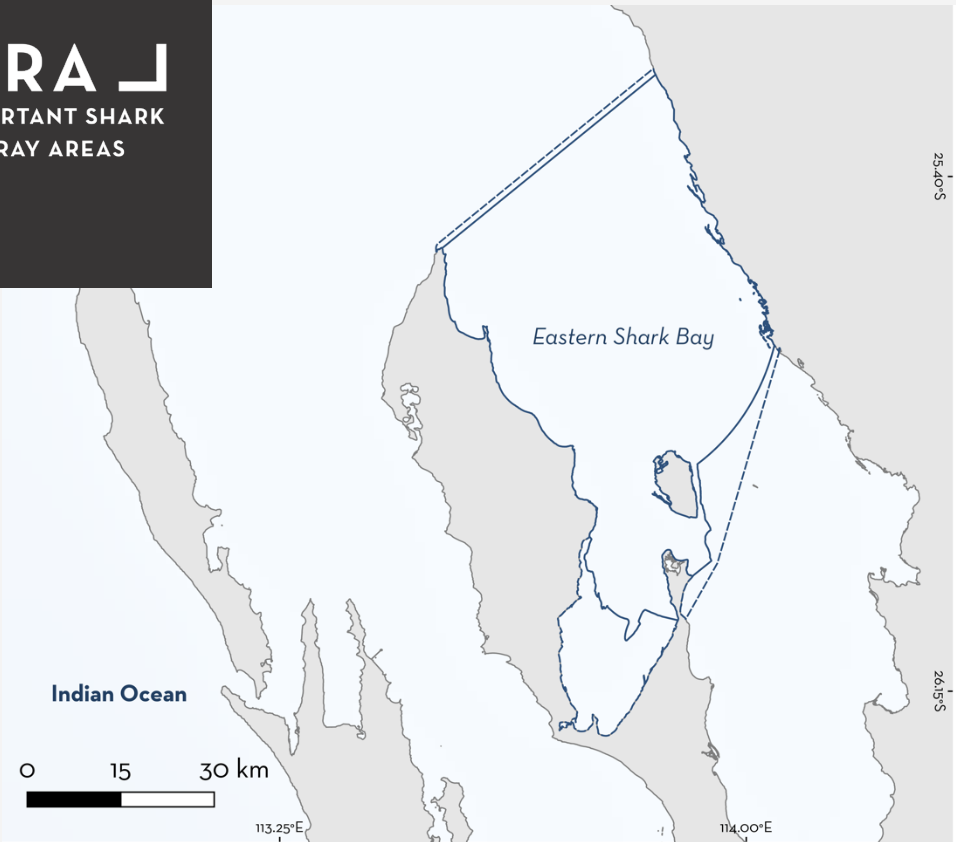
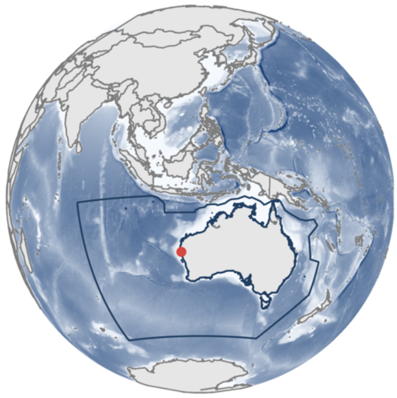
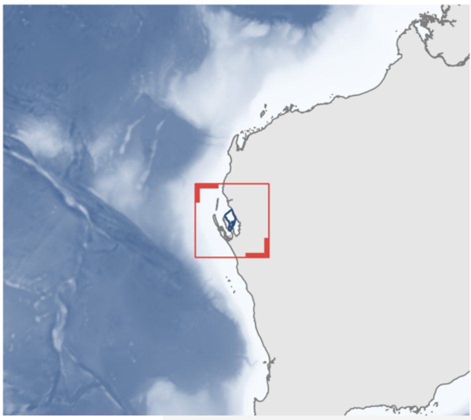
ISRA

