# Northern Territory Offshore Net and Line Fishery

## Ecological Risk Assessment

## October 2024

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| Acronyms | Full form |
|---|---|
| CITES | Convention on the International Trade in Endangered Species of Wild Flora and Fauna |
| DITT | Department of Industry, Tourism and Trade |
| EBFM | Ecosystem-Based Fisheries Management |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* |
| ERA | Ecological Risk Assessment |
| ESD | Ecologically Sustainable Development |
| Fisheries Act | *Northern Territory Fisheries Act 1988* |
| Fisheries Regulations | *Northern Territory Fisheries Regulations 1992* |
| NDF | Non-detriment finding |
| NT | Northern Territory |
| ONLF | Offshore Net and Line Fishery |
| SAFE | Sustainability Assessment for Fishing Effects |
| SAFS | Status of Australian Fish Stocks |
| TEPS | Threatened, Endangered and Protected Species |

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# 1. Executive Summary

This report summarises the outcomes of the Ecological Risk Assessment (ERA) conducted for the Northern Territory Offshore Net and Line Fishery (ONLF) in August – September 2024 to review and update the ecological risks posed by the Fishery for the next five years. The report provides a description of the Fishery, an outline of the risk assessment methodologies used, as well as the rationale behind assigned risk ratings in the fishery. These risk ratings will ensure the Fishery management framework adapts to evolving needs, supporting the ongoing aim of ecologically sustainable development and use of the ONLF resource.

## 1.1. Risk rating outcomes

The risks associated with the Fishery were assessed through consideration of the available evidence by an expert panel that included both scientific and management experts. The risk rating outcomes were subsequently discussed at a stakeholder workshop, providing an opportunity for feedback. This report presents the final risk rating outcomes, which will be used to inform the prioritisation of relevant monitoring, research and management activities for the ONLF.

A total of 35 components relating to the Fishery were identified and assessed to assist future management decisions to be targeted at the correct unit of management (i.e. biological or ecological unit). The fishery was found to present a MEDIUM, LOW or NEGLIGIBLE risk to the majority of components examined, with the exception of Pygmy Devilray interactions which was identified as HIGH risk (Table 1).

Table 1. Risk ratings assessed in the ONLF Ecological Risk Assessment.

| Species assessed | Scientific name | Consequence | Likelihood | Risk Rating |
|---|---|---|---|---|
| Grey Mackerel – Western Zone | *Scomberomorus semifasciatus* | Moderate (2) | Unlikely (2) | LOW |
| Grey Mackerel – Eastern Zone | | Moderate (2) | Possible (3) | MEDIUM |
| Blacktip shark | *Carcharhinus tilstoni* and *C. limbatus* | Minor (1) | Likely (4) | LOW |
| Spot-tail shark | *Carcharhinus sorrah* | Minor (1) | Likely (4) | LOW |
| Pigeye shark | *Carcharhinus amboinensis* | Minor (1) | Likely (4) | LOW |
| Bull shark | *Carcharhinus leucas* | Minor (1) | Likely (4) | LOW |
| Tiger shark | *Galeocerdo cuvier* | Minor (1) | Likely (4) | LOW |
| Great Hammerhead | *Sphyrna mokarran* | High (3) | Remote (1) | LOW |
| Scalloped Hammerhead | *Sphyrna lewini* | High (3) | Unlikely (2) | MEDIUM |
| Winghead shark | *Eusphyra blochii* | Moderate (2) | Possible (3) | MEDIUM |
| All other sharks (less than 5 tonnes average annual capture) | | Minor (1) | Unlikely (2) | NEGLIGIBLE |
| Dusky shark and Sandbar shark | *Carcharhinus obscurus* and *C. plumbeus* | Moderate (2) | Unlikely (2) | LOW |
| Finfish grouped (less than 100kg average annual capture) | | Minor (1) | Unlikely (2) | NEGLIGIBLE |
| Spanish Mackerel | *Scomberomorus commerson* | Minor (1) | Possible (3) | LOW |
| Black Jewfish | *Protonibea diacanthus* | Minor (1) | Remote (1) | NEGLIGIBLE |
| Golden Snapper | *Lutjanus johnii* | High (3) | Remote (1) | LOW |
| Bycatch | | | | |
| Shark and ray species | | Minor (1) | Unlikely (2) | NEGLIGIBLE |

| | | | | |
|---|---|---|---|---|
| Fin fish species | | Minor (1) | Remote (1) | NEGLIGIBLE |
| Threatened, Endangered and Protected Species | | | | |
| Dolphins grouped (undifferentiated); Bottlenose Dolphins (*Tursiops truncatus and T. aduncus*), Common Dolphin (*Delphinus delphis*), Humpback (*Sousa sahulensis*) | | Minor (1) | Likely (4) | LOW |
| Snubfin dolphin | *Orcaella heinsohni* | Moderate (2) | Possible (3) | MEDIUM |
| Dugong | *Dugong dugon* | Minor (1) | Unlikely (2) | NEGLIGIBLE |
| Dwarf Sawfish | *Pristis clavata* | Minor (1) | Possible (3) | LOW |
| Green Sawfish | *Pristis zijsron* | Moderate (2) | Likely (4) | MEDIUM |
| Largetooth Sawfish | *Pristis pristis* | Minor (1) | Possible (3) | LOW |
| Narrow Sawfish | *Anoxypristis cuspidata* | Moderate (2) | Possible (3) | MEDIUM |
| Mobulid rays | *Mobula alfredi and M. birostris* | High (3) | Unlikely (2) | MEDIUM |
| River Sharks (Northern River shark and Speartooth shark) | *Glyphis garricki* and *G. glyphis* | Moderate (2) | Remote (1) | LOW |
| Pygmy Devilray | *Mobula eregoodoo and M. kuhlii* | High (3) | Possible (3) | HIGH |
| Turtles grouped; Flatback Turtle (*Natator depressus*), Green Turtle (*Chelonia mydas*), Hawksbill Turtle (*Eretmochelys imbricata*), Leatherback Turtle (*Dermochelys coriacea*), Loggerhead Turtle (*Caretta caretta*) and Olive Ridley Turtle (*Lepidochelys olivacea*) | | Moderate (2) | Possible (3) | MEDIUM |
| Saltwater Crocodile | *Crocodylus porosus* | Minor (1) | Unlikely (2) | NEGLIGIBLE |
| Incidental interaction | | | | |
| Seabirds grouped (undifferentiated) | | Minor (1) | Remote (1) | NEGLIGIBLE |
| Boat strike | | Minor (1) | Remote (1) | NEGLIGIBLE |
| General ecosystem effects | | | | |
| Removal of organisms – primary species | | Minor (1) | Likely (4) | LOW |
| Removal of organisms – ghost fishing and gear loss | | Minor (1) | Remote (1) | NEGLIGIBLE |
| Additional biological material - discards | | Minor (1) | Possible (3) | LOW |
| Additional biological material – bait | | Minor (1) | Unlikely (2) | NEGLIGIBLE |
| Habitat disturbance – fishing gear | | Minor (1) | Remote (1) | NEGLIGIBLE |
| Habitat disturbance – anchoring | | Minor (1) | Remote (1) | NEGLIGIBLE |
| Broader environment - rubbish | | Minor (1) | Remote (1) | NEGLIGIBLE |
| Broader environment – oil and fuel discharge | | Minor (1) | Remote (1) | NEGLIGIBLE |

# 2. Introduction

The principles of Ecologically Sustainable Development (ESD) are the basis of fisheries and aquatic resource management in the Northern Territory (NT). The *NT Fisheries Act 1988* (the Fisheries Act), describes ESD as "the use, conservation, development and enhancement of the community's resources so that ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased". The Fisheries Division of the Department of Agriculture and Fisheries (DAF) is responsible for fisheries management under the Fisheries Act and utilises an Ecosystem-Based Fisheries Management (EBFM) approach to achieve these goals which considers relevant ecological, social, economic and governance issues, in accordance with Guidelines for implementing the Northern Territory Fisheries Harvest Strategy Policy.

A critical element of the EBFM approach involves periodically undertaking Ecological Risk Assessments (ERA) to assess if the impacts of a fishery's activity on all different components of the marine environments in which they operate are maintained at acceptable levels consistent with ESD principles. The ERA process assesses not only contemporary risks of harvesting activities on targeted species, but also the broader impacts of the activities on the environment (general ecosystem). The outcomes of these risk assessments are used to inform EBFM-based harvest strategies and to prioritise Departmental monitoring, research and management activities (Fletcher 2015: Fletcher et al. 2010).

This assessment is the third ERA for the NT ONLF which follows the processes originally developed for the National Ecologically Sustainable Development reporting framework, 'How to' Guide (Fletcher et al. 2002) with the most recent ERA for the ONLF having been completed in June 2020 (DITT, 2020).

This report presents the outcomes of an ERA conducted on the ONLF during August and September 2024 in order to review and update the ecological risks posed by the Fishery. The risk rating outcomes will be used to inform whether additional management or monitoring activities are required in the Fishery management framework (including the harvest strategy) to mitigate the identified fishery related risks.

# 3. Scope

This ERA assessed the potential fishery related impacts posed by the harvesting of resources in the ONLF over the next five years on retained species, non-retained species, bycatch species, threatened, endangered and protected species (TEPS), habitats and the broader ecosystem.

Activities that were considered **in scope** were limited to Offshore Net and Line Fishery licences (all impacts) and recreational fishers and Fishing Tour Operators for primary species (Grey Mackerel and Blacktip sharks).

Activities that were considered **out of scope** included the Commonwealth-managed Western Tuna & Billfish Fishery (WTBF) and the ecological impacts of fisheries that are assessed in other ERAs (e.g. NT Spanish Mackerel Fishery)

# 4. Offshore Net and Line Fishery resource

The Offshore Net and Line Fishery (ONLF) is a quota managed commercial fishery, operating in Northern Territory (NT) waters from the low water mark to the boundary of the Australian Fishing Zone (AFZ). The area of the fishery is approximately 542,000 $nm^2$. The ONLF predominately targets Grey Mackerel and sharks using pelagic gillnet and longlines. The fishery is divided into two management zones for the management of Grey Mackerel; the Western Grey Mackerel Management Zone (WGMMZ) and the Eastern Grey Mackerel Management Zone (EGMMZ) based on the known stock structure for this species (Figure 1).

The WGMMZ lies west of a line commencing at the low water mark at Cape Arnhem and extending due north until it intersects with the outer boundary of the AFZ.

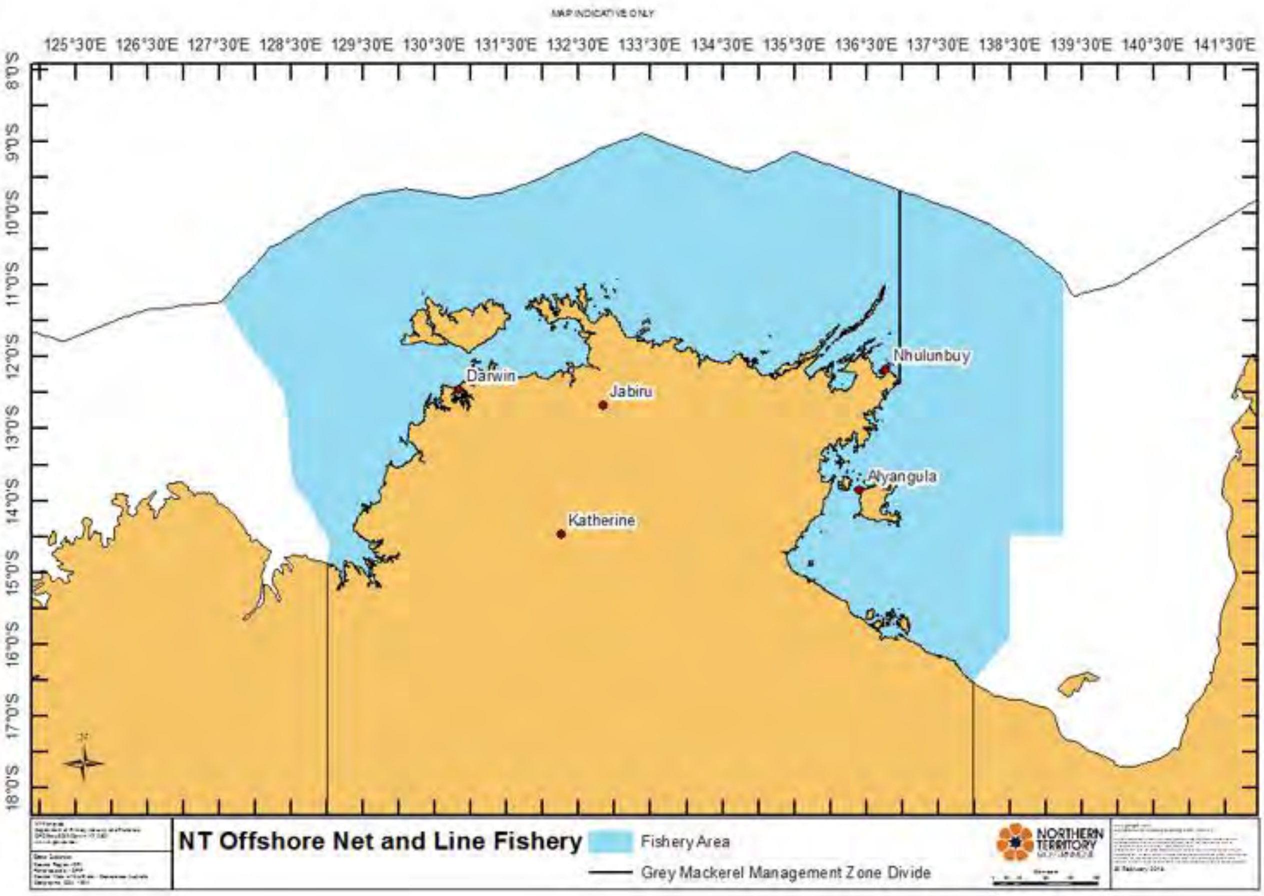


Figure 1. Spatial extent of the Northern Territory Offshore Net and Line Fishery.

## 4.1. Fishing method

Commercial fishers predominately use pelagic nets in their fishing operations but may also use demersal or pelagic longlines. Pelagic nets are a near surface monofilament net that are placed vertically in the water column with the use of buoys and weights (Figure 2). The setting of the net is dependent on the current, wind conditions and tidal flow. Nets are not to be set within 2 metres of the seafloor. The net is usually shot from the stern of the fishing vessels either with or perpendicular to the wind, and then attached to the bow of the boat, where both the vessel and net drift with the tide before being hauled in. The net is hauled onto a drum driven by a hydraulic winch and as the net comes over the bow the fish are removed. Pelagic net can be used from two nautical miles from the low water mark to the boundary of the AFZ, and can be a maximum of 2000m long with a

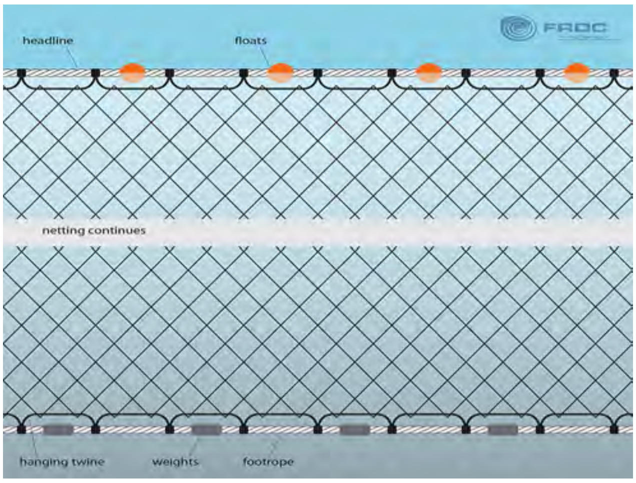


Figure 2. A diagrammatic representation of a commercial pelagic net. Source: Fisheries Research and Development Corporation.

mesh size from 160mm to 185mm and a drop length of no more than 100 meshes. Nets are to be weighted and must have buoyed headlines.

Longlines can be set for pelagic (Figure 3) or demersal fishing (Figure 4). Demersal longlines may be utilised in all regions of the fishery. Demersal longlines are anchored to the seabed at both ends and at intervals along its length. Pelagic longlines can be used from two nautical miles from the low water mark to the boundary of the AFZ. A vessel may use up to 15nm of longlines with a maximum of 1000 snoods. No auto baiting devices are allowed. The line can include monofilament, multi filament and synthetic material.

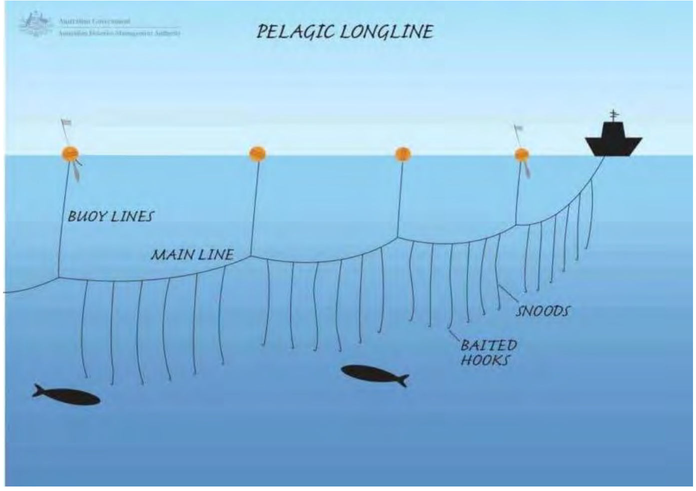


Figure 3. A diagrammatic representation of a commercial pelagic longline. Source: Australian Fisheries Management Authority.

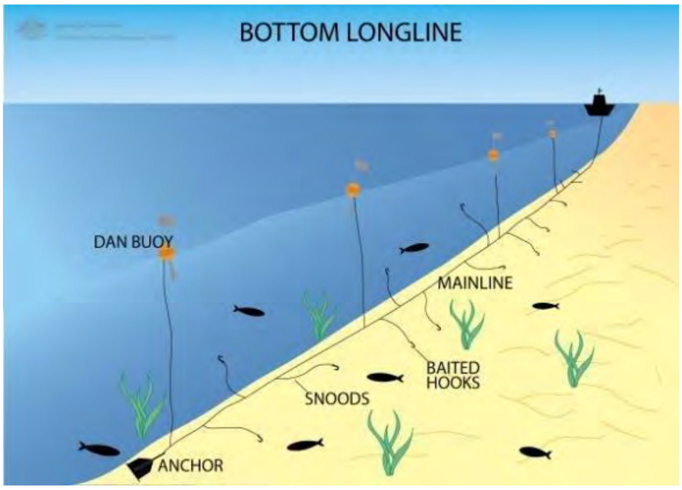


Figure 3. Diagrammatic representation of a commercial demersal longline. Source: Australian Fisheries Management Authority.

## 4.2. Resource sharing

The ONLF shares resources with other users including recreational, fishing tour operator and Aboriginal traditional fishers. The ERA process assesses the risk of commercial fishing activities, it includes relevant catch information from other resource users in the assessment of the primary species.

The ONLF also has overlapping resource access rights with other managed fisheries in the Northern Territory including the Coastal Line Fishery, Coastal Net Fishery, Spanish Mackerel Fishery, Barramundi Fishery, Demersal Fishery and Timor Reef Fishery. These fisheries are permitted to retain most species captured using their respective gear types within the spatial extent of the ONLF.

## 4.3. Catch composition

More than 55 different species of fish are retained by the ONLF. These species are predominately pelagic species, but it does include some demersal species caught as by-product. Figure 5 below shows the catch composition of the ONLF over the past five years (between 2019-20 and 2023-24). The majority of catch is comprised of Grey Mackerel (71.9%), Blacktip Shark (9%), Spot-tail shark (4.1%), Great Hammerhead (3.5%), Spanish Mackerel (2.6%), Pigeye Shark (1.8%) and Tiger Shark (0.95%). Further detail on the catch of species is provided in the Assessment Information in the appendices.

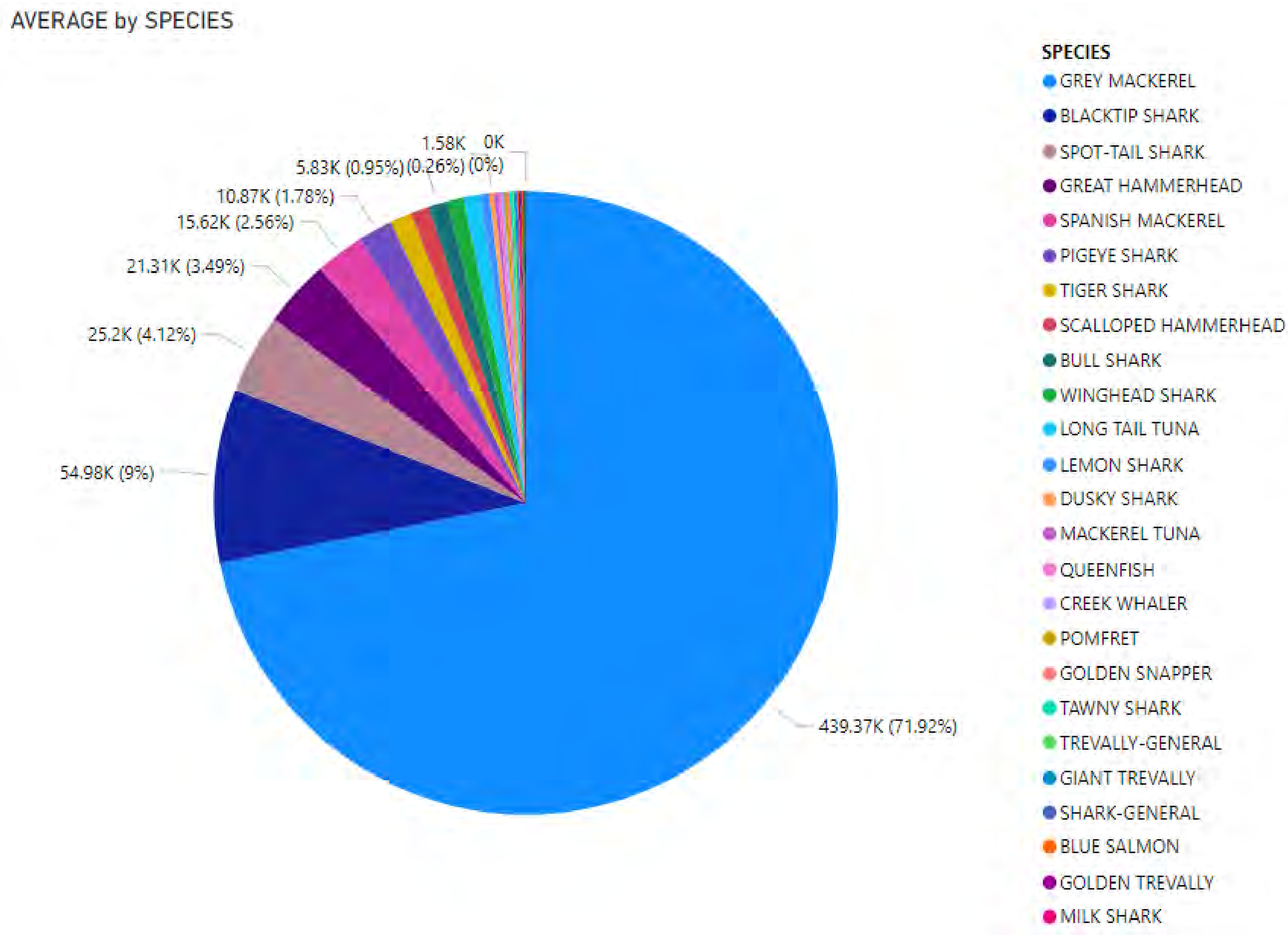


Figure 4. Average catch of species by the ONLF between 2019-20 and 2023-24. Note due to the number of species caught in the fishery not all are able to be shown.

For assessment purposes, the species retained in the ONLF were classified as primary, secondary and other managed species:

- Primary species include Grey Mackerel and Blacktip Sharks.
- Secondary species include all other species of shark and finfish that are retained as by-product.
- Other managed species includes Spanish Mackerel, Golden Snapper and Black Jewfish which are retained as by-product, but for which management responsibility primarily resides in other fisheries.

# 5. Fishing effort

Fishing effort in the ONLF for the five year period between 2018/2019 and 2022-23 is provided in the figure below (Figure 6). The ONLF comprises a relatively small fleet, with an average of seven vessels operating in 2022-23 fishing season. This observed decrease in vessels is due to operators leaving the fishery in 2022-23. The majority of effort in the ONLF has been associated with the use of pelagic nets, with sporadic and minimal use of longlines.

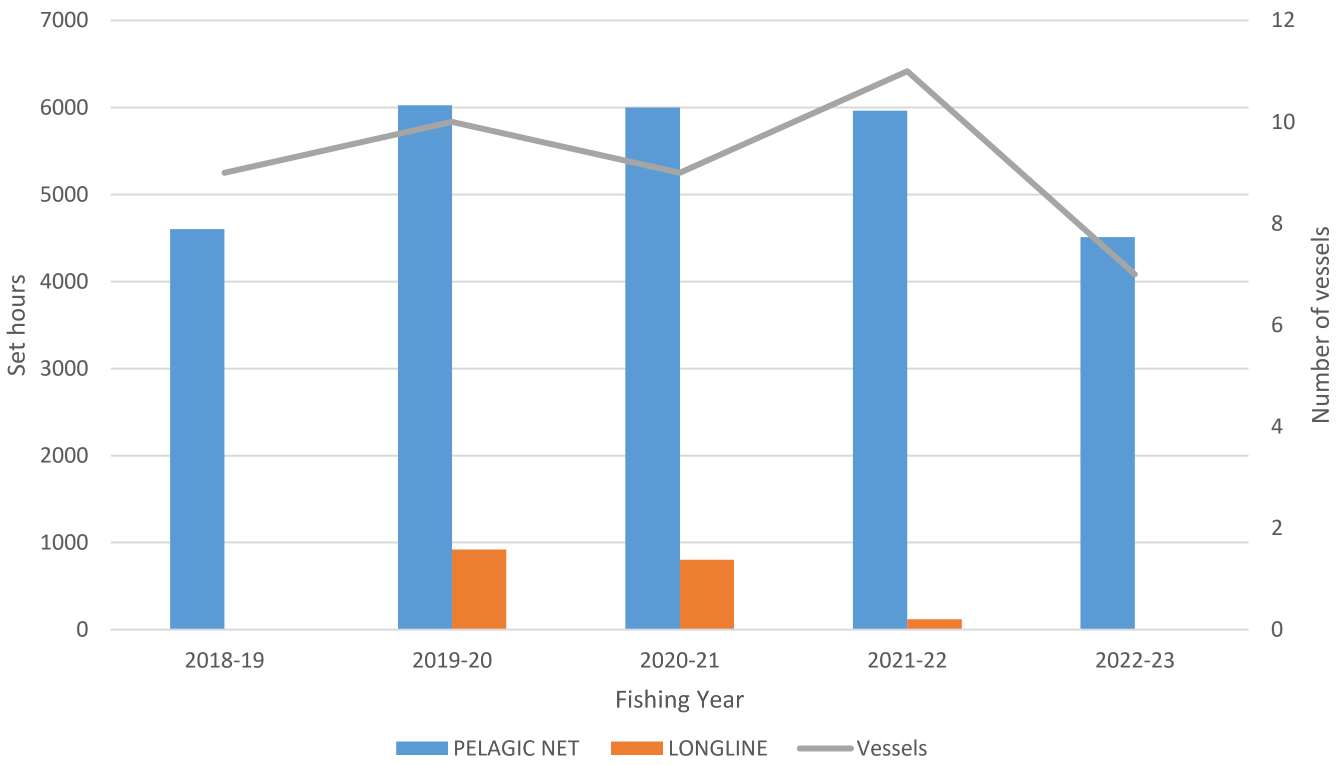


Figure 5. Commercial fishing effort by fishing method (set hours) and number of vessels in the ONLF between 2018-19 and 2022-23.

