 2021). These occur seasonally in large numbers between the months of May to September, usually on tidal flats and shallow areas to a depth of 60 m (A Yamaguchi unpubl. data. 2023).

Ariake Bay is the main habitat for Naru Eagle Ray where the largest known aggregations of this species occur anywhere in its range (Yamaguchi et al. 2021). Animals use this area for mating, gestation, and parturition. Surveys indicate that neonates occur seasonally in large numbers between late August to September with a preference for tidal flats and shallow areas to 20 m depth (A Yamaguchi unpubl. data. 2023). This observation is based on the presence of umbilical scars and age determination using vertebral centra. Size-at-birth for this species is 30–40 cm DW (Yamaguchi et al. 2021). Pregnant Naru Eagle Ray with near-term embryos were caught in estuarine areas during the months of August and September (Yamaguchi et al. 2005). Furthermore, a study on the life history and reproductive biology of Naru Eagle Rays examined a total of 1,189 animals collected by commercial vessels using gillnets at depths of 8–20 m in the northern part of Ariake Bay between August 2001 and November 2019 (Yamaguchi et al. 2021). Their reproductive strategy occurs synchronously on an annual basis and includes 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). At the end of summer when Naru Eagle Rays give birth, bivalves are abundant in Ariake Bay's estuary. Summer water temperature in Ariake Bay, when Naru Eagle Rays give birth is high, but with the onset of autumn, the water temperature declines. When the water temperature reaches 18–19°C in late October and November, Naru Eagle Rays gradually move from the shallow regions to the deeper, southern habitat within Ariake Bay, before migrating to the open sea to overwinter (Yamaguchi et al. 2021). The timing of parturition for Naru Eagle Rays occurs when water temperatures are highest, predator presence lowest, and is optimised for young to maximise food consumption and energy stores in the few months prior to their winter migration (Yamaguchi et al. 2021).

Based on data collected from 1,418 Red Stingrays (males = 682, females = 736) between 2003 and 2014, all life stages were present year-round in the area (Furumitsu et al. 2019; A Yamaguchi unpubl. data 2019). Females have an annual and synchronous reproductive cycle in the area (Furumitsu et al. 2019). The main gestation period is between May and July, when 84% of mature females (n = 147) were reported pregnant. Females with uterine eggs and embryos were collected between April and August with a fecundity of 7–25 embryos per litter (n = 96, mean = 12.3, standard deviation = 3.5) and correlated with female size. The gestation period is followed by a parturition period between July and August (Furumitsu et al. 2019). Evidence of mating (dermal bite marks) was documented between September and May and successful mating was confirmed with the presence of sperm in the cloaca of females between October and April (Furumitsu at al. 2019). Size-at-birth is 10.5–13.0 cm disc width (DW) and smaller specimens <20 cm DW (Furumitsu at al. 2019) were more abundant (68.7%; total n = 498) in estuarine areas 3–8 m deep. Sperm-carrying males and mature females are also abundant across the year in the area (Furumitsu at al. 2019).

A high abundance of pregnant female Yellow-spotted Fanrays are regularly observed in this area. Based on monthly sampling between May 2002 and September 2006, 718 specimens (males = 364, females = 354) were collected at a depth of ~50 m off Shimabara by trawls and gillnets. Males ranged in size from 14.8 to 47.8 cm TL, while females ranged in size from 15.2 to 59.2 cm TL (Kume et al. 2008). Nearly all mature females (97%; n = 146) were pregnant (n = 142) with parturition occurring August–November (A Yamaguchi unpubl. data. 2007). Yellow-spotted Fanrays are the most abundant shark and ray species in the central region of Ariake Bay (Yamaguchi et al. 2012) and it is commonly incidentally caught in gillnets and by small trawlers.

Based on a reproductive biology analysis from a total of 370 specimens (males = 173; females = 197), Ringed Guitarfish regularly use this area for mating and parturition (Kume et al. 2009). Individuals were caught using trawls and gillnets at a depth of ~50 m off Shimabara from May 2002 to July 2007. Size ranges were 18.1–58 cm TL for males and 18.4–73 cm TL for females. Further laboratory dissection and histological analysis revealed that 60% of the females were pregnant (n = 118) with near-term

embryos observed in females with preovulatory ova collected in early August (Kume et al. 2009). The mating period was established as July–August when the presence of semen was confirmed in the seminal vesicles of all mature males and when preovulatory ova were observed in the females. Taken together, these data indicate that parturition occurred in August, and was immediately followed by mating and ovulation (Kume et al. 2009). This species is still regularly captured in this area (A Yamaguchi unpubl. data. 2023).

