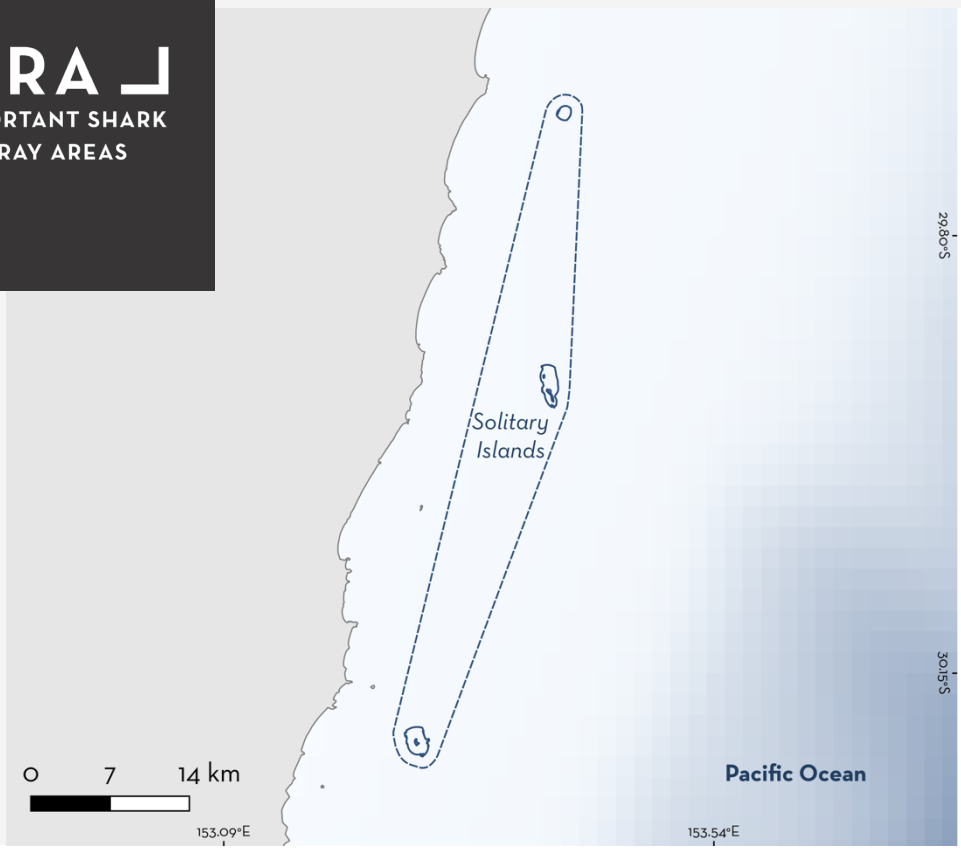
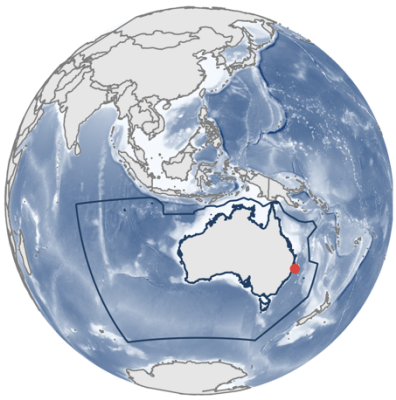
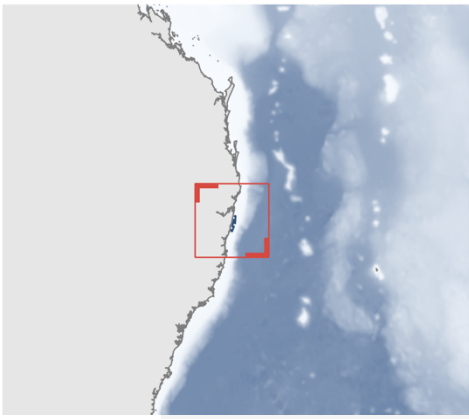
ISRA
IMPORTANT SHARK AND RAY AREAS