# 6. Management arrangements

The ONLF is managed using a combination of input and output-based management controls (Figure 6). These management controls are contained as legislative provisions of the NT *Fisheries Act 1988*, the NT *Fisheries Regulations 1992* and as conditions on licences.

Table 2. Summary of current commercial management controls for the Offshore Net and Line Fishery.

| Management | Description | Instrument |
|---|---|---|
| Individual transferable quota (ITQ) | • Individual Transferable Quota.<br>o Fishery units entitle the holder of the ONLF licence to be allocated a share of the total allowable catch.<br>o On 1 July in each licence year, an allocation is made of the number of quota units to each ONLF licence to which fishery units are attached.<br>o Quota units entitles the holder of the ONLF licence to take 1 kg of the species group to which the quota unit relates | Regulation 96CC, 96CD, 96CG and 96D(1B) |
| Total Allowable Commercial Catch (TACC) | • Western Grey Mackerel Management Zone: 404,000 kg.<br>• Eastern Grey Mackerel Management Zone: 131,000 kg.<br>• Combined Blacktip Shark: 434,694 kg. (*Carcharhinus limbatus* and *C. tilstoni*)<br>• Spot-tail Shark: 121,446 kg.<br>• Combined Shark Group: 246,441 kg. | Regulation 96CE |

| | | |
|---|---|---|
| | (Grey Reef, Pigeye, Spinner, Bull, Dusky, Sandbar, Tiger, Winghead, Lemon Sharks, Scalloped and Great Hammerhead)<br>• Combined other Shark group species: 126,447 kg.<br>• Combined fin fish group (by-product species): 59,397 kg, including 13 500 kg of Spanish Mackerel. | |
| Catch restrictions | • 50 tonnes permitted catch for each Hammerhead species (*S. lewini and S. mokarran*).<br>o Scalloped Hammerhead: Once 37 t has been taken in a licencing year, no more than 5 Scalloped Hammerheads are to be taken during a voyage<br>o Great Hammerhead: Once 37 t has been taken in a licencing year, no more than 5 Great Hammerheads are to be taken during a voyage.<br>• During a voyage a licensee may take as by-product:<br>o 30 Spanish Mackerel. For each tonne of Grey mackerel taken during a voyage an additional 10 Spanish Mackerel can be retained.<br>o 50 kg of snapper.<br>o 5 Black Jewfish.<br>• Long-tail tuna on board a vessel must not exceed 5% of the vessels total catch.<br>• A swim bladder from a jewfish (family *Sciaenidae*) must not be unloaded from the vessel unless it has an individual certified authentication tag attached in a secure and visible position.<br>• No take of Barramundi, King Threadfin or Mud Crab | Regulation 96D<br><br>Licence conditions |
| Spatial restrictions | • Western Grey Mackerel Zone lies west of a line from Cape Arnhem (136° 58.767') and extends to the Australian fishing zone (AFZ).<br>• Eastern Grey Mackerel Zone lies east of a line from Cape Arnhem (136° 58.767') and extends to the AFZ.<br>• Pelagic longline can only be used in the area 3 nautical miles (nm) from the baseline to the boundary of the AFZ.<br>• Pelagic net can only be used in the area 2 nm from the baseline to the boundary of the AFZ.<br>• Pelagic net is not to be used within the Mary River Fish Management Zone.<br>• No fishing in the vicinity of the Reef Fish Protected Areas.<br>• No fishing in the vicinity of the Artificial reefs. | Regulation 10A, 96C, 100, Schedule 1A<br><br>Licence conditions- |
| Permitted gear | • Demersal and pelagic longline: Total length of all line is to be no more than 15 nm and no more than 1,000 snoods.<br>• Pelagic net: mesh size of no less than 160mm and no greater than 185mm, and a drop of no more than a 100 meshes.<br>• Gaff to assist with on boarding of fish.<br>• Auto-baiting devices are prohibited on vessels. | Regulation 4 and 100 |
| Reporting | • Daily logbook returns.<br>• Monthly Market returns.<br>• Catch disposal records (submitted within 1 day of unloading). | Section 14(6) |
| Minimum trip quota holdings | • Demersal longline or pelagic longline:<br>o Combined Blacktip shark: 5,000 kg<br>o Spot-tail Shark: 1,600 kg<br>o Combined Shark group: 4,700 kg<br>o Combined other shark group species: 2,400 kg | Regulation 100C. |

| | | |
|---|---|---|
| | • Pelagic net when targeting Grey Mackerel: total 4,500kg<br>o Grey mackerel in relevant zone: 2,700 kg<br>o Combined Blacktip shark: 1,050 kg<br>o Spot-tail shark: 250 kg<br>o Combined shark group: 150 kg<br>o Combined other shark group species: 50 kg<br>o Combined fin fish species: 300 kg<br>• Pelagic net when targeting sharks – total 6,500kg<br>o Grey mackerel in relevant zone: 1,100 kg<br>o Combined Blacktip shark: 3,700 kg<br>o Spot-tail shark: 800 kg<br>o Combined shark group: 600 kg<br>o Combined other shark group species: 150 kg<br>o Combined fin fish species: 150 kg | |
| Unloading / Loading | • Fish must be unloaded in Darwin or Gove port.<br>• Licence holder can apply for an exemption to unload in other ports. | Regulation 100G |
| Vessel Monitoring System | • Required to have a Vessel Monitoring Unit onboard and operational at all times. | Regulation 100A |

### Recreational fishers

Recreational fishers are managed through a combination of input and output management controls. The controls include spatial and temporal closures (e.g. temporary Reef Fish Protection Areas), gear restrictions, size limits, personal possession limits, and vessel limits. Recreational fishers cannot sell or barter their catch. A summary of the recreational controls that relate to the taking of reef fish species in the NT is provided in the table below (Table 3).

Table 3. Relevant management controls for recreational fishers.

| Management controls | | |
|---|---|---|
| Permitted gear (that relates to reef fishing) | Vertical line<br>Scoop net and gaff<br>Cast nets | Spear-gun and hand spear<br>Float Line<br>Troll line |
| General personal possession limit | 15 fish per person | |
| Personal possession limits. | Three Sharks<br>Five for all other fish species not subject to specific individual limits | |
| Vessel limits | Vessels with four or less people on board, each person can take their personal possession limit<br>Vessels with five to seven people on board can take a maximum of four times the personal possession limit of 'at-risk' species<br>Vessels with eight or more people on board can take a maximum of eight times the personal possession limit of designated 'at risk' species | |
| Reporting | Recreational fishing surveys | |
| Closed areas | Reef Fish Protection Areas | |

### Fishing Tour Operators

Fishing tour operators (FTOs) are managed through a combination of input and output management controls. These include spatial and temporal closures, personal and vessel possession limits and size limits. FTOs must have a licence to take clients fishing in the NT. None of the catch, or product from the catch, can be sold or bartered. FTOs are required to submit monthly logbook returns.

### Aboriginal Traditional fishers

Aboriginal traditional fishers are entitled to use the resources of the area of land or water in a traditional manner.  This entitlement does not extend to engaging in commercial fishing activities without a licence.

### Reef Fish Protection Areas

Under the *Fisheries Regulations 1992*, there are five temporary reef fish protection areas that were implemented to aid the protection and *recovery* of at-risk reef fish. Some of the areas protect known healthy stocks of reef fish, while others will allow reefs that have been depleted by overfishing to recover by protecting spawning aggregations and removing any form of fishing related fish mortality (e.g. barotrauma).The five areas are protected and remain subject to ongoing review. They are located near Bathurst Island, Melville Island, Charles Point Wide, Lorna Shoal and Moyle/Port (Figure 7). These areas apply to the ONLF.

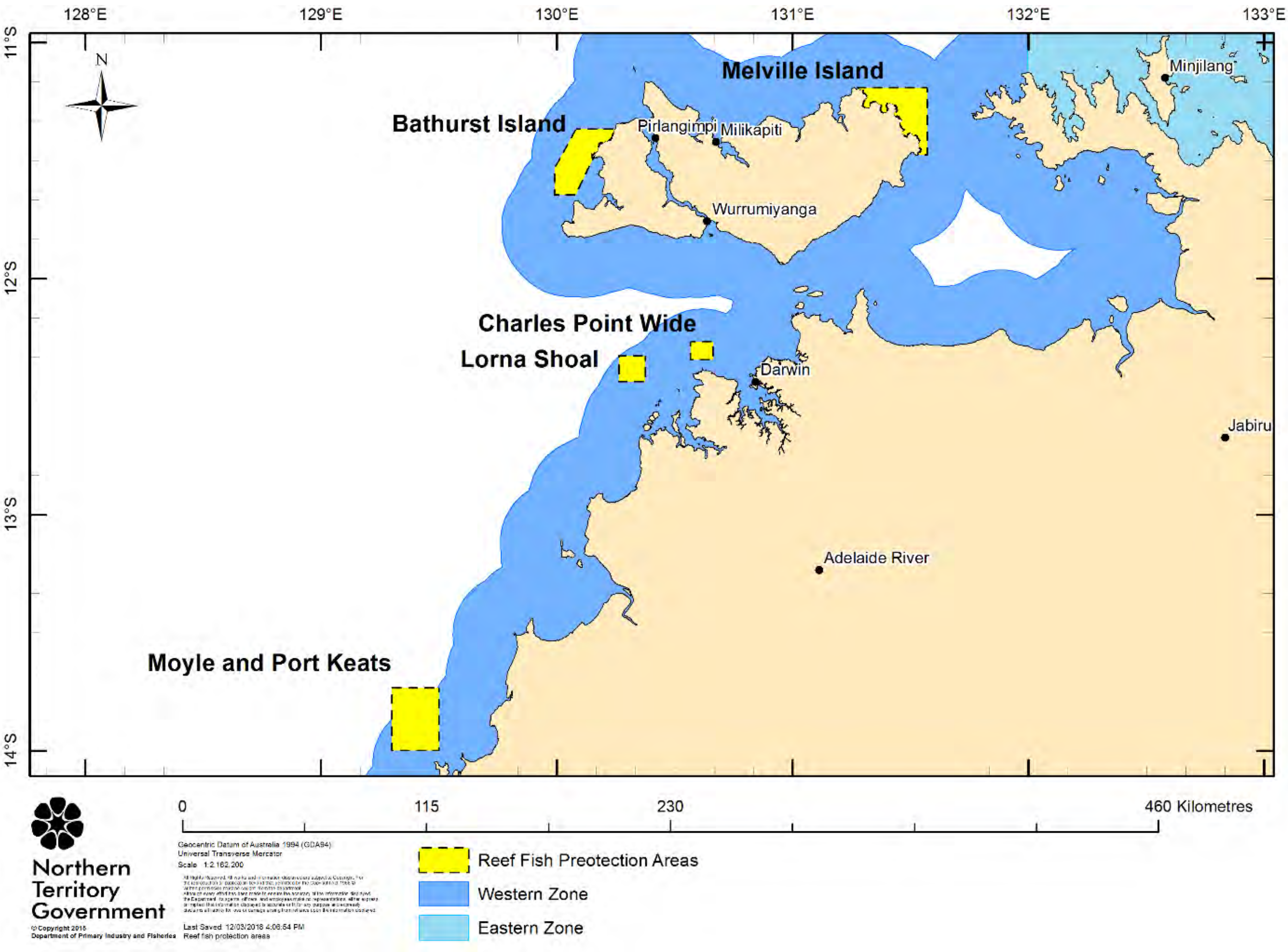


Figure 6. Map showing the location of the five temporary Reef Fish Protection Areas applicable to the Offshore Net and Line fishery.

**Artificial Reefs**

There are four specifically engineered reef complexes installed in the Darwin region in 2019. Operators in the ONLF must not take fish or fish under the licence or from a vessel used for the purposes of the licence, within a one nautical mile radius of the artificial reef coordinates in.

Table 4. Coordinates for artificial reefs in the NT.

| Location | Position | Approximate depth (m) |
|---|---|---|
| Lee Point Wide | 12 10.083'S. 130 47.033'E | 28 |
| Gutters central | 12 09.459'S. 130 34.655'E | 28 |
| Dundee Wide | 12 44.445'S. 130 10.387'E | 16 |
| Adelaide River Mouth | 12 07.587'S. 131 11.545'E | 16 |

# 7. Harvest Strategy

The Harvest Strategy provides a structured framework for decision making to ensure that ESD objectives for the ONLF are achieved. The strategy is designed to implement a precautionary approach to managing the Fishery that promotes stock sustainability, and provides certainty and stability for resource users. The ONLF Harvest Strategy is a component of the fisheries management framework and is available online[1].

# 8. Data validation

The below independent monitoring methods are employed in the ONLF to validate data:

- The on-board observer program involves having trained personnel on-board commercial vessels for the duration of a fishing trip. Observers collect detailed data on catch and bycatch composition, size and age information of target species, and TEPS interactions (e.g. species, size, sex, location). Observers may also collect additional data and samples for research projects.
- Electronic monitoring (E-monitoring) is a system of sensors and video cameras capable of capturing and recording fishing activities which can be reviewed later to verify logbook data. E-monitoring is mandatory for vessels who use demersal long-line or pelagic long-line, or are processing sharks on-board. E-monitoring records 100% of the fishing activity, with 100% of footage monitored and identify interactions with TEPS and species of conservation interest. Full catch composition is determined by monitoring 10% of all video footage.
- Vessel monitoring systems (VMS) is a satellite tracking system that provides information on vessel location, landing port, timing of landings and duration of fishing trips. VMS are mandatory for all vessels operating in the ONLF.

The level of independent monitoring coverage in the ONLF through on-board observer coverage and electronic monitoring is on average 10 percent of fishing trips per year between 2018-19 and 2022-23.

[1] https://industry.nt.gov.au/__data/assets/pdf_file/0017/620432/mgt-arranagements-offshore-net-line-fishery.pdf

# 9. Environment

**Climate**

The climate of northern Australia is tropical monsoonal with two distinct seasons, a summer wet season which occurs broadly between October and March, and a winter dry season between April and September. The winters in northern Australia are influenced by easterly winds generated over inland Australia, resulting in dry and warm conditions with very little rainfall and low relative humidity. The high humidity and thunderstorm activity of the wet season is caused by steady west to north-west winds bringing moisture from the Timor and Arafura Sea. Cyclones may develop in the region between December and April, resulting in severe storms with gale force winds. Typically, cyclones form south of the equator in the Timor or Arafura Seas when sea temperatures are greater than 26.5°C. The monsoonal weather pattern is a major driver of important ecological processes in the marine environment and is a significant factor influencing recruitment of estuarine and coastal fishes in the Northern Territory.

**Tides**

Tidal types change across the Northern Territory between semi-diurnal (two high and two low tides per day), and diurnal (one high and one low per day) that occurs in both the north of the Arafura Sea and in the south of the Gulf (Webb 1981). Considerable variation in tidal range is experienced along the Northern Territory's coast, with ranges exceeding 7 metres in the western areas during the spring tide, to less than 2 metres in areas of the Gulf of Carpentaria. The vast tidal movement combined with major inputs of fine silt sediments from numerous rivers create vast areas of high turbidity and lower light penetration.

**Physical Environment**

The Joseph Bonaparte Gulf, west of Darwin, is an extensive, shallow basin that receives significant loads of sediment from the numerous rivers in the region (Lees 1992). It is dominated by tidal and wind-driven currents according to the season, with the area being comprised of soft substrate expanses with localised rocky outcrops, and strong tidal currents, high turbidity (particularly during the wet season), and substantial sediment mobility (Przeslawski et al. 2011).

The area immediately east of Darwin (Van Diemen Gulf) is a large almost fully enclosed body of water. Mainland landforms along the coast in this area are dominated by extensive low, flat, estuarine, coastal plains fringed at the coast by mud flats/banks often associated with a narrow band of mangroves. The rivers and creeks are typically tide dominated with intertidal flats, mangroves and saline flats/salt marshes with a naturally high turbidity (Roelofs et al. 2005).

The Arnhem Land region has a diverse coastline. The dominant landforms in western Arnhem Land are undulating sand and lateritic plains with sandy beaches and low rocky headlands with mangrove lined saline mudflats in the more protected bays and estuaries. In eastern Arnhem Land, coastal landforms are dominated by floodplains and mangroves with extensive tidal mud and sand flats (Roelofs et al. 2005). The major rivers of this region all have a moderate freshwater output, and wave energy is generally low except during short periods of storm and cyclonic activity in the Wet (Davies 1986). Water clarity varies within the region. The estuaries and protected bays in the west, and the near coastal waters in the east are naturally turbid, whereas the rocky platform and sandy areas in the west have low turbidity.

The Gulf of Carpentaria is a large, shallow, muddy marine bay that has marked seasonality in temperature, rainfall, salinity and wind regimes. The region has a diversity of land forms including offshore islands, fringing coral reefs, sandy, muddy and cliff-lined coastal topographies as well as extensive tidal mud/sand flats. The western Gulf of Carpentaria coast is a complex coastline with few river inputs, and is less muddy than the southern Gulf, where extensive open coastline seagrass communities exist (Poiner et al. 1989). Sediments throughout the Gulf are predominantly fine muds, and these are easily resuspended due to the shallow bathymetry resulting in increased turbidity. Cyclones and storms also readily disturb and shift sediments in this shallow environment (Roelofs et al. 2005).

# 10. Methodology

## 10.1. Ecological Risk Assessment methodology

The outcomes from this ERA provides guidance for the management of the ONLF to ensure that it remains both effective and efficient in the context of achieving ESD outcomes. This ERA not only assists in meeting the statutory requirements of the Fisheries Act, but also generates the information necessary to meet national environmental legislation requirements, plus it provides the fishing industry and key stakeholders with an ongoing opportunity to contribute to fisheries management outcomes.

The processes used to complete this ERA are based on the National ESD Framework "How To Guide" (Fletcher et al., 2002 see http://www.fisheries-esd.com.au) as updated to adopt a 'weight of evidence approach' for use in EBFM (Fletcher, 2015) and to remain consistent with the international standards for risk management and assessment (ISO 31000, 2018). This Standard includes the definition of risk as: 'the *effect of* ***uncertainty*** *on* ***objectives***' which specifically recognises that the assessment of risk is designed to deal with uncertainties.

A risk analysis therefore involves determining how bad or big are the plausible consequences for a specific objective under the current management system; and how likely is it that a certain level of consequence will actually occur in the time frame. The two main activities required during the ERA process to complete a risk analysis are:

(1) the identification of the issues requiring assessment, and for each of these,

(2) an assessment of the level of risk from an objective examination of all threats based on current or proposed risk mitigations and the use of all available lines of evidence.

## 10.2. Issue Identification (component trees)

The issues requiring examination for this Fishery have been determined using the component tree approach as outlined in the ESD Framework during the previous ERA processes (DITT, 2020). This approach separated the ecological wellbeing for the Fishery into three main components and nine sub-components (see below).

Each of the subcomponents are further refined into a set of specific issues for which operational objectives can then be developed. The final set of issues was reviewed by DAF and presented to the expert panel prior to the ERA workshop for confirmation with minimal changes made from the previous ERA set of component trees (Figure 8.).

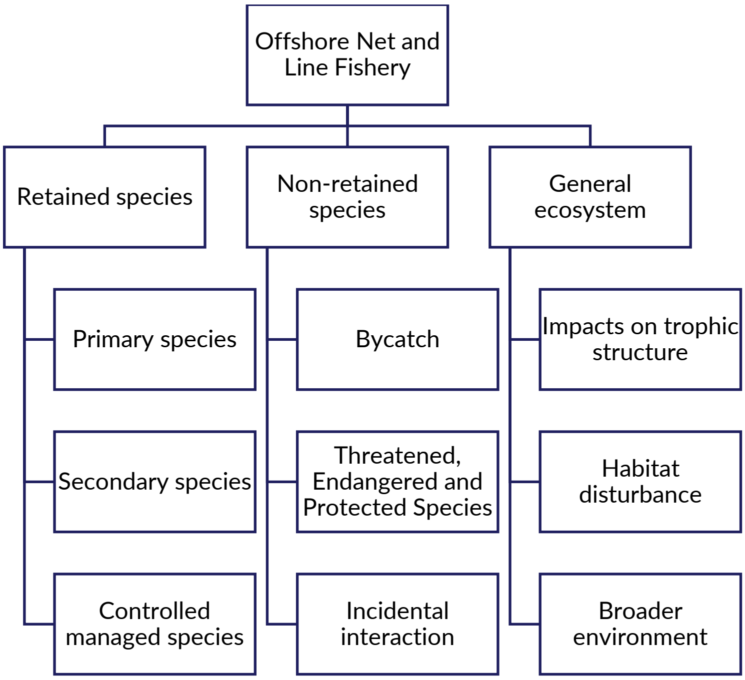


Figure 7. Component tree for the Offshore Net and Line Fishery.

## 10.3. Risk assessments for each issue

After the component trees and their set of individual issues were confirmed, the risk level for each of the issues was assessed using ISO 31000 compliant qualitative risk assessment processes that involves "*the consideration of the sources of risk, their consequences and the likelihood that those consequences may occur*" (see Fletcher, 2015 for full details). In summary this ERA process involved using the following set of essential risk analysis elements:

(1) **Having a clear objective for each issue**

Specific management level objectives were developed based on the desired ESD outcomes as described in the Fisheries Act and the Commonwealth's environmental management legislation for each issue category.

(2) **For each objective, have a defined a set of Consequence levels (C) and acceptable impacts**.

For each issue category, a four-level consequence table (from Minor [1] to Major [4]) was developed (see Tables 8-13). For the retained species the consequence assessment was based at the stock (when information on structure was available) not the individual level.

Similarly, when assessing possible ecosystem impacts this was done at the level of the whole ecosystem or at least in terms of the entire extent of the habitat, not at the level of an individual patch or individuals of non-target species.

**(3) Have a defined set of likelihoods (L) and timeline for assessments.**

A set of four likelihood levels (from Remote [1] – to Likely [4]) was developed for use in all assessments (see Table 7).

**(4) Clearly define the risk levels for each C x L combination.**

The following Consequence x Likelihood Risk Matrix (based on AS/NZS ISO 31000 as adapted from Fletcher 2015) was used to define the risk levels for each C x L combination.

| | | Likelihood | | | |
|---|---|---|---|---|---|
| | | Remote (1) | Unlikely (2) | Possible (3) | Likely (4) |
| Consequence | Minor (1) | Negligible | Negligible | Low | Low |
| | Moderate (2) | Negligible | Low | Medium | Medium |
| | High (3) | Low | Medium | High | High |
| | Major (4) | Low | Medium | Severe | Severe |

Figure 8. Consequence x Likelihood Risk Matric (based on AS/NZS ISO 31000).

### (5) Objective examination of all threats based on current or proposed risk mitigations using all available lines of evidence to determine risk level.

This risk analysis process involved the expert panel (which comprised of persons with considerable expertise in the fields of natural resource management and fisheries science) explicitly examining each of the available lines of evidence relevant to each issue (see Assessment information in the appendices).

This transparent method of assessing uncertainty recognizes that the more consistent or inconsistent each of the lines of evidence are with each of the different consequence level greatly assists determine:

- which consequence levels are plausible to occur within the timeline; and,
- for each of plausible outcomes, their relative likelihood of actually occurring.

Where the panel determined that more than one combination of consequence and likelihood was considered plausible, the C x L combination that generated the highest risk level was chosen as the final risk rating to direct what future management actions should be (i.e. maintain, increase, decrease).

### (6) Clear narrative justification for each chosen C x L combination

To ensure transparency and help stakeholders understand the basis for each of the risk scores generated, a standardised narrative was developed for each issue that documented the justifications for the risk ratings by including the following set of information:

- Specification of the operational objective to be achieved for the issue and the relevant consequence table used in the assessment
- Presentation of relevant background Information for the issue
- An outline of each of the available lines of evidence and whether these were consistent or inconsistent with each of the consequence levels.

- Based on the level of consistency among the lines of evidence, determination of which of the consequence levels were considered plausible during the next five years and the specific likelihood of these actually occurring.
- Specification of the final risk rating within one of five categories (see Table 5).

Once the expert panel had assigned risk ratings to components, these results were presented at a stakeholder workshop for consideration. This workshop provided the opportunity for stakeholders to discuss the risk ratings and provide any additional information that should be factored into the assessment. Where comments were raised, these were recorded (see Stakeholder Workshop) and were used to finalise the ERA scores and associated narratives.

Table 5. Expected outcomes of each risk rating.

| **Risk Levels** | **Likely Management Action** |
|---|---|
| Negligible | Nil |
| Low | None specific |
| Moderate | Specific management and/or monitoring required in Management Framework. |
| High | Increased management activities needed in Management Framework. |
| Severe | Increased management activities including a recovery strategy in the Management Framework. Consideration to be given to interim management arrangements to arrest the decline. |

The national ESD reporting framework suggests that only issues scored as moderate or high risk need to have full ESD performance reports completed, however the rationale for scoring is provided for all issues identified and form part of these reports. Issues scored as either low or negligible have also been documented to encourage transparency and help stakeholders to understand the basis for risk scores.