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

EASTERN SHARK BAY ISRA

Australia and Southeast Indian Ocean Region

AUSTRALIA

0-30 metres

2,466.7 km²

SUMMARY

Eastern Shark Bay is located in Shark Bay, Western Australia, Australia. Shark Bay is a large, semi-enclosed coastal embayment that contains one of the largest reported seagrass beds in the world. Because evaporation exceeds freshwater input, this area functions as an inverse estuary. This area overlaps with the Shark Bay Marine Park. Within this area there are: **feeding areas** (Tiger Shark *Galeocerdo cuvier*).

CRITERIA

Sub-criterion C2 - Feeding Areas

DESCRIPTION OF HABITAT

Eastern Shark Bay is located in Shark Bay, Western Australia, Australia. Shark Bay is a large, semi-enclosed coastal embayment that contains one of the largest reported seagrass beds in the world and the largest in Australia (Walker 1989; Burkholder et al. 2013). The area is dominated by the seagrass *Amphibolis antarctica* which covers ~85% of the area characterised by seagrasses, with smaller areas of *Posidonia australis* (Walker et al. 1988; Burkholder et al. 2013). Other substrates include sand and colonizing seagrass, interspersed with macroalgae, pavement, and microbial mats.

Shark Bay has a semi-arid climate characterised by two main seasons: warm to hot austral summers (October–March) and mild winters (April–September). The bay's waters are warmer than adjacent oceanic waters in summer and cooler in winter (Nahas et al. 2005). Average sea surface temperatures (SST) are higher in summer (mean = 24.6 ± 1.0°C) than in winter (mean = 20.8 ± 1.7°C). Because evaporation exceeds freshwater input, Shark Bay functions as an inverse estuary, with nearshore waters consistently more saline than the surrounding ocean (Logan & Cebulski 1970; Burling et al. 1999). During summer, salinity rises sharply. In winter, reduced wind-driven mixing and tidal forcing cause hypersaline water (salinity >40) from the southern parts of both gulfs of Shark Bay (outside of this area) to flow along the seabed, forming dense plumes that generate strong longitudinal salinity gradients extending from oceanic to inner bay waters (Logan & Cebulski 1970; Hetzel et al. 2015). Although mean sea surface salinity shows little seasonal fluctuation overall, hypersaline water during summer remains largely confined to the southern regions of Shark Bay (outside of this area) (D'Antonio et al. 2025).

The seagrass beds of the area sustain globally significant populations of large marine vertebrates, namely Dugong *Dugong dugon*, Green Turtle *Chelonia mydas*, and Loggerhead Turtle *Caretta caretta* (Marsh et al. 1994; Preen et al. 1997; Heithaus 2001a; Heithaus et al. 2005, 2012; Gales et al. 2004; Wirsing et al. 2007). This area also functions as key foraging grounds for Elegant Sea Snake *Hydrophis elegans* and teleost fishes.

This area overlaps with the Shark Bay Marine Park (WA DBCA 2025).

This Important Shark and Ray Area is benthic and pelagic and is delineated from inshore and surface waters (0 m) to 30 m based on the depth range of Qualifying Species in the area.

ISRA CRITERIA

SUB-CRITERION C2– FEEDING AREAS

Eastern Shark Bay is an important feeding area for one shark species.

Between 1994–1999, 48 stomach contents were analysed showing that Tiger Sharks feed mainly on Elegant Sea Snake, Dugong, Green Turtle, and Loggerhead Turtle with a percentage of occurrence between 25–60%, depending on the prey item (Heithaus 2001a; Simpfendorfer et al. 2001).