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

SOLITARY ISLANDS ISRA

Australia and Southeast Indian Ocean Region

SUMMARY

Solitary Islands is located on the mid-north coast of New South Wales, Australia. This split area includes three sites: Pimpernel Rock, North Solitary Island, and South Solitary Island. The habitat at these sites is characterised by rocky reefs and gutter systems and is influenced by seasonal fluctuations in the East Australian Current. This area overlaps with the Solitary Islands Marine Park. Within this area there are: **threatened species** (e.g., Scalloped Hammerhead *Sphyrna lewini*); **resting areas** (Sand Tiger Shark *Carcharias taurus*); and **undefined aggregations** (e.g., Spotted Wobbegong *Orectolobus maculatus*).

CRITERIA

Criterion A – Vulnerability; Sub-criterion C3 – Resting Areas; Sub-criterion C5 – Undefined Aggregations

AUSTRALIA

0–50 metres

9.06 km²

DESCRIPTION OF HABITAT

Solitary Islands is located on the mid-north coast of New South Wales, Australia. This split area includes three sites: Pimpernel Rock, North Solitary Island, and South Solitary Island. Pimpernel Rock comprises a large pinnacle bisected by a large cave and gutter system. It is situated ~7.5 km offshore from the coastline with the depth ranging from 12 m (at the top of the pinnacle) to ~50 m depth (Malcolm et al. 2025). The three islands contain rocky reefs with hard and soft coral communities, and complex gutter systems (Parks Australia 2025).

Solitary Islands is influenced by the East Australian Current, the poleward flowing western boundary current of the South Pacific Gyre (Suthers et al. 2011). The East Australian Current flow is strongest in the austral summer, and the formation of eddies along this coastline also fluctuates seasonally (Ridgway & Hill 2009).

This area overlaps with the Solitary Islands Marine Park (Parks Australia 2025).

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

ISRA CRITERIA

CRITERION A – VULNERABILITY

Two Qualifying Species considered threatened with extinction according to the IUCN Red List of Threatened Species regularly occur in the area. These are the Critically Endangered Sand Tiger Shark (Rigby et al. 2025) and Scalloped Hammerhead (Rigby et al. 2019).

SUB-CRITERION C3 – RESTING AREAS

Solitary Islands is an important resting area for one shark species.

There are multiple lines of evidence to support Sand Tiger Sharks regularly and predictably using sites within this area for resting. Evidence includes scientific surveys and acoustic tracking conducted by the New South Wales (NSW) Department of Primary Industries Research and Development (Bradford et al. 2025; Otway & Louden 2025), a citizen science photo-identification database (Sharkbook 2025), and opportunistic sightings from the recreational dive industry (M Davey pers. obs. 2025). These lines of evidence have revealed at least three important resting sites for Sand Tiger Sharks within the area: South Solitary Island, North Solitary Island, and Pimpernel Rock.

Nineteen Sand Tiger Shark aggregation sites have been highlighted in eastern Australia (Bradford et al. 2025). Sand Tiger Shark aggregations were defined as a site where five or more Sand Tiger Sharks are seen aggregating either continuously or on a predictable seasonal cycle, and all were classified as resting areas for the species. Between 2011–2021, 10-year acoustic transmitters were used to track sharks and determine their preferred habitats based on residency rates (Otway & Louden 2025), and this information was used to determine aggregation sites. Sand Tiger Sharks are observed at Solitary Islands year-round, with numbers peaking between June–December. Between 2011–2021, 17 of the 31 tagged

individuals were detected in the area across three of the sites (<220,000 detections; Bradford et al. 2025). Observed residence periods lasted up to 74 consecutive days (Otway & Louden 2025). A mixture of ages and sexes were detected within the area, however, there were differences in the seasonality of their site use. Adult males were most prevalent in autumn/winter coinciding with the annual northerly migration to Queensland waters, and then in spring/summer coinciding with the southerly migration to mate. Pregnant Sand Tiger Sharks were present in autumn/winter and either pupped in the area in late winter or migrated further south to pup. Up to 40 Sand Tiger Sharks have been recorded on a single dive in this area (B Louden pers comms. 2025). Sand Tiger Sharks were observed swimming close to the seabed (Bradford et al. 2025) and showed a diel pattern of occupancy to the area with higher detections during the day (Otway & Louden 2025).