## 10.4. ESD performance reports for higher risk issues

Central to any ESD performance report are the 'proposed management actions' to deal with higher risk/priority issues, these include the operational objectives, indicators and performance measures. This is recommended in the ESD Framework's *How To Guide*, but a comprehensive ESD performance report was not prepared for higher risk/priority issues that were identified in this process.

# 11. Performance reports

Component trees were developed for retained and non-retained species caught in the fishery as well as general ecosystem effects. The risk rating, and subsequent colour of the box depicted in the component trees, indicates the level of risk for each issue as determined by the expert panel. Background colour for each component of the tree relates to the determined risk rating according to the following scheme: light blue = negligible, green = low, yellow = medium, orange = high and red = severe.

## 11.1. Retained species

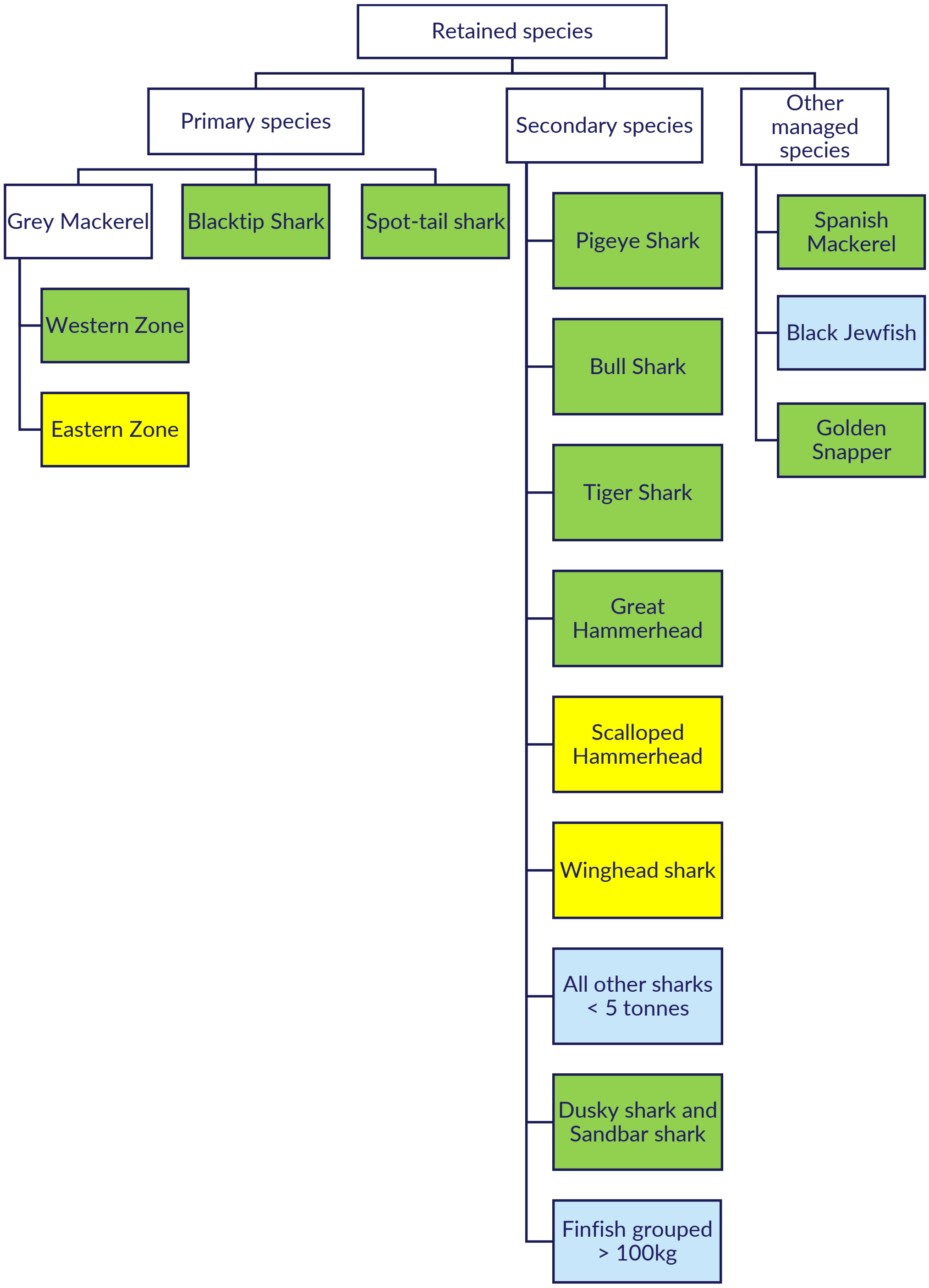


Figure 9. Component tree for retained species in the Offshore Net and Line Fishery.

## Primary species

### Grey Mackerel (*Scomberomorus semifasciatus*) – Western Zone

**Objective:** Maintaining the biomass of target species at sustainable levels.

**Background information:**

- Target level in the Harvest Strategy for Grey Mackerel is B48 (48% of the unfished biomass).
- TACC for Grey Mackerel in the Western Zone is 404,000 kg
- Grey Mackerel grow rapidly, reach sexual maturity at two years of age and are highly fecund.
- At least five distinct Grey Mackerel stocks identified across northern Australia. Two of these stocks occur in the NT, which align with the Grey Mackerel management zones in the fishery.
- Previous risk rating assigned in 2020 was LOW.

**Lines of evidence:**

- Stock assessment undertaken in 2021 estimates:
  - Biomass was 74% of unfished levels. Consistent with C1.
  - Fishing mortality estimated at 54% of that required to achieve MSY (F MSY). Consistent with C1.
- Harvest Strategy and TACCs in place and operational but no interim performance indicators (e.g. CPUE monitoring during years with no stock assessment). Consistent with C1 – C2.
- Application of new stock assessment method (Stock Synthesis) that will include additional biological data (e.g. conditional length at age) is underway, which will reduce assessment uncertainty. Consistent with C1 – C2.
- Catch is not fully utilised, ~92% of quota used annually. Some uncertainty inherent with cause of the underutilised catch. Consistent with C1 - C2.
- Very low catches from other fishing sectors including illegal unreported and unregulated (IUU) fishing – minimal impact on stock. Consistent with C1 - C2.

**Risk rating:**

The risk rating for Grey Mackerel Western Zone was determined in accordance with Table 6 and 7 (see Appendices).

| Consequence level | Lines of evidence | | | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|---|---|
| | Biomass | Fishing mortality | Harvest Strategy-TACC | New assessment method | Catch and effort | Other catches | | |
| 1 | √ | √ | √ | √ | √ | √ | L4 | |
| 2 | X | X | √ | √ | √ | √ | L2 | Low |
| 3 | X | X | X | X | X | X | NP | |
| 4 | X | X | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C3 or C4 it was agreed that only Consequence level 1 and 2 and associated likelihoods were plausible.

Based upon consideration of all the lines of evidence it was agreed that it was Likely (L4) that the stock will be above the target level (C1) for the next five years, but given the uncertainty in the assessment method it was considered plausible but Unlikely (L2) that it could be below the target level but not below the trigger (C2).

The risk rating is C2 x L2 = LOW RISK

### Grey Mackerel (*Scomberomorus semifasciatus*) – Eastern Zone

**Objective:** Maintaining the biomass of target species at sustainable levels.

**Background information:**

- Target level in Harvest Strategy for Grey Mackerel is B48 (48% of the unfished biomass).
- TACC for Grey Mackerel in the Eastern Zone is 131,000 kg.
- Grey Mackerel grow rapidly, reach sexual maturity at two years of age and are highly fecund.
- At least five distinct Grey Mackerel stocks identified across northern Australia.
- Previous risk rating assigned in 2020 was LOW.
- Shared stock with QLD. Catches in the NT are stable and low. QLD catches have increased by 20%.
- Improved collection of biological data for Grey Mackerel has begun in the Eastern Zone, however this has not yet been used in assessments of sustainability.
- In 2021 a catch-MSY model assisted catch only assessment undertaken. The assessment indicated that biomass levels were more than likely above the limit reference point under the ONLF Harvest Strategy. The stock assessment estimated that recent harvests have exceeded F MSY and noted that a catch-MSY modelling has a higher degree of uncertainty.
- A 2020 SAFS stock reduction analysis stock assessment should be interpreted with some caution as there were concerns that some of the catch per unit effort string was not an accurate indicator of abundance.

**Lines of evidence:**

- The 2020 SAFS stock reduction analysis stock assessment indicates that biomass was at 55% of unfished levels and fishing mortality estimates at 55% F MSY. Consistent with C2.
- Most recent 2021 stock assessment uses a catch-MSY model which provide a higher degree of uncertainty indicated that recent harvests have exceeded F MSY. Current catch and effort in the Eastern Zone. Consistent with C1 - C2.
- Fishing mortality estimate at 26% of F MSY.  Consistent with C1.
- Harvest Strategy and TACCs in place and operational but no interim performance indicators (e.g. CPUE monitoring during years with no stock assessment) - Consistent with C1 – C2.
- Catch and effort are both low in the Eastern Zone. Consistent with C1.
- Low catches from other sectors including IUU – minimal impact on stock.  Consistent with C1 - C2.

**Risk rating:**

The risk rating for Grey Mackerel Eastern Zone was determined in accordance with Table 6 and 7 (see Appendices).

| Consequence level | Lines of evidence | | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|---|
| | Stock Reduction Analysis | Catch MSY model | Harvest Strategy-TACC | Catch and effort | Other Catches | | |
| 1 | √ | √ | √ | √ | √ | L3 | |
| 2 | √ | √ | √ | X | √ | L3 | MEDIUM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3 | X | X | X | X | X | NP | |
| 4 | X | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C3 or C4 it was agreed that only Consequence level 1 and 2 and associated likelihoods were plausible.

Based upon consideration of all the lines of evidence while it was agreed that it was still Possible (L3) that the stock will be above the target level (C1) for the next five years, given the declining biomass level in the GoC it was also considered Possible (L3) that it could be below the target level but not below the trigger (C2).

The risk rating is C2 x L3 = MEDIUM RISK

### Blacktip Sharks (*Carcharhinus limbatus* and *C. tilstoni*)

**Objective:** Maintaining the biomass of target species at sustainable levels.

**Background information:**

- Species complex (*Carcharhinus tilstoni* and *C. limbatus*).
- Target level in Harvest Strategy for Blacktip Sharks is $B_{60}$ (60% of unfished biomass).
- One TACC for both species (435,000 kg).
- One management zone in the NT. Two biological stocks in the NT both assessed separately.
- The *Carcharhinus tilstoni* and *C. limbatus* assessed as sustainable in SAFS in the Western Zone. The Eastern Zone is undefined due to limited historic fishing mortality making assessing sustainability challenging.
- The two species have different life histories, with Common Blacktip Shark having higher vulnerability to fishing mortality.
- Previous risk rating assigned in 2020 was LOW.

**Lines of evidence:**

- Non-detrimental findings (NDF) – Positive. Consistent with C1.
- Shark Report Card – Sustainable. Consistent with C1.
- Complexity between two species with differing life histories and possible differences in the geographic distribution of stocks. Consistent with C1 - C2.
- Low catch levels of Blacktip Shark in NT and WA. Consistent with C1.

**West**

- Stock assessment undertaken in 2021 estimates *C. tilstoni* 89% of unfished levels and Catch MSY assessment for *C. limbatus* indicates stocks are sustainable. Increase of biomass since Taiwanese fleet stopped in the 1970's. Consistent with C1.
- Fishing mortality for *C. tilstoni* estimated at 3% of that required to achieve MSY (F MSY). Consistent with C1.
- Mark recapture research also supports a healthy biomass. Consistent with C1.
- Catches/targeting declining due to market demand. Consistent with C1.
- No catches in WA since 2009. Consistent with C1.

**East**

- Low catch by ONLF in Eastern zone. Consistent with C1.
- Low historical catches from Taiwanese fleet. Consistent with C1.

The risk rating for Blacktip Shark was determined in accordance with Table 6 and 7 (see Appendices).

| Consequence level | Lines of evidence | | | | | | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | NDF | Shark Report Card | Biology of species | Stock assessment | Biology of species | Fishing mortality | Research | Catch and effort | Other Catches | | |
| 1 | √ | √ | √ | √ | √ | √ | √ | √ | √ | L4 | LOW |
| 2 | X | X | √ | X | √ | X | X | X | X | L1 | |
| 3 | X | X | X | X | X | X | X | X | X | NP | |
| 4 | X | X | X | X | X | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C3 or C4 it was agreed that only Consequence level 1 and 2 and associated likelihoods were plausible.

Based upon consideration of all the lines of evidence it was agreed that it was Likely (L4) that the stock will be above the target level (C1) for the next five years, but given the uncertainty in the species complex it was considered plausible, but with a remote (L1) likelihood, that the less productive species could be below the target level but not below the trigger (C2).

The risk rating is C1 x L4 = LOW RISK

## Spot-tail Shark (*Carcharhinus sorrah*)

**Objective:** To maintain the biomass of target species at sustainable levels.

**Background information:**

- Target level in Harvest Strategy for Spot-tail Shark is B48 (48% of unfished biomass).
- TACC for Spot-tail is 121,000 kg.
- Previous risk rating assigned in 2020 was LOW

**Lines of evidence:**

- NDF – Positive. Consistent with C1.
- Shark report card – sustainable. Consistent with C1.
- Stock assessment undertaken in 2021 – 89% unfished levels. Includes QLD catch. Consistent with C1.
- Fishing mortality estimate at 7% of F MSY. Consistent with C1.
- Mark re-capture study suggests low impact. Consistent with C1.

**Risk rating:**

The risk rating for Spot-tail shark was determined in accordance with Table 6 and 8 (see Appendices).

| Consequence level | Lines of evidence | | | | Biology of species | Likelihood | Risk rating |
|---|---|---|---|---|---|---|---|
| | NDF | Shark report card | Stock assessment | Fishing mortality | | | |
| 1 | √ | √ | √ | √ | √ | L4 | LOW |
| 2 | X | X | X | X | X | NP | |
| 3 | X | X | X | X | X | NP | |
| 4 | X | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 was associated likelihoods were plausible.

Based upon consideration of all the lines of evidence it was agreed that it was Likely (L4) that the stock will be above the target level (C1) for the next five years.

## Secondary species

### Pigeye Shark (*Carcharhinus amboinensis*)

**Objective:** Maintaining the catch of secondary species at sustainable levels.

**Background information:**

- Harvest Strategy in place to maintain catch of combined shark group.
- Pigeye Shark are included under the combined shark group TACC, with a TACC of 246,441 kg.
- Species mature around 13 years – can live to 30 years. Litter range 6-13 pups.

**Lines of evidence:**

- SAFE – Low. Consistent with C1.
- NDF – Positive. Consistent with C1.
- Shark report card – Sustainable. Consistent with C1.
- Low fishing effort and reduced targeting. Consistent with C1.
- IUCN Red List Australian Assessment – Least Concern status. Consistent with C1.

**Risk rating:**

The risk rating for Pigeye shark was determined in accordance with Table 6 and 8 (see Appendices).

| Consequence level | Lines of evidence | | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|---|
| | SAFE | NDF | Shark Report Card | Catch and effort | IUCN | | |
| 1 | √ | √ | √ | √ | √ | L4 | LOW |
| 2 | X | X | X | X | X | NP | |
| 3 | X | X | X | X | X | NP | |
| 4 | X | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 associated likelihoods was plausible.

Based upon consideration of all the lines of evidence it was agreed that it was Likely (L4) that the stock has only a minor level of depletion (C1) for the next five years.

The risk rating is C1 x L4 = LOW RISK

## Bull shark (*Carcharhinus leucas*)

**Objective:** Maintaining the catch of secondary species at sustainable levels.

**Background information:**

- Harvest Strategy in place to maintain catch of combined shark group.
- Bull Shark are included under the combined shark group TACC, with a TACC of 246,441 kg.
- Relatively late maturity around 9.5 years – can live to 27 years. Litter range 1-13 pups

**Lines of evidence:**

- SAFE Assessment – Low. Consistent with C1.
- NDF – Positive. Consistent with C1.
- Shark report card – Sustainable. Consistent with C1.
- Low fishing effort and reduced targeting. Consistent with C1.
- IUCN Red List Australian Assessment – Least Concern status. Consistent with C1.

**Risk rating:**

The risk rating for Bull shark was determined in accordance with Table 6 and 8 (see Appendices).

| Consequence level | Lines of evidence | | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|---|
| | SAFE | NDF | Shark Report Card | Catch and effort | IUCN | | |
| 1 | √ | √ | √ | √ | √ | L4 | LOW |
| 2 | X | X | X | X | X | NP | |
| 3 | X | X | X | X | X | NP | |
| 4 | X | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 associated likelihoods was plausible.

Based upon consideration of all the lines of evidence it was agreed that it was Likely (L4) that the stock has only a minor level of depletion (C1) for the next five years.

The risk rating is C1 x L4 = LOW RISK

### Tiger shark (*Galeocerdo cuvier*)

**Objective:** Maintaining the catch of secondary species at sustainable levels.

**Background information:**

- Harvest Strategy in place to maintain catch of combined shark group.
- Tiger Shark are included under the combined shark group TACC, with a TACC of 246,441 kg.
- Found close inshore to continental shelf, depth distribution to 0-850 m
- Wide ranging migrations, and localised movement with high site fidelity

**Lines of evidence:**

- SAFE Assessment – Low. Consistent with C1.
- NDF – Positive. Consistent with C1.
- Shark report card – Sustainable. Consistent with C1.
- Low fishing effort and reduced targeting. Consistent with C1.

**Risk rating:**

The risk rating for Tiger shark was determined in accordance with Table 6 and 8 (see Appendices).

| Consequence level | Lines of evidence | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|
| | SAFE | NDF | Shark Report Card | Catch and effort | | |
| 1 | √ | √ | √ | √ | L4 | LOW |
| 2 | X | X | X | X | NP | |
| 3 | X | X | X | X | NP | |
| 4 | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C2, C3 and C4 it was agreed that only Consequence level 1 and associated likelihoods were plausible.

The risk rating is C1 x L4 = LOW RISK

### Great Hammerhead (*Sphyrna mokarran*)

**Objective:** Maintaining the catch of secondary species at sustainable levels.

**Background information:**

- Harvest Strategy in place to maintain catch of combined shark group.
- Great Hammerhead are included under the combined shark group TACC, with a TACC of 246,441 kg.
- A 50 tonne harvest limit for the ONLF under the Harvest Strategy. A 37 tonne harvest trigger under the Harvest Strategy will implement a trip limit of 5, and if no electronic monitoring in place all heads will need to remain attached.
- Due to species morphology (head shape) they are susceptible to pelagic net however longline takes higher catch.
- Tropical and subtropical distribution
- Little known about the population size and trend of Great Hammerheads.
- Shark report card indicates species are depleted due to genetic links and connectivity with Indonesian populations.

**Lines of evidence:**

- SAFE Assessment – Low. Consistent with C1.
- NDF – Conditional. Consistent with C2.
- Shark report card – Depleted. Consistent with C3.
- Reported catches of Great Hammerhead is less than 45 tonnes per year over the last five years. Consistent with C1.

**Risk rating:**

The risk rating for Great Hammerhead was determined in accordance with Table 6 and 8 (see Appendices).

| Consequence level | Lines of evidence | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|
| | SAFE | NDF | Shark Report Card | Catch | | |
| 1 | √ | √ | √ | √ | L3 | |
| 2 | X | √ | √ | X | L2 | |
| 3 | X | X | √ | X | L1 | LOW |
| 4 | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C4 it was agreed that only Consequence level 1, 2 and 3, and associated likelihoods were plausible.

The annual catches by the ONLF are within the limits specified in the NDF for this species, which combined with low risk outcome from the SAFE assessment, support the catch levels are sustainable (C 1 - C2). As the Shark report card suggests this species may be depleted, based upon consideration of all the lines of evidence it was agreed that it there was a remote likelihood (L1) of further depletion being generated by the ONLF over the next five years.

The risk rating is C3 x L1 = LOW RISK

## Scalloped Hammerhead (*Sphyrna lewini*)

**Objective:** To ensure fishing impacts do not result in serious or irreversible harm to Conservation Dependent species

**Background information:**

- Harvest Strategy in place to maintain catch of combined shark group.
- Scalloped Hammerhead are included under the combined shark group TACC, with a TACC of 246,441 kg.
- A 50 tonne harvest limit for the ONLF under the Harvest Strategy. A 37 tonne harvest trigger under the Harvest Strategy will implement a trip limit of 5, and if no electronic monitoring in place all heads will need to remain attached.
- Structure exists within the population, with productivity occurring inshore.
- Catch by other fisheries occur (Demersal Fishery, Barramundi Fishery (juveniles), and Northern Prawn Fishery (NPF).

**Lines of evidence:**

- SAFE – Low. Consistent with C1.
- NDF - Positive but conditional. Consistent with C2.
- Shark report card – Depleted. Stock structure identified North-West stock. Connections with other jurisdictions is uncertain (uncertainties on the connectivity between PNG). This is consistent with C3.
- Stock level greater than 60% unfished assuming limited connectivity with PNG and Indonesia. Below 60% is high connectivity. Consistent with C1 and C2.
- Listed under EPBC Act as Conservation Dependent. Consistent with C3.
- Catch much lower than harvest limit in the last five years (6- 13 tonnes including discards). Consistent with C1.

**Risk rating:**

The risk rating for Scalloped Hammerhead was determined in accordance with Table 6 and 8 (see Appendices).

| Consequence level | Lines of evidence | | | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|---|---|
| | SAFE | NDF | Shark Report Card | Stock assessment | EPBC listing | Catch and effort | | |
| 1 | √ | √ | √ | √ | √ | √ | L2 | |
| 2 | X | √ | √ | √ | √ | X | L3 | |
| 3 | X | X | √ | X | X | X | L2 | MEDIUM |
| 4 | X | X | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C4 it was agreed that only Consequence level 1, 2 and 3, and associated likelihoods were plausible.

Based upon consideration of all the lines of evidence it was agreed that it was Unlikely (L2) that the stock has had only a minor level of depletion (C1). Given the uncertainty in the connectivity with other jurisdictions it was considered only possible (L3) that for the next five years the stock will remain at the maximum level of depletion and it is plausible but unlikely (L2) given the low annual catches that the level of depletion will decline below the acceptable limit (C3).

The risk rating is C3 x L2 = MEDIUM RISK

### Winghead shark (*Eusphyra blochii*)

**Objective:** Maintaining the catch of secondary species at sustainable levels.

**Background information:**

- Harvest Strategy in place to maintain catch of combined shark group.
- Winghead Shark are included under the combined shark group TACC, with a TACC of 246,441 kg.
- Species susceptible to gear types (longline and gillnets). Longlining adds additional catch of larger individuals.
- Species is more vulnerable as it has a more coastally restricted distribution that partially overlaps the effort footprint of the fishery.
- Winghead sharks population structure is not studied particularly well.
- The previous ERA scoring of C4 x L4 = HIGH risk.

**Lines of evidence:**

- SAFE Assessment – Low. Consistent with C1.
- NDF - Positive but conditional. Consistent with C2.
- Shark report card status indicates *Depleting* status (consistent with C2) with the species being vulnerable however not yet considered endangered under the EPBC Act.
- Catch remains within 6 – 12 tonne range, inclusive of discards. Consistent with C1.

**Risk rating:**

The risk rating for Winghead shark was determined in accordance with Table 6 and 8 (see Appendices).

| Consequence level | Lines of evidence | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|
| | **SAFE** | **NDF** | **Shark Report Card** | **Catch and effort** | | |
| 1 | √ | X | X | √ | L2 | |
| 2 | X | √ | √ | X | L3 | MEDIUM |
| 3 | X | X | X | X | NP | |
| 4 | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C3 or C4 it was agreed that only Consequence level 1 and 2, and associated likelihoods were plausible.

Based upon consideration of all the lines of evidence it was agreed that it was Unlikely (L2) that the stock has had only a minor level of depletion (C1)., Given the uncertainty in the connectivity with other jurisdictions it was considered only possible (L3) that for the next five years the stock will remain at maximum level of depletion and it is plausible but unlikely (L2) given the low annual catches that the level of depletion will decline below the acceptable limit (C3).

The risk rating is C2 x L3 = MEDIUM RISK

## All other sharks (less than 5 tonnes average annual capture)

**Objective:** Maintaining the catch of secondary species at sustainable levels.

**Background information:**

- Species included: Grey Reef shark (*C. amblyrhynchos*), Lemon shark (*Negaprion acutidens*), Creek Whaler (*Carcharhinus fitzroyensis*), Fossil Shark (*Hemipristis elongate*), Grey Carpetshark (*Chiloscyllium punctatum*), Guitarfishes (*Rhinobatidae* spp.), Milk Shark (*Rhizoprionodon acutus*), Tawny Shark (*Nebrius ferrugineus*), Whitecheek Shark - (*Carcharhinus dussumieri*), and Sharks – other.
- Grey Reef and Lemon Sharks are included under the combined shark group TACC, with a TACC of 246,441 kg.
- All other shark species listed under the first point are included under the combined other shark group TACC, with a TACC of 126,447kg.
- High diversity represented in catch.
- Milk Shark and Tawny Shark are discarded species in the fishery.
- Guitarfishes (*Rhinobatidae* spp.) make up small catch taken by longline gear type.
- No auto-baiting devices on a vessels.

**Lines of evidence:**

- SAFE Assessment – All shark species – Low. Consistent with C1.
- NDF – All shark species – Positive. Consistent with C1.
- Shark Report card – All species listed as Sustainable. Consistent with C1.
- Low catch of all other shark species in ONLF. Consistent with C1.
- No shark fishing occurs in WA (apart from traditional fishing in the MOU box) and in the region west of NT no fishing of combined shark species. Consistent with C1.