SUB-CRITERION C2 – FEEDING AREAS

Ariake Bay is an important feeding area for one ray species.

Based on data from catches collected between 2003 and 2019, Naru Eagle Ray migrate to the area during the summer to feed on the abundant bivalves inhabiting the tidal flats, occurring regularly and predictably between April and November (Yamaguchi et al. 2005, 2021; A Yamaguchi unpubl. data. 2019). No captures were recorded during December and February when the water temperature was <15–17°C in the area. The rays enter extremely shallow waters at high tide to feed on bivalves and return to deeper water at low tide, and it is assumed that they therefore feed on the tidal flats twice each day (Yamaguchi et al. 2005).

Specific evidence of feeding behaviour in the area was investigated with a growth study (n = 281) and a feeding study (n = 207) on individuals captured between August 2001 and November 2002 (Yamaguchi et al. 2005). The growth study analysed the vertebral band pattern and body sizes and indicated that Naru Eagle Rays grow seasonally, growing rapidly during the summer when they visit Ariake Bay and not growing during the winter (Yamaguchi et al. 2005). Stomach content analysis showed that stomachs were full in individuals caught inside the Bay but empty in animals captured in oceanic areas during the winter (Yamaguchi et al. 2005). Additionally, stomach content prey composition was almost limited to bivalves and a few other mollusc species (Yamaguchi et al. 2005). The most abundant species identified was the Short-neck Clam *Ruditapes philippinarum*, a species farmed in Ariake Bay (Yamaguchi et al. 2005) and naturally one of the most dominant bivalve species on the tidal flats (Nakano et al. 2012). Additional data collected since have revealed that important prey are wild Ostreidae and Bloody Clams *Andara kagoshimensis*, an abundant species in Ariake Bay (Yoshino et al. 2019), while Short-neck Clam are very rare in stomach contents (A Yamaguchi unpubl. data 2024).

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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												
Carcharhinus tjutjot	Indonesian Whaler Shark	VU	0–100	X		X						
RAYS												
Aetobatus narutobiei	Naru Eagle Ray	VU	0–200	X		X	X					
Hemitrygon akajei	Red Stingray	NT	0–100			X						
Platyrhina tangi	Yellow-spotted Fanray	VU	10–100	X		X						
Rhinobatos hynnicephalus	Ringed Guitarfish	EN	20–100	X		X						
Telatrygon acutirostra	Sharpnose Ray	VU	2–142	X	X							

SUPPORTING SPECIES

Scientific Name	Common Name	IUCN Red List Category
SHARKS		
Carcharhinus brachyurus	Copper Shark	VU
Carcharhinus brevipinna	Spinner Shark	VU
Carcharhinus limbatus	Blacktip Shark	VU
Carcharhinus obscurus	Dusky Shark	EN
Hemitriakis japanica	Japanese Topeshark	EN
Mustelus griseus	Spotless Smoothhound	EN
Sphyrna lewini	Scalloped Hammerhead	CR
Sphyrna zygaena	Smooth Hammerhead	VU
Triakis scyllium	Banded Houndshark	EN
RAYS		
Gymnura japonica	Japanese Butterfly Ray	VU
Hemitrygon izuensis	Izu Stingray	VU
Hemitrygon laevigata	Yantai Stingray	VU
Myliobatis tobijei	Japanese Eagle Ray	VU
Okamejei kenojei	Spiny Skate	VU
Telatrygon zugei	Pale-edge Sharpnose Ray	VU
Urolophus aurantiacus	Oriental Stingaree	VU

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 Ariake Bay is an important reproductive area for one shark species. Based on data collected from catches between 2003 and 2019, Scalloped Hammerhead neonates occur seasonally in large numbers between the months of May to September, usually on tidal flats and shallow areas (A Yamaguchi unpubl. data. 2023).

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