Between 2007–2025, the citizen science project Spot a Shark collected 581 photographs of Sand Tiger Sharks from SCUBA divers in the area at the South Solitary Island and North Solitary Island dives sites (Sharkbook 2025). Using photo-identification, at least 126 individual Sand Tiger Sharks were identified based on left flank images. Shark sightings in this area are year-round, although there is a seasonal peak in July and January likely related to their seasonal migrations along this coastline (S Han-de-Beaux unpubl. data 2025). The area offers a resting location for sharks, due to its shallow, protected waters that are sheltered from swells, currents, and surge, creating a calm environment.

Between 2020–2025, daily to weekly recreational dives were conducted in the area year-round depending on conditions (M Davey unpubl. data 2025). 'Manta Arch' off South Solitary Island is the most frequented dive site within the area with daily to weekly dives conducted here year-round (M Davey pers. obs. 2025). Sand Tiger Sharks are seen year-round, however, numbers observed fluctuate seasonally. In summer (November–April), there are as few as 1–2 sharks observed during a single 60-minute dive, with a maximum of 10–15 depending on conditions. However, during winter months (May–October), there are up to 50 individuals in the vicinity of South Solitary Island (M Davey pers. obs. 2025). In general, females and younger males are seen year-round, with higher numbers of males observed in winter. This also corresponds with observations of mating scars on females in late winter. An exact breakdown of numbers, sexes, and maturity status has not been recorded by the dive community (M Davey pers. obs. 2025). During summer months, Sand Tiger Sharks sometimes display predator avoidant behaviours, bunching up in the 'Back Gutter' at Manta Arch, generally coinciding with schools of Scalloped Hammerheads in the area.

Recreational dives to North Solitary Island are conducted 10–15 times during the summer months (M Davey pers. obs. 2025). Sand Tiger Sharks are observed at a dive site called 'Steps'. During summer, up to six individuals are seen on a single 60-minute dive (average n = ~2), however, winter numbers are unknown due to a lack of site visits at that time of year. It is assumed there are probably more Sand Tiger Sharks at the site in the winter, corresponding to their peaking numbers in adjacent parts of the area, however, this was unconfirmed by recreational dive surveys.

The diel patterns in behaviour that the sharks exhibit at these sites is characteristic of Sand Tiger Sharks resting during the day and being active at night (presumably for foraging) (D Harasti pers. obs. 2025). Hovering and milling are also characteristic behaviours of resting Sand Tiger Sharks and comprise the majority of swimming behaviours observed at their main

aggregation sites on Australia's east coast (Smith et al. 2015). When hovering, sharks face into the water current and their tail beats allow them to maintain a stationary position, whereas milling involves slow movements and directional changes generally confined to a particular area within a gutter (Smith et al. 2015).

SUB-CRITERION C5 – UNDEFINED AGGREGATIONS

Solitary Islands is an important area for undefined aggregations of two shark species.

Between 2020–2025, daily to weekly recreational dives were conducted in the area year-round (M Davey unpubl. data 2025). Spotted Wobbegongs are observed on every dive to South Solitary Island. Individuals range from immature to very large adults. Usually ~5–10 individuals are observed during a single 60-minute dive. Occasionally up to 20 individuals are observed together, generally coinciding with a feeding event. There is no apparent seasonality to their aggregation at this site, but no formal records have been maintained. Spotted Wobbegongs are observed laying on the benthos, typical resting behaviour for this species, and they form resting aggregations whereby individuals are seen stacked on top of each other (M Davey pers. obs. 2025). Spotted Wobbegongs are also observed on every dive to North Solitary Island. The numbers vary between 1–2 individuals, and up to 10 per 60-minute dive (M Davey pers. obs. 2025). No seasonality in sightings has been observed at this site, suggesting it may be a year-round site for resting aggregations for this species. Given this is a benthic shark species, more information is needed to understand the nature and function of their aggregations in the area and to determine whether this is an important resting area for this species.