**Risk rating:**

The risk rating for all other sharks (less than 5 tonnes average annual capture) was determined in accordance with Table 6 and 8 (see Appendices).

| Consequence level | Lines of evidence | | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|---|
| | SAFE | NDF | Shark Report Card | Catch and effort | Other catches | | |
| 1 | √ | √ | √ | √ | √ | L2 | NEGLIGIBLE |
| 2 | X | X | X | X | X | NP | |
| 3 | X | X | X | X | X | NP | |
| 4 | X | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 and associated likelihoods were plausible. Based upon consideration of lines of evidence it was agreed that it was Unlikely (L2) that the stock will have minor level of depletion (C1) within the next five years.

The risk rating is C1 x L2 = NEGLIGIBLE RISK

### Dusky Shark (*Carcharhinus obscurus*) and Sandbar shark (*Carcharhinus plumbeus*)

**Objective:** Maintaining the catch of secondary species at sustainable levels.

**Background information:**

- Dusky and Sandbar Sharks are included under the combined shark group TACC, with a TACC of 246,441 kg.
- Low catches in the NT within the last five years.

**Lines of evidence:**

- SAFE Assessment – Low. Consistent with C1.
- NDF – Positive. Consistent with C1.
- Shark Report Card –Dusky shark (*C. obscurus)* and Sandbar shark (*C. plumbeus)* species both listed as recovering. Consistent with C2.
- Both species make up a small component of NT catch (five year average < 1.6 tonnes). Consistent with C2.
- WA undertakes no fishing of combined shark species, except for within the MOU box. Consistent with C1.

**Risk rating:**

The risk rating for Dusky shark and Sandbar shark was determined in accordance with Table 6 and 8 (see Appendices).

| Consequence level | Lines of evidence | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|
| | **SAFE** | **NDF** | **Shark Report Card** | **Catch and effort** | | |
| 1 | √ | √ | √ | √ | L2 | |
| 2 | X | X | √ | X | L2 | LOW |
| 3 | X | X | X | X | NP | |
| 4 | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C3 or C4 it was agreed that Consequence level 1 and 2 and associated likelihoods were plausible.

Based on consideration of all lines of evidence it was agreed that it was Unlikely (L2) that the stock has only moderate level of depletion (C2) for the next five years.

The risk rating is C2 x L2 = LOW RISK

## Combined finfish grouped (greater than 100kg average annual capture)

**Objective:** Maintaining the catch of secondary species at sustainable levels.

**Background information:**

- Species include: Longtail Tuna (*Thunnus tonggol*), Mackerel Tuna (*Euthynnus affinis*), Queenfish (*Scomberoides lysan*), Black Pomfrets (*Parastromateus niger*), Giant Trevally (*Caranx ignobilis*), Trevallies – scad, Blue Threadfin (*Eleutheronema tetradactylum)*, Golden Trevally (*Gnathanodon speciosus*), Batfishes, Cobia (Rachycentron canadum), Black Marlin (*Istiompax indica*), School Mackerel (*Scomberomorus queenslandicus*), Shortfin Batfish (moonfish) (*Zabidius novemaculeatus*), Spotted Mackerel (*Scomberomorus munroi*).
- Longtail Tuna (*Thunnus tonggol)* represents largest catch within combined finfish group (average 10 tonne annually) as a recreational species.

**Lines of evidence:**

- SAFE Assessment – Low (for Black Pomfret, Cobia, Blue Threadfin, Giant Trevally, Golden Trevally, Long-tail Tuna, Mackerel Tuna, Queenfish, Sailfish and Shortfin Batfish). Consistent with C1.
- Majority of species included in group are not individually assessed due to negligible catch levels. Consistent with C1.

**Risk rating:**

The risk rating for combined finfish group was determined in accordance with Table 6 and 8 (see Appendices).

| Consequence level | Lines of evidence | | Likelihood | Risk rating |
|---|---|---|---|---|
| | SAFE | Catch and effort | | |
| 1 | √ | √ | L2 | NEGLIGIBLE |
| 2 | X | X | NP | |
| 3 | X | X | NP | |
| 4 | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 associated likelihoods were plausible.

Based upon consideration of all lines of evidence it was agreed that it was Unlikely (L2) that the impact of fishing is minor (C1) for the next five years.

The risk rating is C1 x L2 = NEGLIGIBLE

# Other managed species

## Spanish Mackerel (*Scomberomorus commerson*)

Spanish Mackerel are assessed separately from the combined finfish group due to it being a managed species in the Spanish Mackerel Fishery.

**Objective:** Maintaining the catch of secondary species at sustainable levels.

**Background information:**

- Harvest Strategy in place to maintain catch of combined finfish group.
- The ONLF has a formal catch share of 3 percent of Spanish Mackerel of 13,500 kg (noting industry regularly exceeds catch allocation).
- Vessel limit of 30 Spanish Mackerel that can be retained during a voyage.
- Spanish Mackerel grow rapidly to a large size and mature at 2 years of age.
- Spanish Mackerel in the NT is classified as a sustainable stock.

**Lines of evidence:**

- Stock assessment undertaken in 2019 estimates biomass was 72% of unfished levels. ONLF catch is incorporated into the stock assessment for the Spanish Mackerel Fishery. Consistent with C1.
- Catch in the ONLF does not pose a risk to the sustainability of the stock. Consistent with C1.

**Risk rating:**

The risk rating for Spanish Mackerel was determined in accordance with Table 6 and 9 (see Appendices).

| Consequence level | Lines of evidence | | Likelihood | Risk rating |
|---|---|---|---|---|
| | Stock Assessment | Catch and effort | | |
| 1 | √ | √ | L3 | LOW |
| 2 | X | X | NP | |
| 3 | X | X | NP | |
| 4 | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 and associated likelihoods were plausible.

Based upon consideration of all lines of evidence it was agreed that it was Possible (L3) due to the uncertainty of incidental catches exceeding catch allocation of Spanish Mackerel in the ONLF that this may generate a measurable impact, but given biomass for Spanish Mackerel is above 60% of unfished levels it was considered Minor (C1).

The risk rating is C1 X L3 = LOW RISK

## Black Jewfish (*Protonibea diacanthus*)

Black Jewfish are assessed separately from the combined finfish group due to it being a managed species in the Coastal Line Fishery.

**Objective:** Maintaining the catch of secondary species at sustainable levels.

**Background information:**

- Harvest Strategy in place to maintain catch of combined finfish group.
- High value species, but not easily targeted by gear type within the ONLF.
- Trip limits for species exist in management.
- Black Jewfish are gonochoristic (i.e. separate sexes throughout life) and have a rapid growth rate reaching 60 cm total length in their first year.
- Populations limited to hundreds of kilometres and adults appear to show movement among sites separated by tens of kilometres but not separated by hundreds of kilometres.

**Lines of evidence:**

- Stock Assessment comprises three assessments. Greater Darwin and Regional are sustainable, Gulf of Carpentaria is undefined. Consistent with C1.
- Yearly catch rate < 400kg over the last five years in the ONLF, with majority of catch from Greater Darwin. Consistent with C1.

**Risk rating:**

The risk rating for Black Jewfish was determined in accordance with Table 6 and 9 (see Appendices).

| Consequence level | Lines of evidence | | Likelihood | Risk rating |
|---|---|---|---|---|
| | Stock Assessment | Catch and effort | | |
| 1 | √ | √ | L1 | NEGLIGIBLE |
| 2 | X | X | NP | |
| 3 | X | X | NP | |
| 4 | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 and associated likelihoods were plausible.

Based upon consideration of all the lines of evidence it was agreed that it was Remote (L1) that catches within the ONLF would even have an impact on Black Jewfish stocks (C1).

The risk rating is C1 x L1 = NEGLIGIBLE RISK

### Golden Snapper (*Lutjanus johnii*)

Golden Snapper are assessed separately from the combined finfish group due to it being a managed species in the Coastal Line Fishery.

**Objective:** Maintaining the catch of secondary species at sustainable levels.

**Background information:**

- Golden Snapper are gonochoristic (i.e. separate sexes throughout life) and grow quickly in their first few years prior to growth slowing; taking several years to reach maturity.
- Separate stocks exist within the waters of NT on a fine scale of tens of kilometres.
- Trip limits of 50kg for all snapper species.
- Incidental catch of species in the ONLF, not commercially targeted due to gear type. Majority of catch is kept.
- High catch in recreational and fishing tour operator fishing sectors.

**Lines of evidence:**

- Yearly catch ranges between 14 – 800kg representing 1% of the overall catch for the NT. Consistent with C1.
- Stock Assessment - Golden Snapper in Greater Darwin region is depleted. Consistent with C3.
- Observations (on-board observers) indicate that catches of this species are typically within the trip limits, and there is minimal discarding of this species. Consistent with C1.

**Risk rating:**

The risk rating for Golden Snapper was determined in accordance with Table 6 and 9 (see Appendices).

| Consequence level | Lines of evidence | | | Likelihood | Risk rating |
|---|---|---|---|---|---|
| | Catch and effort | Stock Assessment | On board observers | | |
| 1 | √ | X | √ | NP | |
| 2 | X | X | X | NP | |
| 3 | X | √ | X | L1 | LOW |
| 4 | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C1, C2 or C4 it was agreed that only Consequence level 3 and associated likelihoods were plausible.

Based upon consideration of all the lines of evidence it was agreed that while the stock assessment in 2017 indicated that Golden Snapper in the Darwin Region is depleted (C3 it was considered that as the catches from the ONLF are minimal (1% of total) the ONLF will have only a Remote (L1) likelihood of measurably contributing to this species depletion. .

The risk rating is C3 X L1 = LOW RISK

## 11.2. Non-retained species risk rating

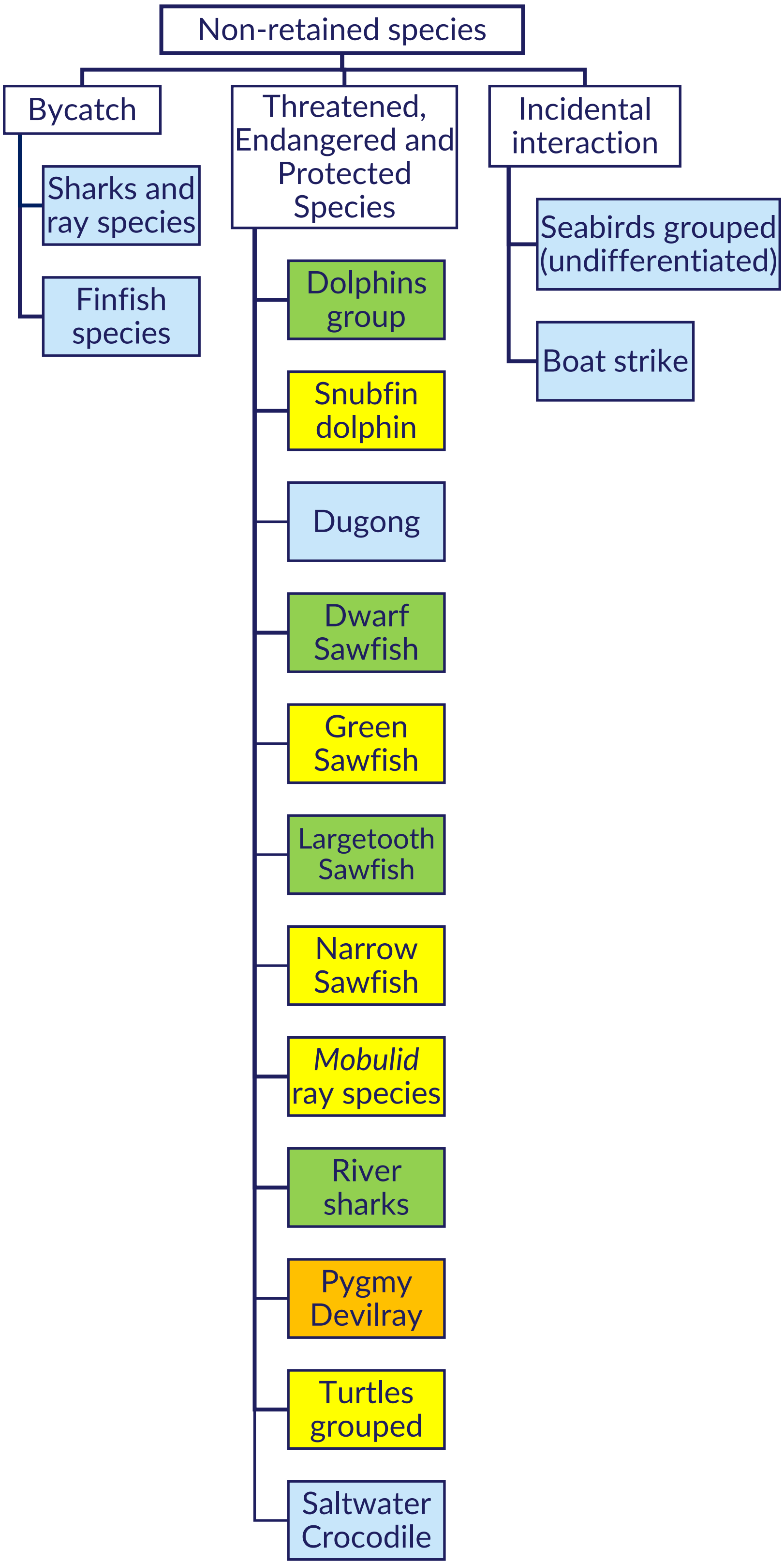


Figure 10. Component tree for non-retained species in the Offshore Net and Line Fishery.

## Bycatch

### Shark and ray species

**Objective:** To ensure that the effects of fishing do not cause irreversible harm to bycatch populations

**Background information:**

- The Non-Retained suite of shark and ray species include: Hardnose Shark (*Carcharhinus macloti*), Whitetip Reef Shark (*Triaenodon obesus*), Spinner Shark (*Carcharhinus brevipinna*) and Stingrays. Stingrays are not reported as a species specific level.
- The ONLF Harvest Strategy includes a performance indicator and harvest control rules to ensure fishing pressure on stocks of bycatch species is sustainable.

**Lines of evidence:**

- SAFE Assessment for Spinner Sharks - Low. Consistent with C1.
- Shark report card lists Whitetip, Hardnose and Spinner sharks as sustainable. Consistent with C1.
- Negligible catch levels of sharks and rays (average <200 kilograms over the last five years, with an exception for stingray species that have an average catch 586 kg over the last five years). While stingrays are grouped leading to potential under-reporting for some species, this is ameliorated by the very low overall catch levels Consistent with C1.

**Risk rating:**

The risk rating for shark and ray species was determined in accordance with Table 6 and 8 (see Appendices).

| Consequence level | Lines of evidence | | | Likelihood | Risk rating |
|---|---|---|---|---|---|
| | SAFE | Shark report card | Catch and effort | | |
| 1 | √ | √ | √ | L2 | NEGLIGIBLE |
| 2 | X | X | X | NP | |
| 3 | X | X | X | NP | |
| 4 | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 associated likelihoods were plausible.

Based upon consideration of all lines of evidence and especially given the low annual catch levels it was agreed that it was unlikely (L2) that the impact of ONLF fishing would generate even a minor (C1) impact to this suite of shark and ray species within the next five years.

The risk rating is C1 x L2 = NEGLIGIBLE RISK

### Finfish species

**Objective:** To ensure that the effects of fishing do not cause irreversible harm to bycatch populations

**Background information:**

- Non-retained suite of Finfish species included: Milkfish (*Chanos chanos*), Sailfish (*Istiophorus platypterus*), Mouth Mackerel (*Rastrelliger kangurta*), Tunas and Mackerels.
- The ONLF Harvest Strategy includes a performance indicator and associated harvest control rules to ensure fishing pressure on stocks of bycatch species is sustainable.

**Lines of evidence:**

- Negligible annual catch levels of this suite of finfish species (annual average <150kg over the last five years). This level of catch is considered negligible to each of these species. Consistent with C1.

**Risk rating:**

The risk rating for finfish species was determined in accordance with Table 6 and 8 (see Appendices).

| Consequence level | Lines of evidence<br>Catch | Likelihood | Risk rating |
|---|---|---|---|
| 1 | √ | L1 | NEGLIGIBLE |
| 2 | X | NP | |
| 3 | X | NP | |
| 4 | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 associated likelihoods were plausible.

Based upon consideration of all lines of evidence, it was agreed there was a remote (L1) likelihood that the impact of ONLF fishing is minor (C1) to finfish species within the next five years given the low catch rates.

The risk rating is C1 x L1 = NEGLIGIBLE RISK

## Threatened, Endangered and Protected Species

### Dolphins grouped (undifferentiated); Bottlenose Dolphins (*Tursiops truncatus and T. aduncus*), Common Dolphin (*Delphinus delphis*), Humpback (*Sousa sahulensis*)

**Objective:** To ensure fishing impacts does not result in serious or irreversible harm to threatened, endangered and protected species populations.

**Background information:**

- Reported interactions with Bottlenose Dolphins may potentially comprise Common Bottlenose Dolphins (*Tursiops truncatus)* and/or the Indo-Pacific Bottlenose Dolphins (*Tursiops aduncus).*
- Bottlenose Dolphin (*Tursiops truncatus* and *T. aduncus)* total population size, estimates and distribution in Australian waters is not known. In the Australian region *T. truncatus* are usually found offshore in waters deeper than 30 m (Hale et al. 2000; Ross 2006) but also appears to be found in some coastal waters (Hale et al. 2000; Kemper 2004). *T. aduncus* are found primarily in shallow coastal, estuarine and in shallow reef complexes (Jefferson et al. 2015).
- At present, there is no range-wide estimate of the abundance of Australian Humpback Dolphins. Overall, available abundance estimates indicate that Australian Humpback Dolphins occur in small populations averaging 54–89 individuals and 0.1–0.19 individuals per $km^2$ (Parra & Cagnazzi 2016).
- Bottlenose Dolphins and Humpback Dolphins are morphologically similar to a range of other dolphins, misidentification is likely.
- There have been no recorded interactions with Humpback Dolphins.
- All available data on the distribution and habitat preferences of Australian Snubfin Dolphins indicate that they mainly occur in protected, shallow, coastal waters close to creeks and river mouths (Beasley, Allen and Parra, 2012, and references therein).
- Common Dolphins are found in offshore waters. They have been recorded in waters off all Australian states and territories, but are rarely seen in northern Australian waters (Jefferson & Waerebeek 2002; Ross 2006). Neither the extent of occurrence nor the area of occupancy of the Common Dolphin have been estimated.
- Most studies to date indicate that Australian Humpback Dolphins occur mostly close to the coast (within 20 km from land), in waters less than 20 m deep, close to river mouths and in relatively sheltered offshore waters near reefs or islands
- There was no impact to listing status whether the interactions were reported as mortalities or released alive.
- Potential misreporting, or misidentification among species (particularly *Tursiops truncatus* and *Delphinus delphis)*. Observer records not recorded to species level.
- Potential misreporting, or misidentification among species. Observer records not recorded to species level.
- No reported interactions with Humpback Dolphin (*Sousa sahulensis*). Humpback Dolphin is predominately an inshore species, however, it was noted they may venture further offshore and the potential exists for spatial overlap with effort in this fishery.
- Some interactions were reported as Bottlenose Dolphin, of which there are two morphologically similar, sympatric species – the Common Bottlenose Dolphin (*Tursiops truncatus*) and the Indo-Pacific Bottlenose Dolphin (*T. aduncus*). The former is listed as 'Least Concern' on the IUCN Redlist, while the latter is listed as 'Near Threatened'. While the more vulnerable *T. aduncus* is typically

associated with inshore habitats, the extent of offshore habitat use (and spatial overlap with the ONLF) for this species is poorly understood.

- There was no impact to listing status whether the interactions were reported as mortalities or released alive.

**Lines of evidence:**

- Species exist is small populations. Consistent with C2.
- There have been 20 reported interactions with dolphins other than Snubfin in the last 20 years, 15 of which were mortalities. Consistent with C1 - C2.
- Over the past five years, 12 interactions with dolphins, including 9 mortalities, have been reported in logbooks. Annual reported interactions from logbooks range between 1 – 6 individuals. Consistent with C1 – C2.
- On-board observer and electronic monitoring coverage has identified an additional 4 undifferentiated dolphin interactions in the past 20 years, including 3 mortalities and one of unknown fate. Consistent with C1.
- Some of the species are distributed as a series of small demes within the larger population. Consistent with C2.
- There was no impact to the EPBC and IUCN listing status whether the interactions were reported as mortalities or released alive. Consistent with C1.

**Risk rating:**

The risk rating for Dolphins grouped was determined in accordance with Table 6 and 10 (see Appendices).

| Consequence level | Lines of evidence | | | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|---|---|
| | Populations | Recorded interactions | Observer data | Distribution | EPBC | IUCN | | |
| 1 | X | √ | √ | | √ | √ | L4 | LOW |
| 2 | √ | √ | X | √ | X | X | L1 | |
| 3 | X | X | X | X | X | X | NP | |
| 4 | X | X | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C3 or C4 it was deemed that only Consequence level 1 and 2 associated likelihoods were plausible for Dolphins (group).

There have been minimal interactions reported in the last 20 years, and the number of deaths indicate consequence levels are consistent with C1 and C2. Due to the relatively small number of overall dolphins impacted in the fishery and the predominately inshore habits of the more vulnerable species, it was considered the plausibility of a C1 impact was likely and a C2 impact was remote.

The risk rating is C1 X L4 = LOW

### Snubfin dolphin (*Orcaella heinsohni*)

**Objective:** To ensure fishing impacts do not result in serious or irreversible harm to threatened, endangered and protected species populations.

**Background information:**

- All available data on the distribution and habitat preferences of Australian Snubfin Dolphins indicate that they mainly occur in protected, shallow, coastal waters close to creeks and river mouths (Beasley, Allen and Parra, 2012, and references therein).
- The NT-wide abundance of Snubfin Dolphins was estimated to be 6058 individuals (Palmer et al. 2017), with a previous aerial survey estimating the western Gulf of Carpentaria population at about 1000 individuals (Freeland & Bayliss 1989).
- Uncertainty on some estimates due to the difficulty of identifying dolphin species in turbid waters from the air, particularly since Australian Snubfin Dolphins are inconspicuous, have low surfacing profiles and are elusive (Parra et al. 2002).
- Given pelagic gillnets must not be used within 2 NM of the coastline, and the species occurrence mostly in protected shallow waters close to the coast (Parra et al. 2006; Parra & Corkeron 2001; Parra et al. 2002), spatial overlap between fishing activity and key Snubfin Dolphin habitats is likely to be limited.

**Lines of evidence:**

- Spatial overlap between fishing activity and key Snubfin Dolphin habitats is likely to be limited. However, some overlap may occur in specific near-shore areas where fishers operate, and interactions, including mortalities, have been reported in such areas. Consistent with C1 and C2.
- While limited numbers of interactions makes detecting spatial patterns difficult, interactions have occurred in two distinct areas reducing the potential impacts on any one region. Consistent with C1.
- Over the past five years, 7 interactions with Snubfin Dolphins, including 6 mortalities, have been reported . Annual reported interactions from logbooks range between 0 – 6 individuals. Consistent with C2 and C3.
- On-board observer and electronic monitoring coverage has identified an additional 4 undifferentiated dolphin interactions in the past 20 years, including 3 mortalities and one of unknown fate. Consistent with C1 and C2.
- EPBC listing - Under threatened listing assessment. Consistent with C2.
- IUCN listing – Vulnerable. Consistent with C2.

**Risk rating:**

The risk rating for Snubfin Dolphins was determined in accordance with Table 6 and 10 (see Appendices).

| Consequence level | Lines of evidence | | | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|---|---|
| | Distribution | Spatial interactions | Recorded interactions | Observer data | EPBC | IUCN | | |
| 1 | √ | √ | X | √ | √ | √ | L3 | |
| 2 | √ | X | √ | √ | √ | √ | L3 | MEDIUM |
| 3 | X | X | √ | X | X | X | L1 | |
| 4 | X | X | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C4 it was deemed that only Consequence level 1, 2 and 3, and associated likelihoods was plausible.

Recent interactions (including mortalities) with Snubfin Dolphins have been reported, however interactions have never been reported by on-board or electronic monitoring observers, suggesting interactions are possible (L3). While there is no direct evidence for “some mortalities in most years” as per the C2 consequence, given that pelagic gillnets may interact with several individuals in the same event, a C1 consequence is considered to be unrealistic. Associated likelihood of L3 (Possible) was aligned with this consequence level. The possibility of increased frequency is indicated by the consideration of C3 consequence with level 1 Likelihood given the remote chance.

The risk rating is C2 x L3 = MEDIUM RISK

### Dugong (*Dugong dugon*)

**Objective:** To ensure fishing impacts do not result in serious or irreversible harm to threatened, endangered and protected species populations.

**Background information:**

- Dugongs are long-lived (> 70 years), late maturing (7-17 years) and slow breeding.
- Dugong population estimate for the Northern Territory is estimated at 8,176 (± 958) dugongs.
- Regular surveys since 1994 indicate stable population in the Gulf of Carpentaria. Population trends elsewhere in the NT are unknown.
- Dugong populations increase slowly, at greatest by 5% annually (under optimum conditions).

**Lines of evidence:**

- Low likelihood of misidentification due to morphology. Consistent with C1.
- Limited spatial overlap between key Dugong habitats and majority of fishing effort. Consistent with C1.
- Over the history of the fishery there has been one reported interaction with Dugongs, with the individual reported released alive. Consistent with C1.
- There has been no reported interactions with Dugongs through the observer program. Consistent with C1.
- Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitoring interaction levels of TEPS through logbook and observer data. Consistent with C1.
- Listed as migrator under the EPBC Act. Consistent with C1.

**Risk rating:**

The risk rating for Dugongs was determined in accordance with Table 6 and 10 (see Appendices).

| Consequence level | Lines of evidence | | | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|---|---|
| | Identification | Distribution | Recorded interactions | Observer data | Harvest Strategy | EPBC | | |
| 1 | √ | √ | √ | √ | √ | √ | L2 | NEGLIGIBLE |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | X | X | X | X | X | X | NP | |
| 3 | X | X | X | X | X | X | NP | |
| 4 | X | X | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C2, C3 and C4 it was agreed that only Consequence level 1 associated likelihoods was plausible.

Given there has been one interaction in the last five years, it is possible but considered unlikely (L2) that some level of interaction with minor levels of mortality may occur (C1).

The risk rating is C1 x L2 = NEGLIGIBLE RISK

### Dwarf sawfish (*Pristis clavata*)

**Objective:** To ensure fishing impacts do not result in serious or irreversible harm to threatened, endangered and protected species populations.