Between 1997–2004, 49 Tiger Sharks were monitored using a combination of acoustic telemetry (n = 8) and Crittercams (animal-borne video and environmental data collection system; n = 41) (Heithaus et al. 2002, 2006). Prey availability was also monitored. Foraging behaviour was observed in 12 (55%) of 22 sharks. At least five sharks were recorded successfully capturing prey. Nine sharks encountered 19 identifiable potential prey items (e.g., sea turtles, sea snakes, rays, including rhino rays) (Heithaus et al. 2002). Sharks exhibited a preference for shallow habitats, as 36% of their time was spent in shallow habitats. Randomisation techniques to test habitat preference showed that sharks strongly preferred shallow habitats where dugongs, turtles, and fish are abundant.

Several prey species were regular recipients of Tiger Shark-inflicted injury: 74% of Indo-Pacific Bottlenose Dolphins *Tursiops aduncus* (Heithaus 2001b), 25% of female Loggerhead Turtles, and 50% of male Loggerhead Turtles (Heithaus et al. 2005, 2012). Two Dugongs showed scars from failed shark attacks, while three Tiger Sharks were directly observed harassing, attacking, killing, and consuming dugongs of various ages (Wirsing et al. 2007).

Between 1997–2005, 159 samples (from fin, whole blood, and red blood cells) were collected from Tiger Sharks in this area (Ferreira et al. 2017). Stable isotope values (δ13C) indicated that sharks feed primarily within coastal, seagrass-associated food webs, rather than pelagic habitats. Their isotopic signatures closely matched those of prey such as Dugongs and sea turtles, confirming a diet based on seagrass-derived carbon sources. A similar study that collected samples from shark fins (n = 166) between 2005–2012 in this area established that Tiger Sharks also obtained most of their energy from seagrass-based food webs (Heithaus et al. 2013).

Tiger Shark prey (Dugongs, Green Turtles, Loggerhead Turtles, and Elegant Sea Snakes) are most abundant in shallow habitats (Heithaus 2001a, 2004; Heithaus et al. 2002, 2005, 2012). Sea turtles, Dugongs, and dolphins modify their habitat use in response to changing Tiger Shark abundance (Heithaus & Dill 2002; Heithaus et al. 2005, 2012; Wirsing et al. 2007). When sharks are scarce, these species forage in shallow, food-rich seagrass areas, and when sharks are abundant, they shift toward safer, deeper habitats. Fear risk effects (i.e., impacts of perceived predation risk on prey behaviour and ecology, even without actual predation) confirms that Tiger Sharks actively hunt in these productive shallow habitats, supporting the importance of this area as a feeding ground (Heithaus et al. 2012).

Between 1997–2004 using drumlines equipped with a single hook, 911 Tiger Shark (101–445 cm total length [TL], mean = 284.4 cm TL) were captured in this area (Heithaus 2001a; Wirsing et al. 2007; Heithaus et al. 2012). Based on size-at-maturity (250–350 cm TL for females; 226–305 cm TL for males) (Ebert et al. 2021), Tiger Sharks found in this area are larger juveniles and adults. Catch rates were highest in warm months, and when prey abundance is high (Heithaus et al. 2012; D'Antonio et al. 2025). Tiger Shark catch rates here are notably higher than in comparable studies targeting large sharks elsewhere (Heithaus et al. 2012).

In 2022, 10 Tiger Sharks (247–406 cm TL; 80% female) were captured using baited drumlines and tagged in Shark Bay during summer and winter (D'Antonio et al. 2025). Most of the location estimates for the filtered tracking dataset were located in this area. Tiger Sharks were typically found within a narrow range of salinities (35.2–39.7), avoiding areas with hypersaline waters (salinities >40) located south of this area. Habitat modelling suggests that Tiger Shark habitat is associated with dense and shallow seagrass beds (D'Antonio et al. 2025).

Since 2020, social media posts provide evidence that this area continues to be used as a feeding area. Also, since 2020, common prey (e.g., Indo-Pacific Bottlenose Dolphins and sea turtles) have been observed with bite marks, most probably originating from Tiger Sharks (D'Antonio pers. obs. 2022–2025). Finally, an ongoing study provides evidence that this area continues to be an important feeding ground for this species (SOS 2025).