Between 2016–2025, aggregations of Scalloped Hammerheads were observed by recreational divers in the area (M Davey unpubl. data 2025). Observations are seasonal during spring/summer, with the peak of sightings during November. An average of ~10 Scalloped Hammerheads were observed, with a range of 5–30 individuals (M Davey unpubl, data 2025). Sightings are very dependent on water clarity (20+ m visibility), as Scalloped Hammerheads are usually timid and on the edge of visibility. Aggregations are observed >10 times per spring/summer, up to ~20 observations per season. Most of these observations were made at the South Solitary Island dive sites in the area owing to the higher survey effort (daily to weekly dives), however, occasional sightings were also made at North Solitary Island. These aggregations are potentially related to increased productivity in the area owing to the seasonal strengthening of the East Australian Current (Ridgway & Hill 2009), however, more information is needed to understand the nature and function of these aggregations.

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We acknowledge the Traditional Owners of Country throughout Australia and recognise the continuing connection to land, waters, and culture. We pay our respects to Elders past, present, and emerging.

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QUALIFYING SPECIES

Scientific Name	Common Name	IUCN Red List Category/ EPBC Act	Global Depth Range (m)	ISRA Criteria/Sub-criteria Met								
				A	B	C1	C2	C3	C4	C5	D1	D2
SHARKS												
Carcharias taurus	Sand Tiger Shark (Grey Nurse Shark)	CR/CR*	0–232	X				X				
Orectolobus maculatus	Spotted Wobbegong	LC	0–218							X		
Sphyrna lewini	Scalloped Hammerhead	CR/CD	0–1,043	X						X		

SUPPORTING SPECIES

Scientific Name	Common Name	IUCN Red List Category
SHARKS		
Carcharodon carcharias	White Shark	VU
Orectolobus halei	Banded Wobbegong	LC
Stegostoma tigrinum	Indo-Pacific Leopard Shark	EN
RAYS		
Aetobatus ocellatus	Spotted Eagle Ray	EN
Mobula alfredi	Reef Manta Ray	VU
Taeniurops meyeni	Blotched Fantail Ray	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.

Australian Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) categories are available at: https://www.dcceew.gov.au/environment/epbc/our-role/approved-lists Abbreviations refer to: CR, Critically Endangered; EN, Endangered; VU, Vulnerable; CD, Conservation Dependent.

**Status for the east coast population*

SUPPORTING INFORMATION

There are indications that this area may be important are for undefined aggregations for one ray species.

Reef Manta Rays have been regularly observed within the area at South Solitary Island between December–May (M Davey pers. obs. 2025). Reef Manta Rays are generally observed as individual rays attending cleaning stations, where small cleaner wrasse attend to them to remove parasites (Armstrong et al. 2021). However, on occasion more than one ray has been observed cleaning in the area (e.g., February 2019). This area lies towards the southern extent of this species' distribution on the east coast of Australia and likely represents an important habitat for their seasonal migration during the warmer summer months (Couturier et al. 2011). Between 2009–2024, there were 10 opportunistic sightings submitted by citizen scientists for photo-identification from this area (n = 9 since 2010; Project Manta unpubl. data 2025). From these 10 sightings, one individual was observed twice, suggesting at least some individuals return to the area between years. Sightings are between December–May (Project Manta unpubl. data 2025), supporting the seasonal nature of this species' habitat use in the area. There was one neonate Reef Manta Ray observed in the area (December 2024) suggesting this area may be important for reproduction. Neonates were classified based on their size (~150 cm disc width; DW), with the size-at-birth for this species 130–150 cm DW (Last et al. 2016). More information is needed to understand the importance of the area to this species.

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