**Background information:**

- Listed as a Protected species under the NT Fisheries Act 1988.
- Listed as Vulnerable and Migratory under the *Environment Protection and Biodiversity Conservation Act 1999*.
- Listed as Depleted on the Shark report card.
- The ONLF Harvest Strategy includes performance indicators that monitors annual interaction levels of TEPS through logbook and observer data and applies harvest control rules.
- Species inhabit shallow coastal waters and estuarine habitats.
- Populations in Western Australia, the NT, and Queensland are distinct maternal and paternal genetic stocks. Population estimates and finer scale structure is unknown for the NT.
- Identification and handling training for sawfish was undertaken with commercial fishers at commencement of the 2024 fishing season to reduce misidentification and improve survivability.
- Previous risk rating assigned in 2020 was MODERATE.

**Lines of evidence:**

- Dwarf sawfish inhabit shallow coastal waters and estuarine habitats. Minimal spatial overlap with more predominant offshore activities of the fishery. Consistent with C1.
- Over the past 5 years, 28 interactions with Dwarf Sawfish, including 3 mortalities have been reported in logbooks in the ONLF. Recorded annual interactions were low, except for 2021/2022 with 26 recorded interactions(3 mortalities, 23 released alive) which were considered to be a misidentification given the location of the reported interaction (10 km offshore) made by one vessel across 2 trips. Consistent with C1.
- On-board observer program identified one Dwarf Sawfish interaction over the last 20 years, validating low interaction rates. Consistent with C1.
- SAFE assessment outcome is Low. Consistent with C1.

**Risk rating:**

The risk rating for Dwarf sawfish was determined in accordance with Table 6 and 10 (see Appendices).

| Consequence level | Lines of evidence | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|
| | Distribution | Recorded interactions | Observer data | SAFE | | |
| 1 | √ | √ | √ | √ | L3 | LOW |
| 2 | X | X | X | X | NP | |
| 3 | X | X | X | X | NP | |
| 4 | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 associated likelihoods was plausible.

Noting the possibility of the high recorded interactions during 2021/2022 being misidentification, combined with the low level of validated interactions from observer data, the likelihood was set as Possible (L3) that while some level of interaction may occur, few mortalities would occur over multiple years (C1).

The risk rating is C1 x L3 = LOW RISK

### Green Sawfish (*Pristis zijsron*)

**Objective:** To ensure fishing impacts do not result in serious or irreversible harm to threatened, endangered and protected species populations.

**Background information:**

- Listed as a Protected species under the NT *Fisheries Act 1988*.
- Listed as Vulnerable and Migratory under the *Environment Protection and Biodiversity Conservation Act 1999*.
- Listed as Depleted on the Shark report card.
- The ONLF Harvest Strategy includes performance indicators that monitors annual interaction levels of TEPS through logbook and observer data and applies harvest control rules.
- Species inhabit shallow coastal waters and estuarine habitats (as shallow as <1 m in depth), but can also be found offshore in depths of more than 70 m.
- No data is available for Green Sawfish population trends in the NT and the Gulf of Carpentaria.
- Post release survival is dependent on the gear method used. Studies are ongoing and data is still being collected.
- Identification and handling training for sawfish was undertaken with commercial fishers at commencement of the 2024 fishing season to reduce misidentification and improve survivability.
- Previous risk rating assigned in 2020 was MODERATE.

**Lines of evidence:**

- Historically Green sawfish populations have been affected by inshore commercial netting activities. Interactions are less common with offshore fishing activities, but they are susceptible to net fishery capture due to entanglement of their rostrums. Consistent with C2.
- Over the past 5 years, 83 interactions with Green Sawfish, including 2 mortalities have been reported in logbooks in the ONLF. Annual reported interactions from logbooks range between 10 – 31 individuals. Consistent with C2.
- On-board observer program identified four Green Sawfish interactions (three released alive, one unknown fate) over the last 20 years. This suggests that there may be some level of misreporting in logbooks. Consistent with C2.
- SAFE assessment outcome is Low. Consistent with C1.

**Risk rating:**

The risk rating for Green sawfish was determined in accordance with Table 6 and 10 (see Appendices).

| Consequence level | Lines of evidence | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|
| | Susceptibility to capture | Recorded interactions | Observer data | SAFE | | |
| 1 | X | X | X | √ | NP | |
| 2 | √ | √ | √ | X | L4 | MEDIUM |
| 3 | X | X | X | X | NP | |
| 4 | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C3 or C4 it was agreed that Consequence level 1 and 2, and associated likelihoods was plausible.

Based on the level of interactions, the likelihood was set as Likely (L4) that interactions were expected to occur and some of those interactions could result in mortalities each year (C2).

The risk rating is C2 x L4 = MEDIUM RISK

### Largetooth Sawfish (*Pristis pristis*)

**Objective:** To ensure fishing impacts do not result in serious or irreversible harm to threatened, endangered and protected species populations.

**Background information:**

- Listed as a Protected species under the NT *Fisheries Act 1988*.
- Listed as Vulnerable and Migratory under the *Environment Protection and Biodiversity Conservation Act 1999*.
- Listed as Depleted on the Shark Report Card.
- The ONLF Harvest Strategy includes performance indicators that monitors annual interaction levels of TEPS through logbook and observer data and applies harvest control rules.

- Largetooth Sawfish adults are known to live in waters up to 100 km offshore. They are known to move to mouths of rivers and in estuaries to pup during the wet season and move back to offshore waters.
- Identification and handling training for sawfish was undertaken with commercial fishers at commencement of the 2024 fishing season to reduce misidentification and improve survivability.
- Previous risk rating assigned in 2020 was MODERATE.

**Lines of evidence:**

- Over the past 5 years, 3 interactions with Largetooth Sawfish, all released alive have been reported in logbooks in the ONLF. Annual reported interactions from logbooks range between 0 – 2 individuals. Consistent with C1.
- On-board observer program identified one interaction with Largetooth Sawfish over the last 20 years. Consistent with C1.
- SAFE assessment outcome is Low. Consistent with C1.

**Risk rating:**

The risk rating for Largetooth sawfish was determined in accordance with Table 6 and 10 (see Appendices).

| Consequence level | Lines of evidence: Recorded interactions | Lines of evidence: Observer data | Lines of evidence: SAFE | Likelihood | Risk rating |
|---|---|---|---|---|---|
| 1 | √ | √ | √ | L3 | LOW |
| 2 | X | X | X | NP | |
| 3 | X | X | X | NP | |
| 4 | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 and associated likelihoods was plausible.

Based on the low levels of interactions, the likelihood was set as Possible (L3) that some level of interactions would occur but few mortalities would occur each year (C1).

The risk rating is C1 x L3 = LOW RISK

### Narrow Sawfish (*Anoxypristis cuspidata*)

**Objective:** To ensure fishing impacts do not result in serious or irreversible harm to threatened, endangered and protected species populations.

**Background information:**

- Listed as Migratory under the *Environment Protection and Biodiversity Conservation Act 1999*.
- Listed as Depleted on the Shark report card.
- Benthopelagic species that inhabits estuarine, inshore and offshore waters up to 120 meters depth.

- Mature individuals found offshore and inshore, while juveniles are found inshore and utilise nursery grounds.
- Species have an Indo-Pacific distribution and are found in QLD, WA and the NT.
- Identification and handling training for sawfish was undertaken with commercial fishers at commencement of the 2024 fishing season to reduce misidentification and improve survivability
- Previous risk rating assigned 2020 was MODERATE.

**Lines of evidence:**

- Benthopelagic species are susceptible to entanglement in pelagic net. Consistent with C2.
- Distribution of Narrow Sawfish makes them vulnerable to fishing operations offshore. Consistent with C2.
- Over the last 5 years, 106 interactions with Narrow Sawfish, including 11 mortalities have been reported in logbooks in the ONLF. Annual reported interactions from logbooks range between 14 – 28 individuals. Consistent with C2.
- On-board observer program reported an average annual interaction of 11 individuals over the last five years. Narrow Sawfish are the most commonly recorded sawfish by observers. Consistent with C2.
- Although logbook and observer data indicate most interactions are released alive (from the point of capture). However, this species does experience a high level of post-release mortality. Consistent with C2.
- SAFE Assessment outcome is Low. Consistent with C1.

**Risk rating:**

The risk rating for Narrow sawfish was determined in accordance with Table 6 and 10 (see Appendices).

| Consequence level | Lines of evidence | | | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|---|---|
| | Susceptibility to capture | Distribution | Recorded interactions | Observer data | Post-release mortality | SAFE | | |
| 1 | | X | X | X | X | √ | L2 | |
| 2 | √ | √ | √ | √ | √ | X | L3 | MEDIUM |
| 3 | X | X | X | X | X | X | NP | |
| 4 | X | X | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C3 or C4 it was agreed that Consequence level 1 and 2, and associated likelihoods were plausible.

Based on the reported interactions in the five years, the likelihood was considered that for the next five years it was Possible (L3) that mortalities occur each year (C2).

The risk rating is C2 x L3 = MEDIUM RISK.

## Mobulid rays (*Mobula alfredi* and *M. birostris*)

**Objective:** To ensure fishing impacts do not result in serious or irreversible harm to threatened, endangered and protected species populations.

**Background information:**

- Listed as Migratory under the *Environment Protection and Biodiversity Conservation Act 1999*.
- Shark report card – Depleted for *Mobula birostris* and sustainable for *M. alfredi*.
- Species inhabit offshore oceanic and coastal tropical waters.
- Low biological productivity; *M. alfredi* produces one pup every 1-7 years; *M. birostris* one pup born possibly every 4-5 years.
- Uncertainty with regards to post-release mortality.
- Potential that Manta Rays are misidentified as Pygmy Devilrays.
- Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.
- Guidelines for handling and releasing manta and devil rays developed. Identification and handling training for rays was undertaken with commercial fishers at commencement of the 2024 fishing season to reduce misidentification and improve survivability.
- Previous risk rating assigned for Devil and Manta rays in the 2020 ERA was LOW.

**Lines of evidence:**

- Species are susceptible to entanglement in pelagic net. Post- release survival rates are unknown. Consistent with C2.
- Biological characteristics such as slow-growth, low productivity and aggregating behaviour makes them vulnerable to fishing pressure. Consistent with C2 and C3.
- Over the last 5 years, 124 interactions with Manta Rays, including 19 mortalities have been reported in logbooks in the ONLF (104 released alive in a pelagic net, one released alive in longline). Annual reported interactions from logbooks range between 8 – 37 individuals. Consistent with C2 and C3.
- Average annual observed interactions for the last five years is 1.4 individuals per year. Consistent with C2.

**Risk rating:**

The risk rating for Mobulid rays was determined in accordance with Table 6 and 10 (see Appendices).

| Consequence level | Lines of evidence | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|
| | Susceptibility to capture | Biological characteristics | Recorded interactions | Observer data | | |
| 1 | X | X | X | X | NP | |
| 2 | √ | √ | √ | √ | L3 | |
| 3 | X | √ | √ | X | L2 | MEDIUM |
| 4 | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level

NP – not plausible

As there were no lines of evidence for C1 or C4 it was agreed that only Consequence level 2 and 3 and associated likelihoods was plausible.

While it was determined that it was Possible (L3) for a Moderate (C2) level of consequence occurring in the next five years, a precautionary approach was applied, given the high vulnerability and uncertainty on post-release mortality, whereby it is was considered plausible but Unlikely (L2) for some mortalities occurring in most years (C3).

The risk rating is C3 X L2 = MEDIUM RISK

### River Sharks (Northern River Shark *Glyphis garricki*, and Speartooth Shark *Glyphis glyphis*)

**Objective:** To ensure fishing impacts do not result in serious or irreversible harm to threatened, endangered and protected species populations.

**Background information:**

- Larger individuals are more likely to be captured when longlining. Low amount of longlining effort with the main gear used being pelagic net.
- Pelagic gillnet effort footprint partially overlaps distribution of adult river sharks, however, this gear has low selectivity for larger sharks.
- Movement ecology is poorly understood for both species, *G. garricki* adults are suspected to move offshore (Pillans et al., 2009; Field et al., 2013) whereas *G. glyphis* are tend towards river mouths (Pillans et al. 2009).
- Two interactions reported in the last 5 years. These interactions were reported outside their typical distribution, by an operator who was misidentifying Sandbar Sharks as Speartooth Sharks, which was confirmed via electronic monitoring review for other reported interactions.
- Previous risk rating assigned in 2020 was C2 x L2 = LOW.

**Lines of evidence:**

- Shark report card – Undefined. Consistent with C1 and C2.
- Historically River Sharks have been reported in low numbers in logbooks (11 interactions reported in the last 20 years; 7 Speartooth Sharks and 4 *Glyphis spp.* respectively). Consistent with C1.
- On-board observer program identified 7 interactions with Speartooth Shark and 1 interaction with Northern River Shark over the last 5 years. Consistent with C1.
- Pelagic gillnets, the predominant gear type in the fishery, has low selectivity for large sharks. More likely to encounter larger individuals when longlining, however, minimal longlining effort in the last 5 years. Consistent with C1.
- Species exist as small populations. The application of Close-Kin Mark-Recapture has shown that adult population sizes are very low. Consistent with C1 and C2.
- EPBC Act listing: *Glyphis spp* - Critically endangered and *Glyphis garricki* - Endangered. Consistent with C1 and C2.

**Risk rating:**

The risk rating for River Sharks was determined in accordance with Table 6 and 10 (see Appendices).

| Consequence level | Lines of evidence | | | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|---|---|
| | Shark report card | Recorded interactions | Observer data | Gear selectivity | Population | EPBC | | |
| 1 | √ | √ | √ | √ | √ | √ | L4 | LOW |
| 2 | √ | X | X | X | √ | √ | L1 | |
| 3 | X | X | X | X | X | X | NP | |
| 4 | X | X | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence for C3 and C4 it was agreed that only Consequence level 1 and 2, and associated likelihoods was plausible.

Given the uncertainty in the misreporting, combined with the EPBC status and patchy distribution of the combined River Sharks group, it was agreed that the likelihood was considered Likely (4) that mortalities could occur in the next five years (C1).

The risk rating is C1 X L4 = LOW RISK

### Pygmy Devilray (*Mobula eregoodoo* and *M. kuhlii*)

**Objective:** To ensure fishing impacts do not result in serious or irreversible harm to threatened, endangered and protected species populations.

**Background information:**

- Listed as Migratory under the *Environment Protection and Biodiversity Conservation Act 1999*.
- Pelagic species which inhabits coastal waters (0-50 metres depth).
- Low biological productivity; *M. eregoodoo* and *M. kuhlii* produces one pup every 1-3 years.
- Majority of species interacted are reported as being released alive. Uncertain on post-release mortality.
- This complex can be difficult to identify to species level and there is taxonomic uncertainty. There is likely to be misidentification of species due to their similarities.
- Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.
- With the relatively recent Migratory listing, there has likely been an increase in awareness of the listing status of these species through education and distribution of TEPS ID guides.
- Guidelines for handling and releasing manta and devil rays developed. Identification and handling training for rays was undertaken with commercial fishers at commencement of the 2024 fishing season to reduce misidentification and improve survivability.
- Previous risk rating assigned for Devil and Manta rays in the 2020 ERA was LOW.

**Lines of evidence:**

- Vulnerable life history. Consistent with C3.

- Unknown population size. Consistent with C3.
- Unknown post-release survival rates increases risk. Consistent with C3.
- Over the past 5 years, 952 interactions with Pygmy Devilrays, including 31 mortalities have been reported in logbooks in the ONLF. Annual reported interactions from logbooks ranges between 2 – 408 individuals. Reported interactions with Pygmy Devilrays have increased over the last 5 years. Consistent with C3.
- On-board observer program reported an average annual interaction of 19.6 individuals over the last 5 years. Consistent with C3.

**Risk rating:**

The risk rating for Pygmy Devilray was determined in accordance with Table 6 and 10 (see Appendices).

| Consequence level | Lines of evidence | | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|---|
| | Life history | Population size | Post-release survival | Recorded interactions | Observer data | | |
| 1 | X | X | X | X | X | NP | |
| 2 | X | X | X | X | X | NP | |
| 3 | √ | √ | √ | √ | √ | L3 | HIGH |
| 4 | X | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C1, C2 or C4 it was agreed that Consequence level 3 and associated likelihoods was plausible.

Based on the levels of reported interactions and the vulnerability of the species, despite the reported release of most captured individuals alive, the likelihood was set at Possible (L3) that there could be a High (C3) impact on this species.

The risk rating is C3 x L3 = HIGH RISK

### Turtles grouped: Flatback Turtle (*Natator depressus*), Green Turtle (*Chelonia mydas*), Hawksbill Turtle (*Eretmochelys imbricata*), Leatherback Turtle (*Dermochelys coriacea*), Loggerhead Turtle (*Caretta caretta*) and Olive Ridley Turtle (*Lepidochelys olivacea*)

NOTE: All turtle species were assessed independently by the expert panel, however due to similarities in lines of evidence they are presented as a group in this report.

**Objective:** To ensure fishing impacts do not result in serious or irreversible harm to threatened, endangered and protected species populations.

**Background information:**

- Leatherback, Loggerhead and Olive Ridley turtle are each listed as endangered, and Green, Hawksbill and Flatback turtle are each listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*.
- IUCN Red listings: Leatherback, Loggerhead, Olive Ridley are listed as Vulnerable (Global status), and Green listed as Endangered (Global status), Hawksbill are listed as Critically Endangered (Global status), and Flatback turtle is listed as Data Deficient (Global status).

- The ONLF Harvest Strategy includes performance indicators that monitors annual interaction levels of TEPS through logbook and observer data and harvest control rules.
- Identification guides developed to assist commercial fishers identify turtles at a species level.
- Biological differences between turtle species, some species are more well known that others.
- Some commercial fishers are apply techniques to help aid in the recovery of captured turtles.
- Low annual reported interactions of Flatback, Green, Loggerhead, Olive-Ridley and Leatherback turtles. More common reported interactions occur with Hawksbill turtles.
- Observer records confirm that Hawksbill and Green turtles are captured more commonly than other species.
- Green turtles from West Australian stock will forage in NT. Interactions will occur with both NT and WA stocks. Species are known to nest in the NT.
- Turtle species interactions with foreign ghost nets are assumed to be comparatively higher than actively monitored gear use in the ONLF (nets remain attached to the vessel at all times). No reported lost gear has occurred in the ONLF.
- Logbook data lacks size information which could help determine if turtles are juveniles or mature.

**Lines of evidence:**

- Post-release survival of species can be high if handled correctly as per Code of Practice. Identification guides developed to assist operators identify turtles at a species level. Consistent with C1.
- Distribution of all turtle species spatially overlap with the ONLF and are susceptible to capture in pelagic nets. Consistent with C2.
- Over the past 5 years there have been low reported interactions of Flatback (9 released alive), Green (14 released alive), Loggerhead (1 released alive), Olive-Ridley (5 released alive) and Leatherback (1 released alive) turtles. Consistent with C1.
- In the past 5 years, 54 interactions with Hawksbill turtles, including one mortality have been reported in logbooks in the ONLF. Annual reported interactions from logbooks ranges between 0 – 20 individuals. Consistent with C2.[2]
- On-board observer program identified average annual interactions with turtles for the last five years; Green - 1 p/a, Hawksbill - 0.8 per year; and Turtle - undifferentiated - 0.8 per year. Consistent with C1.

**Risk rating:**

The risk rating for Turtles grouped was determined in accordance with Table 6 and 10 (see Appendices).

| Consequence level | Lines of evidence | | | | Likelihood | Risk rating |
|---|---|---|---|---|---|---|
| | Post-release survival | Distribution | Reported interactions | Observer data | | |
| 1 | √ | X | √ | √ | L3 | |
| 2 | X | √ | √ | X | L3 | MEDIUM |
| 3 | X | X | X | X | NP | |

[2] Hawksbill turtles have a separate line of evidence given they have the highest level of interactions, with the majority of individuals reported being released alive. The expert panel were comfortable assigning a risk rating to remaining turtle species as a group.

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | X | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C3 or C4 it was agreed that only Consequence level 1 and 2 and associated likelihoods were plausible.

Based on the generally low numbers of reported interactions for most species of turtles and the high proportions reportedly released alive, the likelihood was set as Possible (L3) that only few mortalities may occur each year (C1). However, due to the distribution overlap and the frequency of interactions with Hawksbill Turtles in most years, this would be consistent with there being a Possible (L3) likelihood of mortalities occurring in most years which is a Moderate consequence (C2).

The risk rating is C2 x L3 = MEDIUM RISK

### Saltwater Crocodile (*Crocodylus porosus*)

**Objective:** To ensure fishing impacts does not result in serious or irreversible harm to threatened, endangered and protected species populations.

**Background information:**

- Estimated to be over 100,000 saltwater crocodiles in the NT.
- Crocodiles inhabit marine, coastal wetlands and rivers throughout the NT, widely spread from northern WA across to QLD.
- Biomass in some waterways continues to increase, including in rivers where the increase in abundance has plateaued.
- Protected species with a well-documented recovery.
- Low reported interactions with Saltwater Crocodiles.

**Lines of evidence:**

- In the past 5 years, 2 interactions with Saltwater Crocodiles, all released alive have been reported in logbooks in the ONLF. Annual reported interactions from logbooks ranges between 0 – 2 individuals. Consistent with C1.
- On-board observer program reported no interactions with crocodiles in the past 5 years. Consistent with C1.
- Estimated population of Saltwater Crocodiles is estimated to be over 100,000 individuals. Consistent with C1.

**Risk rating:**

The risk rating for Saltwater Crocodile was determined in accordance with Table 6 and 10 (see Appendices).

| Consequence level | Lines of Evidence | | | Likelihood | Risk rating |
|---|---|---|---|---|---|
| | Recorded interactions | Observer program | Population size | | |
| 1 | √ | √ | √ | L2 | NEGLIGIBLE |

| | | | | | |
|---|---|---|---|---|---|
| 2 | X | X | X | NP | |
| 3 | X | X | X | NP | |
| 4 | X | X | X | NP | |

√ – consistent with consequence level
X – not consistent with consequence level
NP – not plausible

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 and associated likelihoods were plausible.

Based upon consideration that there are low reported interactions and a large population of Saltwater Crocodiles in the NT, it was agreed that it was Unlikely (L2) that there are even Minor (C1) levels of interactions occurring.

The risk rating is C1 X L2 = NEGLIGIBLE RISK

## Incidental interaction

### Seabirds grouped (undifferentiated)

**Objective:** To ensure fishing impacts do not result in serious or irreversible harm to threatened, endangered and protected species populations.

**Background information:**

- No auto baiting devices allowed on vessels that use longlines.
- No logbook or observer reported interactions with seabirds.
- Fishing is conducted in a manner that avoids mortality of, or injuries to seabirds.

**Lines of evidence:**

- Fishing is conducted in a manner that avoids mortality or injury to seabirds (setting at night, rapid sink rates of longlines). Consistent with C1.
- Observer reports indicate that 10-20 seabirds can be present in tow of an operational vessel. However, no captures have been observed. Consistent with C1.

**Risk rating:**

The risk rating for seabirds grouped was determined in accordance with Table 6 and 10 (see Appendices).

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 and associated likelihoods were plausible.

Given there have been no reported interactions from logbooks and observers it was agreed that it was Remote (L1) that incidental interactions of seabirds will even have a Minor (C1) impact on seabird populations.

The risk rating is C1 X L1 = NEGLIGIBLE RISK

### Boat strike

**Objective:** To ensure fishing impacts do not result in serious or irreversible harm to threatened, endangered and protected species populations.

**Background information:**

- The ONLF is a small fleet (between seven and 11 active vessels over the past five years).
- When vessels are actively fishing using pelagic nets, the vessels are drifting.
- Boat strike occurrences are required to be reported under catch and effort logbooks.
- Boat strikes have not been observed during the history of Fishery observer trips.

**Lines of evidence:**

- Type of fishing vessels used in this fishery are slow moving and are larger vessel (50-70 feet in length). Consistent with C1.
- In 2023/2024 there was seven active vessels in the ONLF. Consistent with C1.

**Risk rating:**

The risk rating for boat strike was determined in accordance with Table 7 and 10 (see Appendices).

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 and associated likelihoods were plausible.

Given the ONLF fleet is small and the nature of vessels actively fishing it was agreed that it was Remote (L1) that boat strikes will even have a Minor (C1) impact on TEPS.

The risk rating is C1 x L1 = NEGLIGBLE RISK

## 11.3. General ecosystem effects

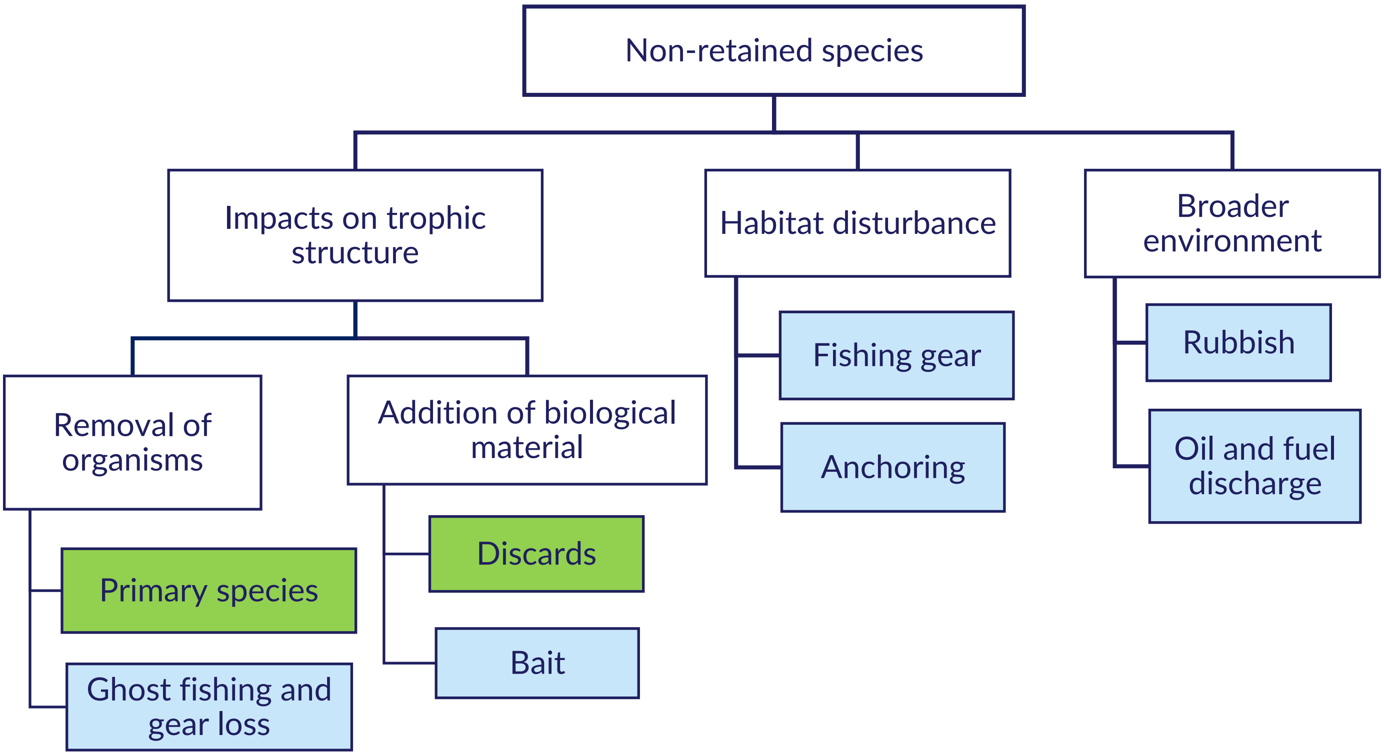


Figure 11. Component tree for general ecosystem effects in the Offshore Net and Line Fishery.