Acknowledgments

Michael R Heithaus (Florida International University), Ben D'Antonio (Shark Research Foundation), Karissa O Lear (Murdoch University), Luciana Ferreira (Australian Institute of Marine Science), and Adriana Gonzalez Pestana (IUCN SSC Shark Specialist Group – ISRA Project) contributed and consolidated information included in this factsheet. We thank all participants of the 2025 ISRA Region 08 – Australia and Southeast Indian Ocean workshop for their contributions to this process.

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.

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. 2025. Eastern Shark Bay 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												
Galeocerdo cuvier	Tiger Shark	NT	0–1,275				X					

SUPPORTING SPECIES

Scientific Name	Common Name	IUCN Red List Category
SHARKS		
Carcharhinus amboinensis	Pigeye Shark	VU
Carcharhinus brevipinna	Spinner Shark	VU
Carcharhinus cautus	Nervous Shark	LC
Carcharhinus limbatus	Blacktip Shark	VU
Carcharhinus plumbeus	Sandbar Shark	EN
Carcharhinus obscurus	Dusky Shark	EN
Negaprion acutidens	Sharptooth Lemon Shark	EN
Rhizoprionodon acutus	Milk Shark	VU
RAYS		
Bathytoshia brevicaudata	Smooth Stingray	LC
Glaucostegus typus	Giant Guitarfish	CR
Himantura australis	Australian Whipray	LC
Mobula alfredi	Reef Manta Ray	VU
Neotrygon australiae	Australian Bluespotted Maskray	NT
Neotrygon leylandi	Painted Maskray	LC
Pastinachus ater	Broad Cowtail Ray	VU
Pateobatis fai	Pink Whipray	VU
Rhinoptera neglecta	Australian Cownose Ray	DD

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 is additional evidence that the Eastern Shark Bay might be an important reproductive area for Spinner Shark, Nervous Shark, Sharptooth Lemon Shark, Milk Shark, and Giant Guitarfish.

Between January 1999 and September 2001, four sites, in Herald Bight (northern Peron Peninsula), near the shore and in water depths <3 m, were sampled using gillnets bimonthly. The nets were set at night for 3 h around the time of high tide (White et al. 2002). A total of 247 Nervous Sharks were sampled. Around 15–20 pregnant females were recorded, each bearing 2–6 embryos. The presence, in November and early December, of fresh bite marks on the sides of mature Nervous Shark females and of a very high proportion of sexually mature male sharks that have recently mated and released their sperm indicate that Nervous Sharks mate in late October/early November. Ovulation and fertilisation occur in late November/early December and parturition takes place approximately 11 months later (White et al. 2002).

Between October 1999 and September 2001, four sites, in Herald Bight (northern Peron Peninsula), near the shore and in water depths <3 m, were sampled using gill nets bimonthly. The nets were set at night for 3 h around the time of high tide (White & Potter 2004). A total of 369 sharks from 10 species, and 13 rays from five species were caught. Nervous Shark (n = 229), Milk Shark (n = 59), and Sharptooth Lemon Shark (n = 41) were the three most commonly caught species. Neonates (i.e., with open umbilical scars) were recorded for these three species: Nervous Shark (n = 23), Milk Shark (n = 8), and Sharptooth Lemon Shark (n = 12). Of the 12 Spinner Sharks caught, ten were neonates due to the presence of umbilical scars (65–81 cm TL).