## Removal of organisms

### Primary species

**Objective:** To ensure the effects of fishing do not result in serious or irreversible harm to ecological processes.

**Background information:**

- Management controls limit the take of primary species.
- The role of the primary species, Grey Mackerel and Blacktip Shark, is that of intermediate predators. They prey on lower trophic guilds and are a food source for higher trophic level species such as large sharks and large Spanish Mackerel.

**Lines of evidence:**

- Relatively low level of removal of primary species which results in relatively high biomass levels. Consistent with C1.
- Neither of the primary species plays a keystone role. Consistent with C1.
- No evidence that there has been a measurable shift of composition of the catch. Consistent with C1.

**Risk rating:**

The risk rating for removal of primary species was determined in accordance with Table 6 and 12 (see Appendices).

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 and associated likelihoods were plausible.

Based on the relatively low catch rates and high biomass levels it was considered that it was Likely (L4) that there would be only minor (C1) effects on the removal of primary species to the ecosystem structure.

The risk rating is C1 X L4 = LOW RISK

## Ghost fishing & gear loss

**Objective:** To ensure the effects of fishing do not result in serious or irreversible harm to ecological processes.

**Background information:**

- Pelagic net that are lost have the potential to continue to fish.
- Demersal longlines likely have a limited capacity to continue to fish due to hooks rusting relatively quickly and lines 'bundling' overtime. Note, majority of fishing uses pelagic net method.
- Environmental Management System developed by the Northern Territory Seafood Council for the Fishery.
- It is a requirement that any lost gear is to be reported.
- Under regulations it is prohibited that pelagic nets are to be set within two metres of the seabed.

**Lines of evidence:**

- Minimal risk of lost gear due to gear operation and use. Consistent with C1.

**Risk rating:**

The risk rating for ghost fishing and gear loss was determined in accordance with Table 6 and 12 (see Appendices).

As there were no lines of evidence that were consistent with C2, C3 and C4 it was agreed that only Consequence level 1 and associated likelihoods was plausible.

Given the low probability of gear loss it was agreed that it was Remote (L1) that ghost fishing and gear loss would have a Minor (C1) impact on the trophic structure.

The risk rating is C1 X L1 = NEGLIBLE RISK

## Addition of biological material

### Discards

**Objective:** To ensure the effects of fishing do not result in serious or irreversible harm to ecological processes.

**Background information:**

- Some processing occurs on-board the vessel while at sea. Biological discards include: heads, fillet, trunks from less desirable finfish species.
- The ONLF comprise of a small fleet.

**Lines of evidence:**

- Low discard rate disposed across a large area, over numerous days. Consistent with C1.
- Observer validated discard rates can at time be high (100's kg at one time), however limited processing management in place. Consistent with C1.

**Risk rating:**

The risk rating for addition of biological material from discards was determined in accordance with Table 6 and 12 (see Appendices).

As there were no lines of evidence that were consistent with C2, C3 and C4 it was agreed that only Consequence level 1 and associated likelihoods was plausible.

Given the small fleet, large area of operation and observer reports of discards it was agreed that it was Possible (L3) that discards would have a Minor (C1) impact on the trophic structure.

The risk rating is C1 X L3 = LOW RISK

### Bait

**Objective:** To ensure the effects of fishing do not result in serious or irreversible harm to ecological processes.

**Background information:**

- Pelagic net is the main gear method used.
- The use of demersal and pelagic longlines have been minimal over the last 10 years.

**Lines of evidence:**

- Decreased level of bait discard due to reduced demersal and pelagic longlining within the last 10 years. Consistent with C1.

**Risk rating:**

The risk rating for addition of biological material from bait was determined in accordance with Table 6 and 12 (see Appendices).

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 and associated likelihoods was plausible.

Given the use of demersal and pelagic longlines have been minimal the past 10 years it was agreed that it was Unlikely (L2) that the addition of bait would even have Minor (C1) impacts on the trophic structure.

The risk rating is C1 X L2 = NEGLIGBLE RISK

## Habitat disturbance

### Fishing gear

**Objective:** To ensure the effects of fishing do not result in serious or irreversible harm to ecological processes.

**Background information:**

- Type of gear permitted to be used in the ONLF are pelagic net, pelagic longline and demersal longline.
- Pelagic nets are not to be set within 2 metres of the seabed.
- Demersal longlines can be anchored to the seabed floor at both ends.
- Vessels can use up to 15 nautical miles of longlines with a maximum of 1000 snoods.
- Environmental Management System developed by the Northern Territory Seafood Council for the Fishery.

**Lines of evidence:**

The risk rating for habitat disturbance from fishing gear was determined in accordance with Table 6 and 11 (see Appendices).

- Small fleet operating in the ONLF and large area of fishing operation. Consistent with C1.
- Given the types of static gear used, the small footprint of their interaction with the bottom and the small number of vessels operating over extensive areas of the NT coastline, there would be no measurable impact to the coastal habitat from the fishery. Consistent with C1.

**Risk rating:**

As there were no lines of evidence that were consistent with C2, C3 and C4, with negligible impacts to habitat it was agreed that only Consequence level 1 and associated likelihoods was plausible.

Given the fishing fleet is small, a large area of operation and nature of the fishing gear used it was agreed that it was Remote (L1) that fishing gear would even have a Minor (C1) disturbance on the habitat.

The risk rating is C1 X L1 = NEGLIGIBLE RISK

## Anchoring

**Objective:** To ensure the effects of fishing do not result in serious or irreversible harm to ecological processes.

**Background information:**

- Anchors used in the ONLF are designed to have minimal impact on the seafloor.
- Vessels tend to locate out of weather along coastline in mud environments.

**Lines of evidence:**

- Operations for the Fishery run through the night, therefore anchoring often not required. Consistent with C1.
- Seven vessels actively operating within the fishery. Consistent with C1.

**Risk rating:**

The risk rating for habitat disturbance from anchoring was determined in accordance with Table 6 and 11 (see Appendices).

As there were no lines of evidence that were consistent with C2, C3 and C4 it was agreed that only Consequence level 1 and associated likelihoods was plausible.

Given the small fleet size and selective areas to anchor it was agreed that it was Remote (L1) that anchoring would have Minor (C1) disturbance on the habitat.

The risk rating is C1 X L1 = NEGLIGIBLE RISK

## Broader environment

### Rubbish

**Objective:** To ensure the effects of fishing do not result in serious or irreversible harm to ecological processes.

**Background information:**

- Environmental Management System developed by the Northern Territory Seafood Council for the Fishery.
- The disposal of solid, non-degradable waste in Australian waters is regulated through the *Marine Pollution Act 1999 (MARPOL).*
- Most operators store rubbish on board for disposal when return to port.

**Lines of evidence:**

- Operators are aware of the public sensitivities to waste disposal and are compliant with regulations, disposing of all waste appropriately. Consistent with C1.
- There is no suggestion to indicate that the fishery is contributing to rubbish in the marine environment. Consistent with C1.

**Risk rating:**

The risk rating for rubbish in the broader environment was determined in accordance with Table 6 and 11 (see Appendices).

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 and associated likelihoods were plausible.

Based on a lack of evidence to suggest the ONLF is contributing to rubbish in the marine environment it was agreed that it was Remote (L1) that rubbish derived from ONLF operations is having Minor (C1) impact on the broad environment.

The risk rating is C1 X L1 = NEGLIGIBLE RISK

## Oil and Fuel Discharge

**Objective:** To ensure the effects of fishing do not result in serious or irreversible harm to ecological processes.

**Background information:**

- Environmental Management System developed by the Northern Territory Seafood Council for the Fishery.
- The disposal of solid, non-degradable waste in Australian waters is regulated through the *Marine Pollution Act 1999 (MARPOL).*
- Vessels operating out of Darwin have shorter trips as vessels operating in the Gulf of Carpentaria have longer trips.
- Potential for oil and fuel discharge into the water column through emissions on extended trips (>10 days), however the quantity is very low and impacts in open ocean are unmeasurable.
- Small fishing fleet in the ONLF.

**Lines of evidence:**

- Fishers practice safe and appropriate handling and storage of chemicals and fuels at sea. Consistent with C1.
- Fishers follow safe fuelling procedures when refuelling and maintain a spill kit for emergency situations. Consistent with C1.

**Risk rating:**

The risk rating for oil and fuel discharge in the broader environment was determined in accordance with Table 6 and 11 (see Appendices).

As there were no lines of evidence that were consistent with C2, C3 or C4 it was agreed that only Consequence level 1 and associated likelihoods was plausible.

Given the small fleet size in the ONLF and lack of evidence to suggest the fishery is responsible for oil and fuel discharge in the marine environment, it was agreed that it was Remote (L1) that the discharge of oil and fuel would have a Minor (C1) impact on the broader environment.

The risk rating is C1 X L1 = NEGLIGIBLE RISK

# 12. Appendices

## 12.1. Likelihood and consequence definitions

Table 6. Likelihood definitions.

| Level | Score | Definition |
|---|---|---|
| Remote | 1 | Never heard of in these circumstances but still plausible within the timeframe (<5% probability) |
| Unlikely | 2 | Not expected to occur in the timeframe but it has been known to occur elsewhere under special circumstances (5- <20% probability) |
| Possible | 3 | Clear evidence to suggest this is possible in some circumstances within the timeframe (20- <50% probability) |
| Likely | 4 | Expected to occur in the timeframe (≥50% probability) |

Table 7. Consequence definitions for primary species.

| Level | Score | Definition |
|---|---|---|
| Minor | 1 | Measurable but minor levels of depletion of fish stock (remain above target reference point in the ONLF Harvest Strategy) |
| Moderate | 2 | Maximum acceptable level of depletion of stock (remain between target and trigger reference point in the ONLF Harvest Strategy) |
| High | 3 | Level of depletion of stock unacceptable but still not affecting recruitment level of the stock (remain between trigger and limit reference point in the ONLF Harvest Strategy) |
| Major | 4 | Level of depletion of stock are already affecting (or will definitely affect) future recruitment potential of the stock (are below limit reference point in the ONLF Harvest Strategy) |

Table 8. Consequence definitions for secondary, tertiary and bycatch species.

| Level | Score | Definition |
|---|---|---|
| Minor | 1 | Measurable but minor levels of depletion of fish stock (LOW risk in SAFE/PSA assessment) |
| Moderate | 2 | Maximum acceptable level of depletion of stock (MEDIUM risk in SAFE/PSA assessment) or species have high vulnerability and low resilience to harvest (LOW risk in SAFE/PSA assessment) |
| High | 3 | Level of depletion of stock unacceptable but still not affecting recruitment level of the stock (MEDIUM risk in SAFE/PSA assessment) |
| Major | 4 | Level of depletion of stock are already affecting (or will definitely affect) future recruitment potential of the stock (HIGH risk in SAFE/PSA assessment) |

Table 9. Consequence definitions for other managed species.

| Level | Score | Definition |
|---|---|---|
| Minor | 1 | Measurable but minor levels of depletions of fish stock (biomass above 60% of unfished levels) |
| Moderate | 2 | Maximum acceptable level of depletion of stock (biomass 40-60% of unfished levels) |
| High | 3 | Level of depletion of stock unacceptable but still not affecting recruitment level of the stock (biomass 20-40% of unfished levels) |
| Major | 4 | Level of depletion of stock are already affecting (or will definitely affect) future recruitment potential of the stock (biomass <20% of unfished levels) |

Table 10. Consequence definitions for threatened, protected and endangered species.

| Level | Score | Definition |
|---|---|---|
| Minor | 1 | Some level of interaction may occur but either no clear negative impacts or extremely few mortalities generated at the time scale of years and no measureable effect on local recovery time. |
| Moderate | 2 | Some individuals directly impacted in most years, although no effect on local dynamics or overall stock level and would not significantly affect stock level recovery. |
| High | 3 | The impact on threatened species would start to measurably affect local but not stock level recovery. |
| Major | 4 | The impact is well above the level that may be having significant additional impacts on their already threatened status demonstrably affecting their recovery |

Table 11. Consequence definitions of habitat impacts

| Level | Score | Definition |
|---|---|---|
| Minor | 1 | There are measurable impacts in localised areas (<5% of habitat impacted) |
| Moderate | 2 | Levels of impact are measurable at larger scales (5-20% of habitat impacted) |
| High | 3 | The area impacted is sufficient that loss of habitat function is possible (20-50% of habitat impacted) |
| Major | 4 | Levels of impact are causing loss of habitat function and there is a risk of the entire habitat being impacted/ removed (>50% of habitat impacted) |

Table 12. Consequence definitions for ecosystem structure and broader environment

| Level | Score | Definition |
|---|---|---|
| Minor | 1 | Measurable but minor change in the environment or ecosystem structure but no measurable change to function |
| Moderate | 2 | Maximum acceptable level of change in the environment / ecosystem structure with no material change in function |

| | | |
|---|---|---|
| High | 3 | Ecosystem function altered to an unacceptable level with some function or major components now missing and/or new species are prevalent |
| Major | 4 | Long-term, significant impact with an extreme change to both ecosystem structure and function; different dynamics now occur with different species / groups now the major targets of capture or surveys |

## 12.2. Assessment information

### 12.2.1. Description of common assessments

**SAFS (Status of Australian Fish Stocks)**

The Status of Australian Fish Stock Reports (SAFS) assess the biological sustainability of a broad range of wild-caught fish stocks against a nationally agreed framework. The reports examine whether the abundance of fish and the level of harvest from the stock are sustainable.

SAFS spans across all jurisdictions to provide a consistent reporting framework and comparable results across Australia. Previously, each state, territory and Commonwealth would use a variety of approaches to carry out their own assessment. The lack of consistency across jurisdictions made comparisons of fish stock health difficult, and stocks that either straddled state borders, or were captured in both state and Commonwealth-managed fisheries proved challenging to manage.

**SAFE (Sustainability Assessment for Fishing Effects)**

A Sustainability Assessment for Fishing Effects (SAFE) are conducted for species that not assessed using traditional stock assessments, often due to the paucity of data available for that species. SAFE analysis is a quantitative approach which derives estimates of natural mortality rates based on life history parameters, and estimates of fishing mortality, accounting for species' spatial distribution within the fishery, susceptibility to fishing gear and the proportion of the distribution that was fished in the previous year. The output from the SAFE assessment provides a risk rating to species as to whether the risk of overfishing is LOW, MEDIUM or HIGH.  All mortality estimates resulted in a 'LOW' SAFE risk for species listed in the table below.

Table 13. Species that have SAFE assessments that are caught in the ONLF.

| Common name | Scientific name |
|---|---|
| Black Pomfret | *Parastromateus niger* |
| Blacktip Reef Shark | *Carcharhinus melanopterus* |
| Blue Threadfin | *Eleutheronema tetradactylum* |
| Bull Shark | *Carcharhinus leucas* |
| Cobia | *Rachycentron canadus* |
| Creek Whaler | *Carcharhinus fitzroyensis* |
| Dusky Shark | *Carcharhinus obscurus* |
| Dwarf Sawfish | *Pristis clavata* |
| Fossil Shark | *Hemipristis elongata* |
| Giant Manta Ray | *Mobula birostris* |
| Giant Trevally | *Caranx ignobilis* |
| Golden Trevally | *Gnathanodon speciosus* |
| Great Hammerhead | *Sphyrna mokarran* |

| | |
|---|---|
| Green Sawfish | *Pristis zijsron* |
| Grey Reef Shark | *Carcharhinus amblyrhynchos* |
| Largetooth Sawfish | *Pristis pristis* |
| Lemon Shark | *Negaprion acutidens* |
| Longtail Tuna | *Thunnus tonggol* |
| Mackerel Tuna | *Euthynnus affinis* |
| Milk Shark | *Rhizoprionodon acutus* |
| Narrow Sawfish | *Anoxypristis cuspidata* |
| Pigeye Shark | *Carcharhinus amboinensis* |
| Queenfish | *Scomberoides commersonnianus* |
| Sailfish | *Istiophorus platypterus* |
| Scalloped Hammerhead | *Sphyrna lewini* |
| Shortfin Batfish | *Zabidius novemaculeatus* |
| Spinner Shark | *Carcharhinus brevipinna* |
| Spotted Mackerel | *Scomberomorus munroi* |
| Tawny Shark | *Nebrius ferrugineus* |
| Tiger Shark | *Galeocerdo cuvier* |
| Whitecheek shark | *Carcharhinus dussumieri* |
| Winghead Shark | *Eusphyra blochii* |

**Shark Report Card**

It is important that there is a broad understanding of the status of sharks and rays to make sure that environmental managers, policy makers, advocacy groups and the public can act to address any concerns. The Shark Report Card for Australia's Sharks is designed to fulfil this purpose. It compiles the outcomes of the assessments into summary report cards to provide a snapshot of the health of Australia's stocks (available online at https://www.fish.gov.au/shark-and-ray-reports).

**NDF (Non-Detriment Findings)**

Ensuring trade lies within sustainable limits is at the core of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). According to the Convention, Parties shall allow trade in specimens of species including in Appendix II, or non-commercial trade in species included in Appendix I, only if the Scientific Authority of the State of export has advised that 'such export will not be detrimental to the survival to the species' (Article IV.2(a)). Non-Detriment Findings (NDFs) are intended to ensure that exports of products from CITES listed species will not be detrimental to the survival of that species, i.e. the harvest and trade is sustainable.

### 12.2.2. Assessment information for retained species

#### Grey Mackerel (*Scomberomorus semifasciatus*)

| Grey Mackerel assessment information | |
|---|---|
| **Management controls** | Total allowable commercial catch:<br>• Western Grey Mackerel Management Zone - 404,000 kg<br>• Eastern Grey Mackerel Management Zone - 131,000 kg. |

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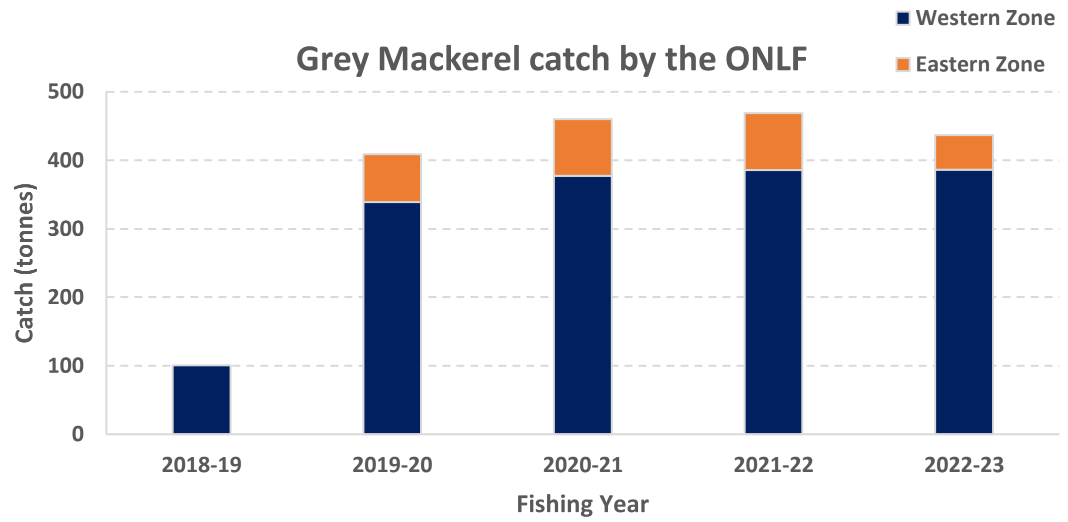
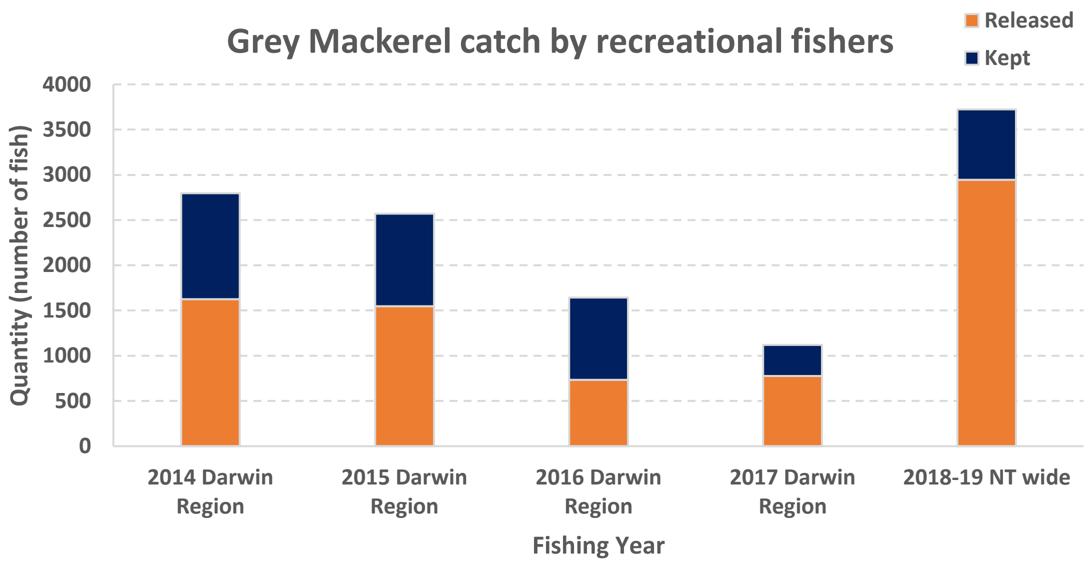
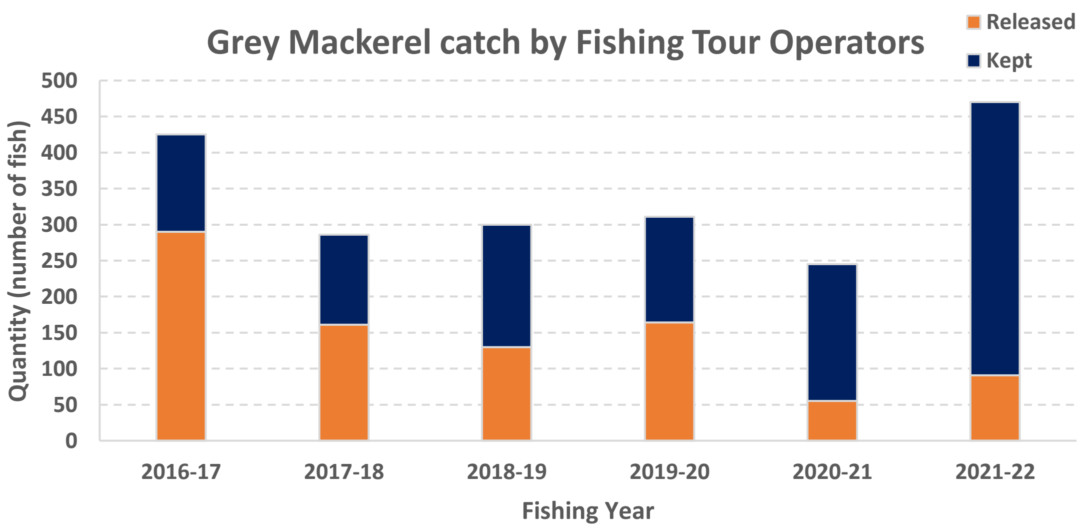
| | Spatial restrictions on the use of pelagic net (from 2nm seaward) and pelagic longline (3nm seaward).<br>Pelagic net gear restrictions: mesh size between 160mm and 185mm; and a drop of not more than 100 meshes.<br>Total length of all pelagic and demersal long lines is not more than 15nm.<br>A maximum of 1000 snoods on a vessel.<br>No auto-baiting devices on a vessel.<br>Spatial closures (Reef Fish Protection Areas, Artificial Reefs, Mary River Fish Management Zone). |
| **Distribution** | Grey Mackerel (*Scomberomorus semifasciatus*) have a restricted distribution and are confined to the waters of southern Papua New Guinea and around northern Australia from the Houtman Abrolhos Islands are on the west coast and to Northern NSW on the east coast. Adult Grey Mackerel are known to commonly occur in turbid tropical and subtropical waters at approximately 3-30m depth. This is usually in the vicinity of bottom structure in close proximity to headlands and reefs and on sandy mud and muddy sand substrates |
| **Growth and reproduction** | Grey Mackerel grow rapidly, attaining a maximum size of 10kg and 120cm fork length (FL). Male and female fish attain sexual maturity at 55-60cm and 65-70cm FL respectively at approximately two years of age. Grey Mackerel are highly fecund (producing approximately 250,000 oocytes per spawning). |
| **Stock structure** | Grey Mackerel are found in southern Papua New Guinea and northern Australia from Shark Bay, Western Australia, to northern New South Wales. At least five Grey Mackerel stocks have been identified for management purposes across northern Australia as determined by otolith stable isotopes chemistry and parasite abundance: Western Australia, North West Northern Territory, Gulf of Carpentaria, East Coast North and East Coast South. Four of these stocks have been confirmed as genetically distinct biological stocks: Western Australia, North West Northern Territory, Gulf of Carpentaria and the East Coast of Queensland. Research suggests that a sixth stock potentially occurs in the north-east Gulf of Carpentaria (Welch et al. 2009; Charters et al. 2010; Newman et al. 2010; Broderick et al. 2011; Welch et al. 2015]. However, the presence of this stock has yet to be confirmed; therefore, it was not included in the assessment. |
| **Vulnerability** | Although the species fast growing and highly fecund (high production of spawn), they form aggregations which are predicate enough both spatially and temporally to be targeted. During spawning grey mackerel often schools together which means they can be easily targets by net fishing. |
| **Stock status** | *North West Northern Territory* (Western Zone)<br>The most recent 2023 SAFS assessment of the North West Northern Territory stock of Grey Mackerel using data to 2021 estimates that the biomass in 2021 was 74% of the unfished level and that the harvest rate was 54% of that required to achieve MSY (Northern Territory Government unpublished). The stock is not considered to be recruitment overfished and the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired. Consequently, the North West Northern Territory biological stock is classified as a sustainable stock.<br><br>*Gulf of Carpentaria (*Eastern Zone)<br>Grey Mackerel in the Gulf of Carpentaria (GoC) is primarily a commercial gillnet-caught species. Queensland and the NT share the management of the GoC biological stock through the individual jurisdictions management arrangements. Queensland took most of the commercial harvest (61 per cent) in 2017. There has been a rising trend in the commercial catch since targeted fishing for Grey Mackerel began in the GoC in the late 1990s. Queensland catches and catch rates reached record levels in 2010 and 2012, |

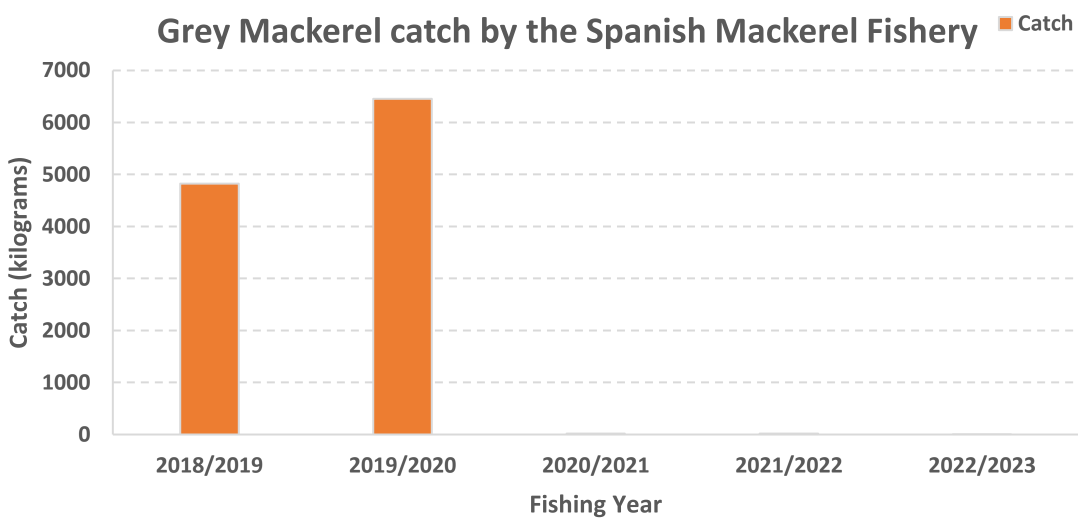
| | |
|---|---|
| | respectively. Although Queensland's catch rate has fluctuated over time. The most recent assessment (stock reduction analysis) estimated that the GoC biomass in 2011 (896 t) was 74 per cent of the unfished biomass (Grubert et al. 2013) and stock is not considered recruitment overfished. The GoC catch in 2017 (586 t) was below 2011 levels and therefore the stock is not considered recruitment overfished. Stock reduction analysis of Grey Mackerel in the GoC, using Queensland and NT catches, also concluded that the harvest rate was at 26 per cent of that required to achieve MSY (Grubert et al. 2013). Queensland introduced changes to the net fishery at the start of the 2012 season to reduce pressure on Grey Mackerel. These measures decreased the total length of available net by two-thirds, from 27km to 9km in the offshore component of the Fishery. Changes made for the Queensland inshore fishery (within 7 nautical miles of the coast) also reduced the capacity for boats to target Grey Mackerel. Commercial effort in 2017 (1,322 days fished) was above the 10-year average (1,104 days fished from 2007 to 2016).<br>Grey Mackerel in the Gulf of Carpentaria (GoC) is primarily a commercial gillnet-caught species. Queensland and the Northern Territory share management of the Gulf of Carpentaria biological stock through the Queensland Fisheries Joint Authority. Queensland took the majority (91 per cent; 741 tonnes) of the commercial harvest in 2019. The most recent stock assessment for Grey Mackerel catch in the Gulf of Carpentaria was conducted in 2019 using the Stock Reduction Analysis method. Estimated biomass of Grey Mackerel was 55% of unfished biomass in 2019 and the harvest rate was at 57% of that required to achieve MSY. This stock assessment should be interpreted with some caution as there were concerns that some of the catch per unit effort string was not an accurate indicator of abundance.<br>Grey Mackerel catch in the Gulf of Carpentaria (Queensland and Northern Territory data) was subject to a catch-MSY model-assisted catch-only assessment based on catch data to 2021 (Martell and Froese 2013). The analysis detected a declining trend in regional Grey Mackerel biomass, however the model also indicated that biomass levels were more than likely above the limit reference point in 2021 (Northern Territory Government, unpublished). The analysis also suggests fishing mortality is more likely to be below the limit reference point, although mortality was estimated to show an increasing trend [Northern Territory Government, unpublished]. This indicates that the current level of fishing is unlikely to cause the stock to become recruitment impaired in the short-term. However, the assessment estimated that recent harvests have exceeded F MSY and are beyond that which would be considered sustainable in the long term. The notable caveat being that catch-MSY modelling has a higher degree of uncertainty and should not be solely relied on to make inferences about long-term biomass trends. The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired. On the basis of the evidence provided above, the GoC biological stock is classified as a sustainable stock. |
| **Fishing activity** | |




*Grey Mackerel catch by recreational fishers is based from Recreational fishing surveys from 2014 to 2019.






The annual harvest (numbers) of mackerel species taken by Indigenous fishers in the Northern Territory were estimated to be 1,416 in the 2000-01 National Indigenous Fishing Survey (Henry & Lyle 2003).

## Blacktip sharks (*Carcharhinus limbatus* and *Carcharhinus tilstoni*)

| Blacktip sharks assessment information | |
|---|---|
| **Management controls** | Total allowable commercial catch of combined Blacktip Shark of 434.694 tonnes.<br>Spatial restrictions on the use of pelagic net (from 2nm seaward) and pelagic longline (3nm seaward).<br>Pelagic net gear restrictions: mesh size between 160mm and 185mm; and a drop of not more than 100 meshes.<br>Total length of all pelagic and demersal long lines is not more than 15nm.<br>A maximum of 1000 snoods on a vessel.<br>No auto-baiting devices on a vessel.<br>Spatial closures (Reef Fish Protection Areas, Artificial Reefs, Mary River Fish Management Zone). |
| **Distribution** | The Common Blacktip Shark (*Carcharhinus limbatus*) and the Australian Blacktip Shark (*C. tilstoni*) are members of the family Carcharhinidae and are collectively known as 'Blacktip sharks' due to their physical similarities (Grubert et al. 2013).<br>The Australian Blacktip Shark inhabits the continental shelf from the Thevenard Island in Western Australia to Sydney in NSW. Within its range it co–occurs with the Common Blacktip Shark, which is found globally in tropical and warm temperate areas. Common Blacktip Shark has been reported from the intertidal zone to a depth of 150m with larger sharks occurring in deeper water. Though it occupies the entire water column it is most common close to the surface or in the midwater. |
| **Growth and reproduction** | Primarily *piscivorous*, the Australian Blacktip Shark forms large groups of similar size and sex that tend to remain within a local area. It exhibits viviparity (unborn young are provided for through a placental connection). There is a well-defined annual reproductive cycle with mating occurring in February and March, females bear one to six pups around January of the following year, after a 10 month gestation period. |
| **Stock structure** | Australian Blacktip Shark are found only in Australia and the Indo West Pacific, while the Common Blacktip Shark is globally distributed in tropical to warm temperate waters. In |

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|---|---|
| | Australian waters, genetic studies have identified two biological stocks of Australian Blacktip Shark, a Western stock extending from the Western Northern Territory into Northern Western Australia and an Eastern stick extending from the Gulf of Carpentaria to the East coast of QLD and NSW. There are three biological stocks of Common Blacktip Shark. One across WA and the NT, another in Gulf of Carpentaria, and one across the East coast of QLD and NSW. There is a single biological stock of *C. sorrah* across northern Australia (Ovenden et al. 2007). Stock boundaries between the western biological stocks of *C.tilstoni* and *C.limbatus* and those in the gulf are uncertain. |
| **Vulnerability** | Have an inherent vulnerability to fishing due to their life history, which is generally less productive than some bony fish or invertebrates. |
| **Stock status** | *North Western Australia stocks*<br><br>The North and West Coast biological stock straddles two jurisdictions: The Northern Territory, west of the Wessel Islands–Western Australian border; and Western Australia. In 2011, a stock assessment was undertaken for this biological stock utilising stock reduction analysis models, which rely on catch per unit effort data. The results from these models at the time estimated that the harvest rates for all species within the complex were less than 20 per cent of that required to reach MSY and current pup production was approximately 80 per cent of unfished levels (Grubert et al. 2013). Results from a mark-recapture study done for all species of Blacktip Shark in Northern Territory waters supports the stock assessment results (Bradshaw et al. 2013). Catches for this Blacktip Shark stock peaked in 2012 but have subsequently decreased to relatively low levels. This decrease in catch was predominately market driven due to a drop in market prices for shark fin and a shift in fishing practises to greater targeting of Grey Mackerel. Although there is uncertainty regarding species composition and the magnitude of historical catches of Blacktip Sharks from Western Australia, these species have not been harvested in this jurisdiction since April 2009 (Molony et al. 2013), allowing the biomass to increase. The most recent assessment (Grubert et al. 2013) estimated that biomass in 2011 was 80 per cent of the unfished 1970 level. As current catches are well below those recorded in 2011, when the catches were assessed as sustainable, it is unlikely that current catches are having a reductive impact on the stock. The stock is not considered to be recruitment impaired and the current level of fishing is unlikely to cause the stock to become recruitment impaired. On the basis of the evidence provided above, the North and West Coast multispecies biological stock is classified as a sustainable stock.<br><br>*Gulf of Carpentaria stocks*<br><br>The Queensland Department of Agriculture and Fisheries commissioned a scientific assessment of shark stocks which provided MSY per annum estimates for *C. tilstoni* and *C. sorrah* in the GoC. This assessment produced qualified MSY estimates of 95 t for *C. tilstoni* and 29.4 t for *C. sorrah* (Leigh GM 2015). The QLD report also, however, acknowledged a number of data limitations for Queensland Fisheries, particularly with respect to accuracy of species identifications and the quantity and reliability of available catch data.<br><br>In 2017, 103 t of *C. tilstoni* and 9 t of *C. sorrah* were reported from the GoC Inshore Finfish Fishery (GOCIFFF); catches that were above and below the respective MSY estimates. Species-specific data for the fishery showed that over the past 10 years the annual catches of *C. sorrah* (9–34 t) exceeded the MSY estimate twice, while catch of *C. tilstoni* (54–160 t) exceeded MSY seven times over the same period. An estimated 38–125 t was reported from the GOCIFFF each year for the period 2007–17 under the 'Blacktip Whaler Shark' catch category that includes Graceful Sharks (*C. amblyrhynchoides*). At present, catch reported in the 'Blacktip Whaler Shark' category cannot be differentiated into individual species. |

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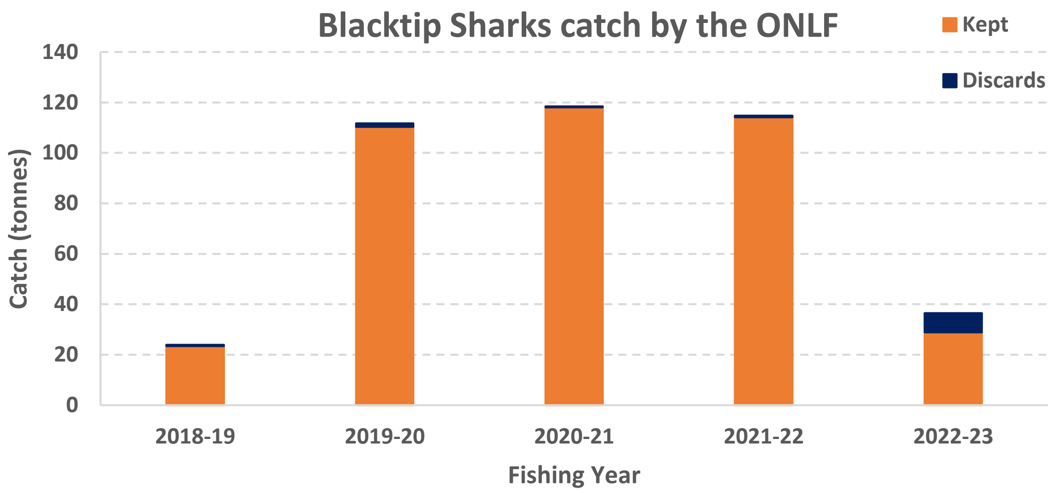
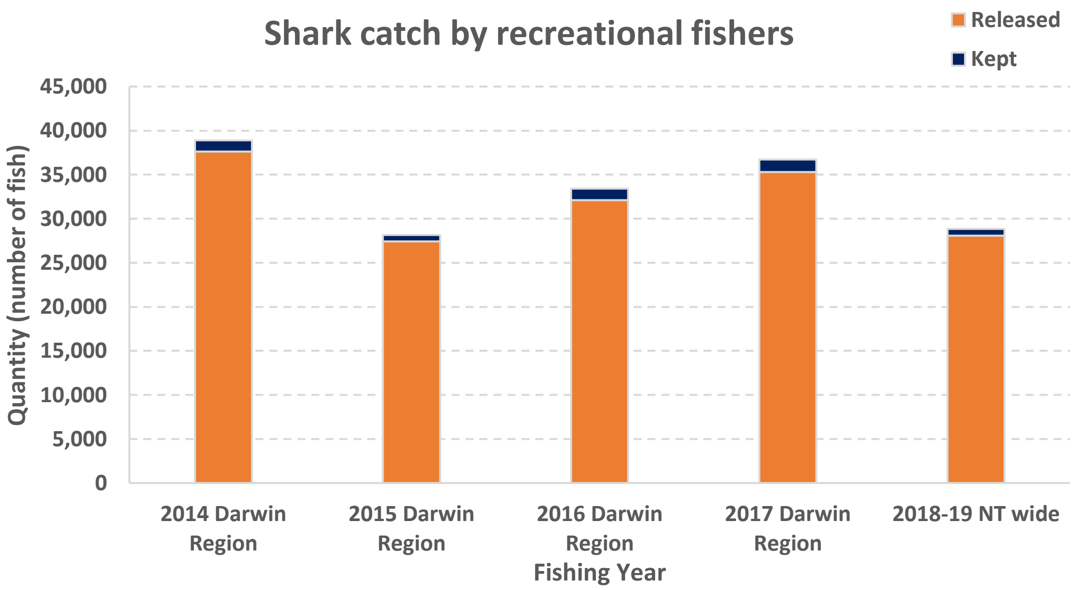
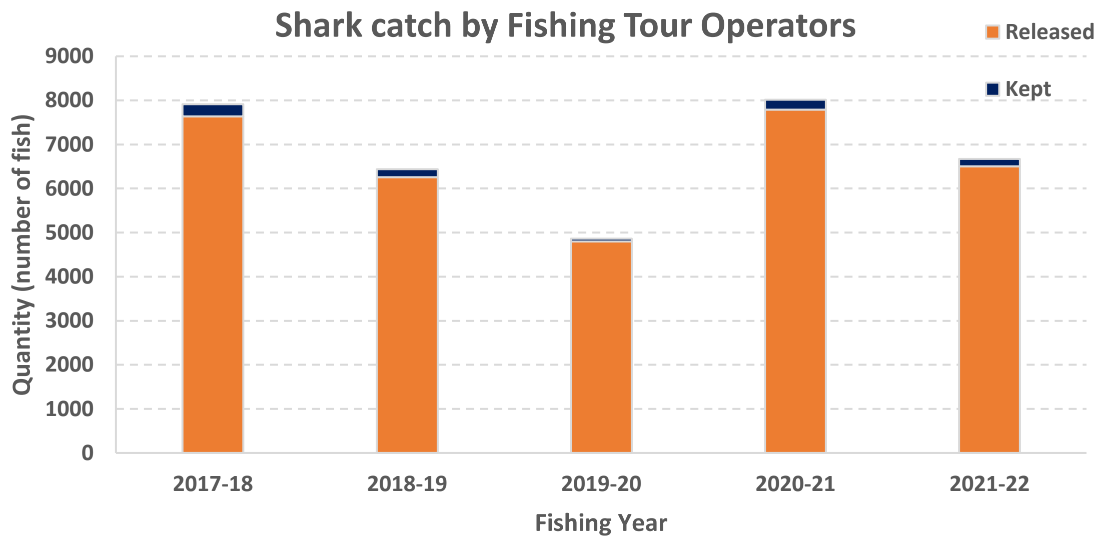
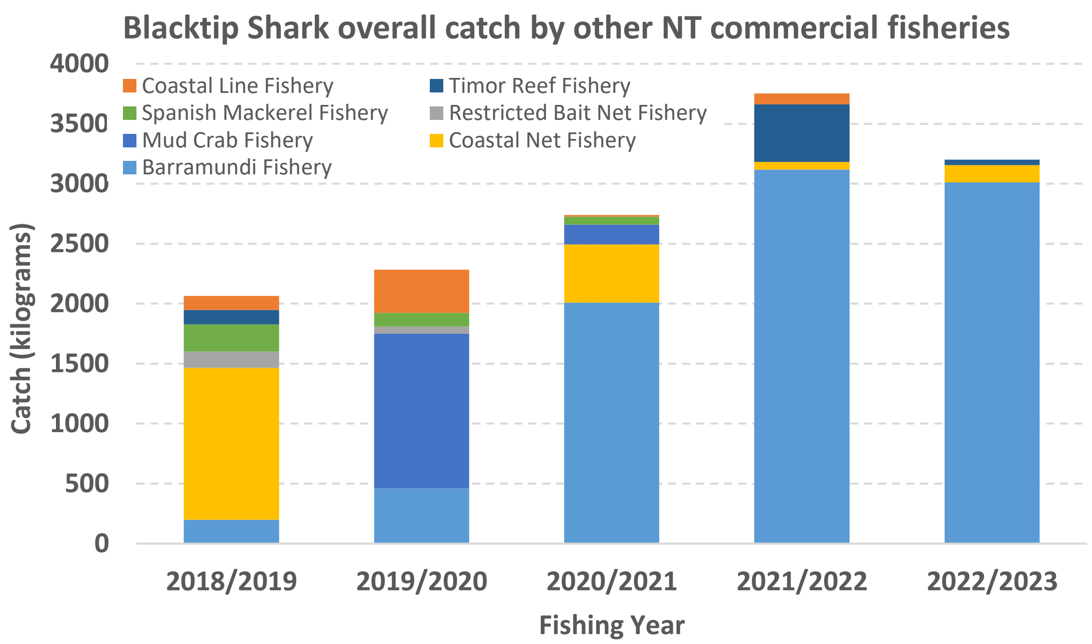
| | The inability to assign more multispecies catch records to Blacktip Shark species makes it difficult to identify catch and effort trends for this species complex. Consequently, current catch levels and their impact on the biological stock are unknown, and there is insufficient information to confidently classify the status of this stock. This situation is expected to improve through time with the introduction of a new Shark and Ray logbook into the GoC on 1 January 2018, which limits the 'Blacktip Whaler' category to *C.*<br><br>Expert advice found the current management arrangements in place in Australian-managed fisheries (including the ONLF) mostly meet the requirements of a positive NDF. All sharks species assessed had a positive NDF outcomes, with the exception of Winghead shark and hammerhead sharks species, which had positive NDF outcomes with conditions. |
| **Fishing activity** |     |




## Spot-tail Shark (*Carcharhinus sorrah*)

| Spot-tail Shark assessment information | |
|---|---|
| **Management controls** | Total allowable commercial catch of 121.446 tonnes.<br>Spatial restrictions on the use of pelagic net (from 2nm seaward) and pelagic longline (3nm seaward).<br>Pelagic net gear restrictions: mesh size between 160mm and 185mm; and a drop of not more than 100 meshes.<br>Total length of all pelagic and demersal long lines is not more than 15nm.<br>A maximum of 1000 snoods on a vessel.<br>No auto-baiting devices on a vessel. |

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| | Spatial closures (Reef Fish Protection Areas, Artificial Reefs, Mary River Fish Management Zone). |
| **Distribution** | The Spot-tail shark is found in the tropical Indo-Pacific on continental and insular shelves commonly to a depth of about 73m but possibly as deep as 140 metres. Its range extends from the East African coast, Madagascar and the Red Sea to India, Malaysia, China, the Philippines and Northern Australia. |
| **Growth and reproduction** | The Spot-tail Shark is viviparous with a yolk sac placenta, giving birth once a year to a litter of one to eight live young. The gestation period is 10 months and the pups measure about 50cm at birth. The young develop in shallow inshore waters. They grow rapidly at first, increasing in length by about 20cm during their first year but growth slows down thereafter. Females reach sexual maturity at two to three years and live for a maximum of seven years while males live up to five years. |
| **Stock structure** | Spot-Tail Shark (*Carcharhinus sorrah)* are medium-sized Whalers that are common over open areas on the shallow continental and insular shelves in northern Australian and Indo-West Pacific waters (Last and Stevens 2009; Kyne et al. 2021). Spot-Tail Shark form discrete populations across deep water boundaries, with the Australian population thought to be distinct (Giles et al. 2014; Naylor et al. 2012). While stock differentiation between Australia and other regions is well established, population structure within Australia is less clear. Genetic studies have found low to no genetic structuring within Australian waters (Giles et al. 2014; Laverly and Shaklee 1989; Ovenden et al. 2007) and tag release research has shown that Spot-Tail Shark display movements that would provide sufficient gene flow to prevent genetic stock differentiation (Stevens et al. 2000). |
| **Vulnerability** | Have an inherent vulnerability to fishing pressure due to their life history, which is generally less productive than some bony fish or invertebrates. |
| **Stock status** | Assessment of the stock status for Spot-Tail Shark is presented at the biological stock level—Northern Australia. The Northern Australian biological stock straddles three jurisdictions: Western Australia, The Northern Territory and Queensland.<br><br>Spot-Tail Sharks are relatively easily distinguished from other blacktip shark species and have been recorded to species level in Northern Territory commercial logbooks since 2000. In the Northern Territory, Spot-Tail Shark is primarily taken in the Offshore Net and Line Fishery (ONLF) under a species-specific total allowable catch limit, which is managed through an individual transferable quota system. Northern Territory commercial catches from this stock have declined to relatively low levels, averaging 20 t a year since 2013, compared to an annual average of 110 t for the 10 years preceding 2013. This decrease in catch was largely driven by changing operational practises in the ONLF (Northern Territory Government 2017).<br><br>A stock assessment was undertaken for the Northern Australian biological stock utilising a stochastic Stock Reduction Analysis (SRA) model using data to 2021. Standardised Catch Per Unit Effort (CPUE) from the pelagic gillnet component of the ONLF was used as the abundance indicator for this assessment. The assessment estimated that biomass in 2021 was 89% of the unfished levels and that fishing mortality was 7% of that required to reach maximum sustainable yield [Northern Territory Government, unpublished]. The results of this assessment are consistent with mark-recapture studies undertaken on all species of blacktip shark in Northern Territory waters [Bradshaw et al. 2013], a previous assessment undertaken for the Northern Territory and West Australian portion of this stock (Grubert et al. 2013) and an assessment that demonstrates that Spot-Tail Shark are being fished within sustainable limits on the east coast of Australia (Leigh 2015). The above evidence indicates that the biomass of this stock is not recruitment impaired and the current level of fishing will not cause the stock |

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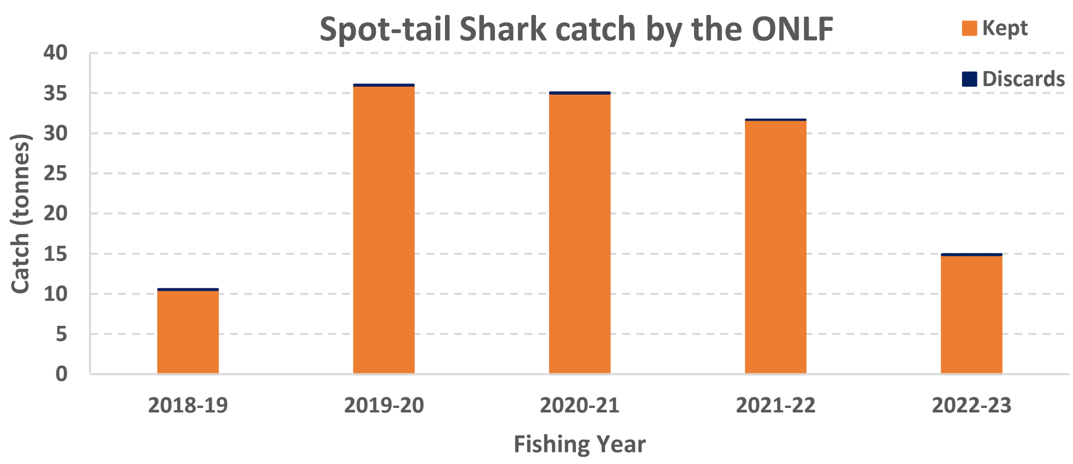
| | to become recruitment impaired. On the basis of the evidence provided above, the Northern Australian biological stock is classified as a sustainable stock.<br><br>Expert advice found the current management arrangements in place in Australian-managed fisheries (including the ONLF) mostly meet the requirements of a positive NDF. All sharks species assessed had a positive NDF outcomes, with the exception of Winghead shark and hammerhead sharks  species, which had positive NDF outcomes with conditions. |
| **Fishing activity** |  |