Between March 2006 and October 2007, 190 transects (1.5 km long) were conducted using a vessel in the waters of Cape Rose during September–May and June–August (Vaudo & Heithaus 2009). Additionally, between September 2005 and November 2006, 71 longline sets were completed at Cape Rose (Vaudo & Heithaus 2009). During transects, 630 individuals from 15 species of sharks and rays were sighted. Giant Guitarfish was the dominant species making up 48% (n = 303) of individuals. Giant Guitarfish were present throughout the year and were occasionally observed resting as solitary individuals or in assemblages with other ray species. Over a total of 3,324.8 hook hours, 62 sharks and rays were captured from six species. Giant Guitarfish made up 81% of the longline catch. The size of Giant Guitarfish (n = 126) ranged for females (n = 60) and males (n = 61) between 69–213 cm TL and 62–232 cm TL, respectively (Vaudo & Heithaus 2009). Based on the size-at-birth for this species (38–40 cm TL; Last et al. 2016) and the size-at-maturity (150–180 cm TL; Last et al. 2016), individuals were young-of-the-year (YOY), juveniles, and adults. The number of immature individuals is likely underestimated, as smaller individuals (including neonates and YOY) were difficult to capture but were regularly observed during transect surveys. Between March–November 2022, Giant Guitarfish (n = 66) were sampled by set nets, throw nets, or hand at Cape Rose (n = 5; 174–191 cm TL), Dubaut Point (n = 34; 39.0–207.3 cm TL), and Faure Island (n = 27; 38.4–210.7 cm TL) (Ingelbrecht et al. 2024). These three sites are located in this area and are considered the southern limit of the species' distribution in the Eastern Indian Ocean. From the 66 individuals sampled, 24% were neonates or YOY (<52 cm TL), 59% were juveniles, and 17% were mature (Ingelbrecht et al. 2024).

Further information is needed to confirm the importance of this area for these species.

There is additional evidence that Eastern Shark Bay might be important for undefined aggregations of Australian Whipray, Broad Cowtail Ray, and Pink Whipray.

Between March 2006 and October 2007, 190 transects (1.5 km long) were conducted at Cape Rose during September–May and June–August (Vaudo & Heithaus 2009). Between September 2005 and November 2006, 71 longline sets were completed during daylight at Cape Rose (Vaudo & Heithaus

2009). During transects, 630 elasmobranchs from 15 species were sighted. The Australian Whipray was one of the most dominant rays on transects with more than 50 individuals sighted. The Australian Whipray and Broad Cowtail Ray were occasionally observed resting in single or multispecies groups (animals were considered to be part of a group if they were <1 m from another individual) or looser aggregations/assemblages (animals separated by >1 m). The only species that was regularly seen in groups was Pink Whipray, with groups making up 42.4% of sightings (25 of 59). Groups of Pink Whiprays, which were observed resting and swimming together, ranged from two to at least 25 individuals with 68% of groups containing fewer than six individuals. Maximum elasmobranch density on these transects was 29.3 animals per 0.01 km^2 and on five transects, densities were greater than 10 animals per 0.01 km^2. The overall density of elasmobranchs occupying the sandflat was higher during warmer months. Further information is needed to confirm the importance of this area for these species.

REFERENCES

Burkholder DA, Fourqurean JW, Heithaus MR. 2013. Spatial pattern in seagrass stoichiometry indicates both N-limited and P-limited regions of an iconic P-limited subtropical bay. *Marine Ecology Progress Series* 472: 101–115. https://doi.org/10.3354/meps10042

Burling MC, Ivey GN, Pattiaratchi CB. 1999. Convectively driven exchange in a shallow coastal embayment. *Continental Shelf Research* 19: 1599–1616. https://doi.org/10.1016/S0278-4343(99)00034-5

D'Antonio B, Meekan M, Ferreira LC, Taylor MD, Pattiaratchi CB, Sequeira AM. 2025. Salinity drives the distribution of a top-order predator, the tiger shark (*Galeocerdo cuvier*), in an inverse estuary. *Scientific Reports* 15: 9612. https://doi.org/10.1038/s41598-025-92272-6

Ebert DA, Dando M, Fowler SL. 2021. *Sharks of the world: A complete guide*. Princeton: Princeton University Press.

Ferreira LC, Thums M, Heithaus MR, Barnett A, Abrantes KG, Holmes BJ, Zamora LM, Frisch AJ, Pepperell JG, Burkholder D, et al. 2017. The trophic role of a large marine predator, the tiger shark *Galeocerdo cuvier*. *Scientific Reports* 7: 7641. https://doi.org/10.1038/s41598-017-07751-2

Gales N, McCauley RD, Lanyon J, Holley D. 2004. Change in abundance of dugongs in Shark Bay, Ningaloo and Exmouth Gulf, Western Australia: evidence for large-scale migration. *Wildlife Research* 31: 283–290. https://doi.org/10.1071/WR02073

Heithaus MR. 2001a. The biology of tiger sharks, *Galeocerdo cuvier*, in Shark Bay, Western Australia: sex ratio, size distribution, diet, and seasonal changes in catch rates. *Environmental Biology of Fishes* 61: 25–36. https://doi.org/10.1023/A:1011021210685

Heithaus MR. 2001b. Shark attacks on bottlenose dolphins (*Tursiops aduncus*) in Shark Bay, Western Australia: attack rate, bite scar frequencies, and attack seasonality. *Marine Mammal Science* 17: 526–539. https://doi.org/10.1111/J.1748-7692.2001.TB01002.X

Heithaus MR. 2004. Fish communities of a subtropical seagrass ecosystem. *Bulletin of Marine Science* 75: 79–99.

Heithaus MR, Dill LM. 2002. Food availability and tiger shark predation risk influence bottlenose dolphin habitat use. *Ecology* 83: 480–491. https://doi.org/10.1890/0012-9658(2002)083[0480:FAATSP]2.0.CO;2

Heithaus MR, Dill L, Marshall G, Buhleier B. 2002. Habitat use and foraging behavior of tiger sharks (*Galeocerdo cuvier*) in a seagrass ecosystem. *Marine Biology* 140: 237–248. https://doi.org/10.1007/s00227-001-0711-7

Heithaus MR, Frid A, Wirsing AJ, Bejder L, Dill LM. 2005. Biology of sea turtles under risk from tiger sharks at a foraging ground. *Marine Ecology Progress Series* 288: 285–294. https://doi.org/10.3354/meps288285

Heithaus MR, Hamilton IM, Wirsing AJ, Dill L. 2006. Validation of a randomization procedure to assess animal habitat preferences: microhabitat use of tiger sharks in a seagrass ecosystem. *Journal of Animal Ecology* 75: 666–676. https://doi.org/10.1111/j.1365-2656.2006.01087.x

Heithaus MR, Wirsing AJ, Dill LM. 2012. The ecological importance of intact top-predator populations: a synthesis of 15 years of research in a seagrass ecosystem. *Marine and Freshwater Research* 63: 1039–1050. http://dx.doi.org/10.1071/MF12024

Heithaus MR, Vaudo JJ, Kreicker S, Layman CA, Krützen M, Burkholder DA, Gastrich K, Bessey C, Sarabia R, Cameron K, et al. 2013. Apparent resource partitioning and trophic structure of large-bodied marine predators in a relatively pristine seagrass ecosystem. *Marine Ecology Progress Series* 481: 225–237. https://doi.org/10.3354/meps10235

Hetzel Y, Pattiaratchi C, Lowe R, Hofmeister R. 2015. Wind and tidal mixing controls on stratification and dense water outflows in a large hypersaline bay. *Journal of Geophysical Research: Oceans* 120: 6034–6056. https://doi.org/10.1002/2015JC010733

Ingelbrecht J, Lear KO, Lymbery AJ, Bateman RL, Norman BM, Martin SB, Fazeldean T, Morgan DL. 2024. Ectoparasites of the Critically Endangered Giant Shovelnose Ray *Glaucostegus typus* in the Eastern Indian Ocean, with a summary of the known metazoan parasites. *Acta Parasitologica* 69: 1937–1954. https://doi.org/10.1007/s11686-024-00918-8

Last PR, White WT, de Carvalho MR, Séret B, Stehmann MFW, Naylor GJP. 2016. *Rays of the world*. Clayton South: CSIRO Publishing.

Logan BW, Cebulski DE. 1970. Sedimentary environments of Shark Bay, Western Australia. In: Logan BW, Davies GR, Read JF, Cebulski DE, eds. *Carbonate sedimentation and environments, Shark Bay, Western Australia*. Perth: American Association of Petroleum Geologists.

Marsh H, Prince RIT, Saafeld WK, Shepherd R. 1994. The distribution and abundance of the dugong in Shark Bay, Western Australia. *Wildlife Research* 21: 149–161. https://doi.org/10.1071/WR9940149

Nahas EL, Pattiaratchi CB, Ivey GN. 2005. Processes controlling the position of frontal systems in Shark Bay, Western Australia. *Estuarine, Coastal and Shelf Science* 65: 463–474. https://doi.org/10.1016/j.ecss.2005.06.017

Preen AR, Marsh H, Lawler IR, Prince RIT, Shepherd R. 1997. Distribution and abundance of dugongs, turtles, dolphins and other megafauna in Shark Bay, Ningaloo Reef and Exmouth Gulf, Western Australia. *Wildlife Research* 24: 185–208. https://doi.org/10.1071/WR95078

Save Our Seas (SOS). 2025. Tiger sharks, dugongs and sea turtles: a triangle of fear in Shark Bay. Available at: https://saveourseas.com/project/tiger-sharks-dugongs-and-sea-turtles-a-triangle-of-fear-in-shark-bay/ Accessed October 2025.

Simpfendorfer CA, Goodreid AB, McAuley RB. 2001. Size, sex and geographic variation in the diet of the tiger shark, *Galeocerdo cuvier*, from Western Australian waters. *Environmental Biology of Fishes* 61: 37–46. https://doi.org/10.1023/A:1011021710183

Vaudo JJ, Heithaus MR. 2009. Spatiotemporal variability in a sandflat elasmobranch fauna in Shark Bay, Australia. *Marine Biology* 156: 2579–2590. https://doi.org/10.1007/s00227-009-1282-2

Walker DI. 1989. Regional studies – seagrass in Shark Bay, the foundation of an ecosystem. In: Larkum AWD, McComb AJ, Shepherd SA, eds. *Biology of seagrasses. First edition*. New York: Elsevier, 182–210.

Walker DI, Kendrick GA, McComb AJ. 1988. The distribution of seagrass species in Shark Bay, Western Australia, with notes on their ecology. *Aquatic Botany* 30: 305–317. https://doi.org/10.1016/0304-3770(88)90063-0

Western Australia Department of Biodiversity, Conservation and Attractions (WA DBCA). 2025. Management. Available at: https://www.dbca.wa.gov.au/management Accessed September 2025.

White WT, Potter IC. 2004. Habitat partitioning among four elasmobranch species in nearshore, shallow waters of a subtropical embayment in Western Australia. *Marine Biology* 145: 1023–1032. https://doi.org/10.1007/s00227-004-1386-7

White W, Hall N, Potter I. 2002. Size and age compositions and reproductive biology of the nervous shark *Carcharhinus cautus* in a large subtropical embayment, including an analysis of growth during pre- and postnatal life. *Marine Biology* 141: 1153–1164. https://doi.org/10.1007/s00227-002-0914-6

Wirsing AJ, Heithaus MR, Dill LM. 2007. Fear factor: Do dugongs (*Dugong dugon*) trade food for safety from tiger sharks (*Galeocerdo cuvier*)? *Oecologia* 153: 1031–1040. https://doi.org/10.1007/s00442-007-0802-3