## Pigeye Shark (*Carcharhinus amboinensis*)

| Pigeve Shark assessment information | |
|---|---|
| **Management controls** | Total allowable commercial catch - combined shark group of 246.441 tonnes.<br>Spatial restrictions on the use of pelagic net (from 2nm seaward) and pelagic longline (3nm seaward).<br>Pelagic net gear restrictions: mesh size between 160mm and 185mm; and a drop of not more than 100 meshes.<br>Total length of all pelagic and demersal long lines is not more than 15nm.<br>A maximum of 1000 snoods on a vessel.<br>No auto-baiting devices on a vessel.<br>Spatial closures (Reef Fish Protection Areas, Artificial Reefs, Mary River Fish Management Zone). |
| **Distribution** | The Pigeye Shark is common to coastal waters in tropical and subtropical Indo-west Pacific and Eastern Atlantic (Last and Stevens 2009). In Australia it is found in northern waters from Carnarvon in the west to Moreton Bay in the east. |
| **Growth and reproduction** | Pigeye Shark reach a maximum size of 280cm. Female Pigeye Sharks mature at 13 years and live for more than 30 years, with males maturing at 12 years and living more than 26 years (Tillett et al. 2011). Pigeye Sharks are viviparous, with litters of 6 to 13 pups that are born at 60-65cm long (Last and Stevens 2009). Young sharks spend their first few year in sheltered in shore habitats (Tillett et al. 2011). |
| **Stock structure** | There is evidence within Australia that sub-populations may be present (Tillett et al. 2011). However, Tillet et al. (2012) failed to discern a finer population structure using nuclear microsatellite markers. |

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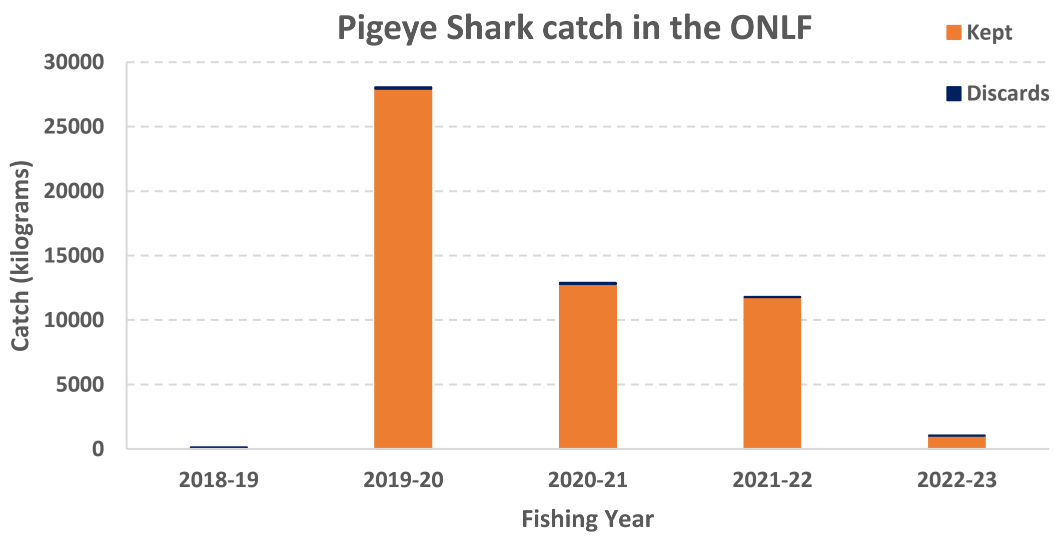
| **Vulnerability** | It is sensitive to fishing pressure due to late age at maturity and limited fecundity. |
| **Stock status** | Expert advice found the current management arrangements in place in Australian-managed fisheries (including the ONLF) mostly meet the requirements of a positive NDF. All sharks species assessed had a positive NDF outcomes, with the exception of Winghead shark and hammerhead sharks species, which had positive NDF outcomes with conditions<br><br>A Sustainability Assessment for Fishing Effects (SAFE) was conducted for Pigeye Shark in Northern Territory waters. SAFE analysis is a quantitative approach which derives estimates of natural mortality rates based on life history parameters, and estimates of fishing mortality, accounting for species' spatial distribution within the fishery, susceptibility to fishing gear and the proportion of the distribution that was fished in the previous year. All mortality estimates resulted in a 'Low' SAFE risk for Pigeye Shark. |
| **Fishing activity** |  |

### Bull Shark (*Carcharhinus leucas*)

| Bull Shark assessment information | |
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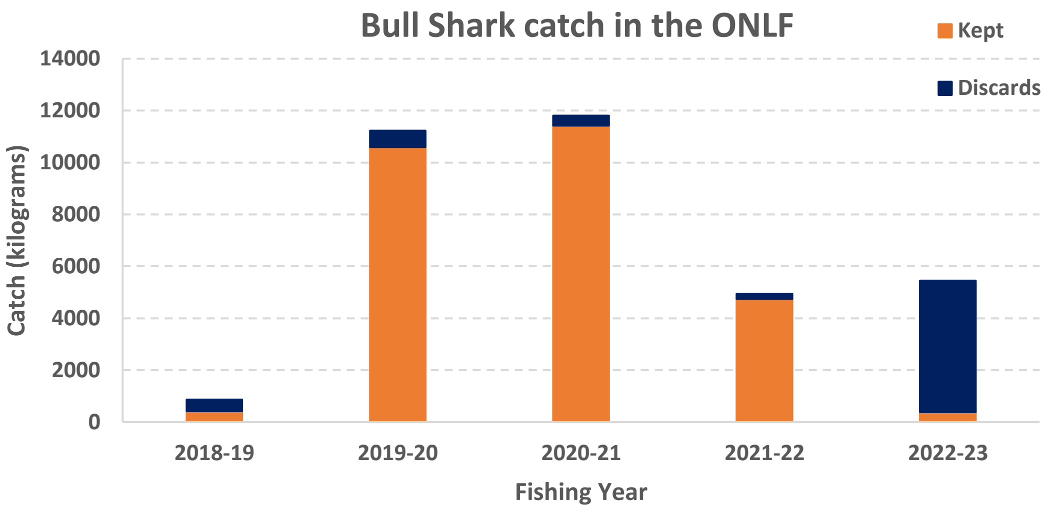
| **Management controls** | Total allowable commercial catch - combined shark group of 246.441 tonnes.<br>Spatial restrictions on the use of pelagic net (from 2nm seaward) and pelagic longline (3nm seaward).<br>Pelagic net gear restrictions: mesh size between 160mm and 185mm; and a drop of not more than 100 meshes.<br>Total length of all pelagic and demersal long lines is not more than 15nm.<br>A maximum of 1000 snoods on a vessel.<br>No auto-baiting devices on a vessel.<br>Spatial closures (Reef Fish Protection Areas, Artificial Reefs, Mary River Fish Management Zone). |
| **Distribution** | The Bull Shark is found worldwide in coastal areas of tropical and temperate waters. Bull Sharks are a euryhaline species that frequently enters rivers and lakes. In Australia they are known from Perth, Western Australia around the tropical north to Sydney in New South Wales. |
| **Growth and reproduction** | Bull Sharks are viviparous, with the young approximately 70cm at birth and litter size ranges from 1 to 13. Females usually give birth in estuaries and river mouths with the young spending time in estuarine and coastal nursery areas. Female Bull Sharks have been shown to display reproductive philopatry in Northern Australia, likely utilising the same nursey habitat across multiple breading events (Tillett et al. 2012). Bull Sharks in the Northern Territory are thought to mature at 9.5 years and live for more than 27 years (Tillett et al. 2011). Length at maturity for bull sharks is 204cm for females and 190-200cm for males (Cruz-Martínez et al. 2004). |
| **Stock structure** | There is currently little information on population size, structure or trend for Bull Sharks in the Northern Territory. |
| **Vulnerability** | The use of coastal areas as nursey habitat make Bull Sharks susceptible habit degradation. A relatively late age at maturity and limited fecundity make it susceptible to fishing pressure. |
| **Stock status** | Expert advice found the current management arrangements in place in Australian-managed fisheries (including the ONLF) mostly meet the requirements of a positive NDF. All sharks species assessed had a positive NDF outcomes, with the exception of Winghead shark and hammerhead sharks  species, which had positive NDF outcomes with conditions<br><br>A Sustainability Assessment for Fishing Effects (SAFE) was conducted for Bull Shark in Northern Territory waters. SAFE analysis is a quantitative approach which derives estimates of natural mortality rates based on life history parameters, and estimates of fishing mortality, accounting for species' spatial distribution within the fishery, susceptibility to fishing gear and the proportion of the distribution that was fished in the previous year. All mortality estimates resulted in a 'Low' SAFE risk for Bull Shark. |

**Fishing activity**



## Tiger Shark (*Galeocerdo cuvier*)

| Tiger Shark assessment information | |
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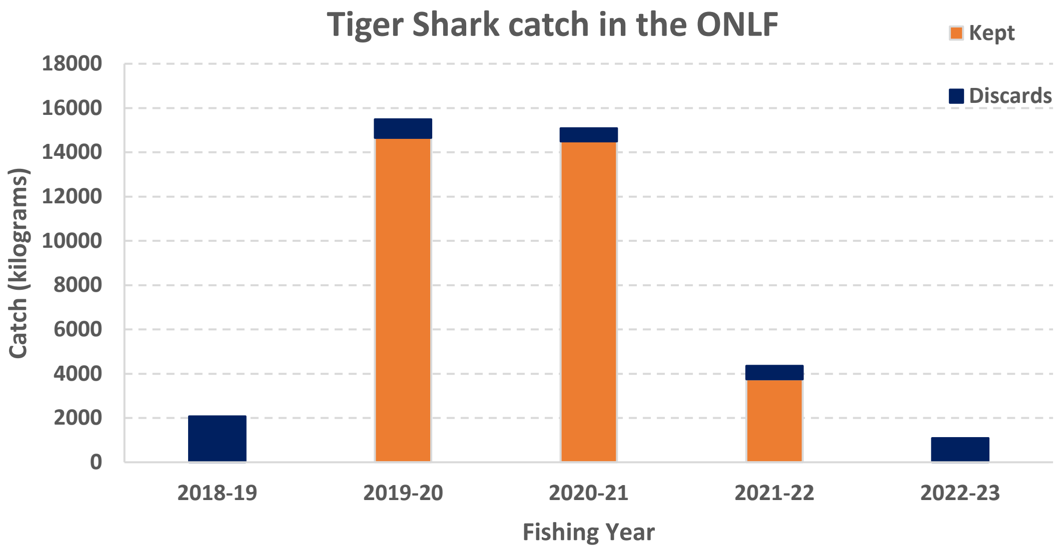
| **Management controls** | Total allowable commercial catch - combined shark group of 246.441 tonnes.<br>Spatial restrictions on the use of pelagic net (from 2nm seaward) and pelagic longline (3nm seaward).<br>Pelagic net gear restrictions: mesh size between 160mm and 185mm; and a drop of not more than 100 meshes.<br>Total length of all pelagic and demersal long lines is not more than 15nm.<br>A maximum of 1000 snoods on a vessel.<br>No auto-baiting devices on a vessel.<br>Spatial closures (Reef Fish Protection Areas, Artificial Reefs, Mary River Fish Management Zone). |
| **Distribution** | Tiger Sharks are globally distributed in tropical and temperate waters. The Australian distribution includes all northern Australia waters, extending south to Perth in the West and Bass Strait in the east. Tiger Sharks are found from close inshore to well off the continental shelf, with a depth distribution ranging from the surface to 850m. Individuals within Tiger Shark populations are thought to display varied and complex movement patterns, where some individuals undertake wide-ranging migrations, while others are restricted to more localised movement patterns with high site fidelity (Werry et al. 2014; Ferreira et al. 2015). |
| **Growth and reproduction** | Tiger Sharks are the largest shark in the family *Carcharhinidae*, reaching lengths in excess of 5m. Estimates of size and age at maturity vary greatly between studies and regions, which is unsurprising given the diverse habitat and diet preferences for this species. In Australia, L50 and A50 for Tiger Sharks has been estimated to be 297cm and between 10 and 13 years for males, and 326cm and 10 to 13 years for females (Holmes et al. 2015). Tiger Sharks are an ovoviviparous species with litter sizes of 10-82 pups, with an average litter size of 35. Gestation last from 15 to 16 months (Whitney and Crow 2007) and at birth tiger sharks are 80-90cm in length (Whitney and Crow 2007). It is thought that most, if not all females follow a triennial reproductive cycle, however it is possible that some females reproduce biennially (Whitney and Crow 2007). |
| **Stock structure** | It has been suggested that Tiger Sharks comprise a single Indo-Pacific population, which is supported by demonstrated migrations across the region by individuals (Werry et al. 2014; Ferreira et al. 2015) and an absence of genetic differentiation between the east and west coast of Australia (Holmes et al. 2017). |
| **Vulnerability** | Relatively fecund for an ovoviviparous species, with up to 80 pups in a litter. Thought to reproduce only every three years, which reduces its ability to recover from over exploitation. |
| **Stock status** | Expert advice found the current management arrangements in place in Australian-managed fisheries (including the ONLF) mostly meet the requirements of a positive NDF. All sharks species assessed had a positive NDF outcomes, with the exception of Winghead shark and hammerhead sharks species, which had positive NDF outcomes with conditions<br><br>A Sustainability Assessment for Fishing Effects (SAFE) was conducted for Tiger Shark in Northern Territory waters. SAFE analysis is a quantitative approach which derives estimates of natural mortality rates based on life history parameters, and estimates of fishing mortality, accounting for species' spatial distribution within the fishery, susceptibility to fishing gear and the proportion of the distribution that was fished in the previous year. All mortality estimates resulted in a 'Low' SAFE risk for Tiger Shark. |

**Fishing activity**



## Great Hammerhead (*Sphyrna mokarran*)

| Great Hammerhead assessment information | |
|---|---|
| **Management controls** | Total allowable commercial catch - combined shark group of 246.441 tonnes.<br>A harvest limit of 50t each for Hammerhead species (*S. lewini* and *S. mokarran*). Once 37 tonnes has been taken in a licencing year, no more than 5 Great Hammerheads are to be taken during a voyage.<br>Spatial restrictions on the use of pelagic net (from 2nm seaward) and pelagic longline (3nm seaward).<br>Pelagic net gear restrictions: mesh size between 160mm and 185mm; and a drop of not more than 100 meshes.<br>Total length of all pelagic and demersal long lines is not more than 15nm.<br>A maximum of 1000 snoods on a vessel.<br>No auto-baiting devices on a vessel.<br>Spatial closures (Reef Fish Protection Areas, Artificial Reefs, Mary River Fish Management Zone). |
| **Distribution** | The Great Hammerhead have circum-global distributions in tropical and sub-tropical waters. Great Hammerhead range extends from Sydney on the east coast around the north of the continent to Mandurah on the west coast. |
| **Growth and reproduction** | A large shark, the Great Hammerhead regularly reaches lengths greater than 4m, with extremely large individuals approaching 6m. Both female and male Great Hammerheads mature at 227cm and 8.3 years, with maximum age estimated to be 39 years (Harry et al. 2011). Great Hammerheads are viviparous producing 6-33 young of 65cm (Last and Stevens 2009), with females likely breeding biennially (Stevens and Lyle 1989). |
| **Stock structure** | Heupel et al. (2020) examined the stock structure of the Great Hammerhead and found support for limited movement of individuals over short timeframes, with mixing across the extent of their distribution over longer timeframes. Brunjes et al. (2024) used single nucleotide polymorphisms to investigate the stock structure of Great Hammerhead in Australia and concluded that Great Hammerhead most likely for a single genetic stock within Australia. However, further research is needed to determine if the Australian stock is connected to regional neighbours (Heupel et al. 2020). |
| **Vulnerability** | The high value of fins of Great Hammerheads make them an attractive target for fishers and the life history of these species renders them susceptible to overfishing. |
| **Stock status** | Expert advice found the current management arrangements in place in Australian-managed fisheries (including the ONLF) mostly meet the requirements of a positive NDF. All sharks species assessed had a positive NDF outcomes, with the exception of Winghead shark and hammerhead sharks species, which had positive NDF outcomes with conditions.<br><br>A Sustainability Assessment for Fishing Effects (SAFE) was conducted for Great Hammerhead in Northern Territory waters. SAFE analysis is a quantitative approach which derives estimates of natural mortality rates based on life history parameters, and estimates of fishing mortality, accounting for species' spatial distribution within the fishery, susceptibility to fishing gear and the proportion of the distribution that was fished in the previous year. All mortality estimates resulted in a 'Low' SAFE risk for Great Hammerhead. |

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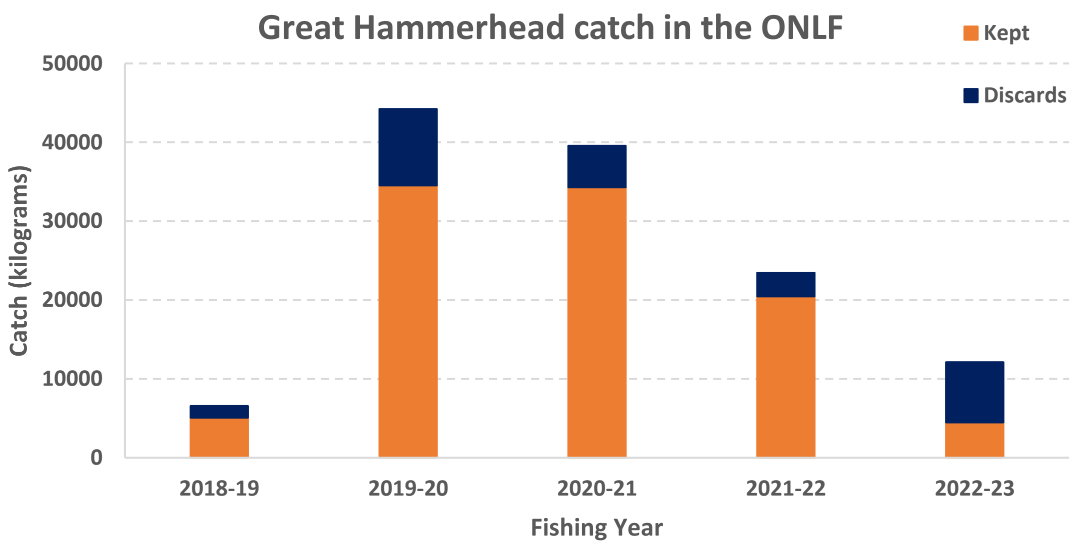
| | Shark report card assessment for Great Hammerhead lists the species as depleted. In Australia, the species is assessed as endangered (IUCN) (Kyne et al. 2021) and depleted (SAFS). |

**Fishing activity**



## Scalloped Hammerhead (*Sphyrna lewini*)

| Scalloped Hammerhead assessment information | |
|---|---|
| **Management controls** | Total allowable commercial catch - combined shark group of 246.441 tonnes.<br>A harvest limit of 50t each for Hammerhead species (S. lewini and S. mokarran). Once 37 tonnes has been taken in a licencing year, no more than 5 Scalloped Hammerheads are to be taken during a voyage.<br>Spatial restrictions on the use of pelagic net (from 2nm seaward) and pelagic longline (3nm seaward).<br>Pelagic net gear restrictions: mesh size between 160mm and 185mm; and a drop of not more than 100 meshes.<br>Total length of all pelagic and demersal long lines is not more than 15nm.<br>A maximum of 1000 snoods on a vessel.<br>No auto-baiting devices on a vessel.<br>Spatial closures (Reef Fish Protection Areas, Artificial Reefs, Mary River Fish Management Zone). |
| **Distribution** | The Scalloped Hammerheads have circum-global distributions in tropical and sub-tropical waters. In Australia, Scalloped Hammerhead extend from New South Wales around the north of the continent to Geographe Bay, WA, though it is rarely recorded south of Houtman Abrolhos islands. The Scalloped Hammerhead shows strong genetic population structuring across ocean basins as it rarely ventures into or across deep ocean waters, but ranges quite widely over shallow coastal waters. |
| **Growth and reproduction** | The age and size at maturity of Scalloped Hammerheads vary between temperate and topical waters. In tropical waters males mature at 5.7 years and 147cm and in temperate males mature at 8.9 years and 204cm (Harry et.al 2011). There are no direct estimate of the age at maturity of female hammerheads in Australian waters, however, Stevens and Lyle (1989) estimated it to be 200cm. Across northern Australia the peak pupping season spans October to January and the gestation period is 9 to 10 months (Last and Stevens 2009). |
| **Stock structure** | Recent research on the stock structure of the Scalloped Hammerhead shark identified that a western stock exists in Western Australia waters, which is separated genetically from other national and international jurisdictions (Heupel et al. 2020, Green et al. 2022). Heupel et al. (2020) also identified separate stocks comprising western stock in WA, a northern stock in the NT and Gulf of Carpentaria waters as well as eastern stock on the east coast of Australia. However, these stocks were not separated genetically from international jurisdictions to the north and it was proposed that there is likely to be limited connectivity from larger individuals along the continental shelf between the northern stock with Indonesia and the eastern stock with Papua New Guinea. |
| **Vulnerability** | The high value of fins of Scalloped Hammerheads make them an attractive target for fishers and the life history of these species renders them susceptible to overfishing. The Scalloped Hammerhead is considered to have a low potential to recover from increased mortality (Smith et.al. 1998) and recolonization of depleted areas from neighbouring regions is expected to be a slow and complex process (Simpfendorfer et al. 2019). |
| **Stock status** | Expert advice found the current management arrangements in place in Australian-managed fisheries (including the ONLF) mostly meet the requirements of a positive NDF. All sharks species assessed had a positive NDF outcomes, with the exception of Winghead shark and hammerhead sharks species, which had positive NDF outcomes with conditions. |

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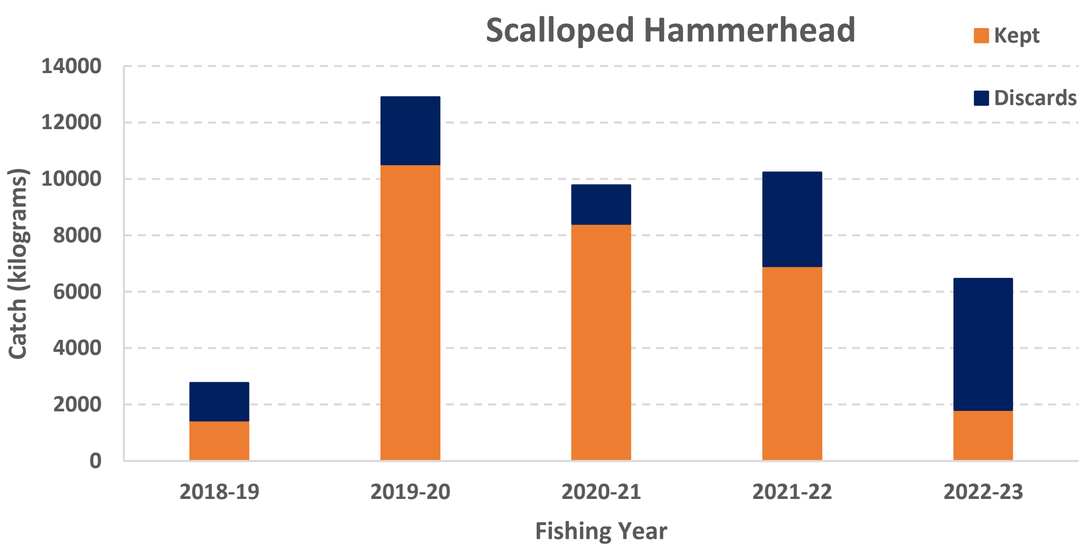
| | A Sustainability Assessment for Fishing Effects (SAFE) was conducted for Scalloped Hammerhead in NT waters. SAFE analysis is a quantitative approach which derives estimates of natural mortality rates based on life history parameters, and estimates of fishing mortality, accounting for species' spatial distribution within the fishery, susceptibility to fishing gear and the proportion of the distribution that was fished in the previous year. All mortality estimates resulted in a 'Low' SAFE risk for Scalloped Hammerhead.<br><br>The results of the most recent study (Thor Saunders *et.al* unpublished) found that all Australian stocks of *S. lewini* are likely to be above conventional fishery target reference points (60 percent unfished levels). |
| **Fishing activity** |  |

## Winghead shark (*Eusphyra blochii*)

| Winghead Shark assessment information | |
|---|---|
| **Management controls** | Total allowable commercial catch - combined shark group of 246.441 tonnes.<br>Spatial restrictions on the use of pelagic net (from 2nm seaward) and pelagic longline (3nm seaward).<br>Pelagic net gear restrictions: mesh size between 160mm and 185mm; and a drop of not more than 100 meshes.<br>Total length of all pelagic and demersal long lines is not more than 15nm.<br>A maximum of 1000 snoods on a vessel.<br>No auto-baiting devices on a vessel.<br>Spatial closures (Reef Fish Protection Areas, Artificial Reefs, Mary River Fish Management Zone). |
| **Distribution** | The Winghead Shark occurs in tropical regions from the Arabian Gulf through southeast Asia and Papua New Guinea. In Australia, it occurs in northern waters from Ingham (Queensland) to Monte Bello Islands (Western Australia) (Last and Stevens 2009).<br>One tag recapture has been confirmed from northern Australia with this individual re-caught within 21 km of the original capture location after 12 months (Stevens et al. 2000). |
| **Growth and reproduction** | Young are born at approximately 45 cm total length (TL), maturity occurs at around 120 cm TL for females and 108 cm TL for males, and they reach a maximum size of 186 cm TL (Stevens and Lyle 1989). Mature females produce litters of 6–25 (mean = 11) every year after a gestation period of 8 to 11 months (Compagno 1984, Stevens and Lyle 1989). Winghead Shark reaches maturity at 7.2 years for females and 5.5 years for males. The oldest documented maximum age is 21 years according to vertebral analysis (Stevens and Lyle 1989, Smart et al. 2013). Generation length is estimated to be 14 years. |
| **Stock structure** | There is limited information about the stock structure of Winghead Sharks in Northern Australia. Genetic evidence was unable to detect any fine scale structuring in Australia, however, more research is need using a combination of approaches to determine if finer scale structuring exists or if movement is restricted at shorter time frames. |
| **Vulnerability** | The Winghead Shark is heavily exploited in many parts of its range, for example the Gulf of Thailand, India and Indonesia (Simpfendorfer 2003). Only one individual was seen in market surveys in Indonesia during which approximately 20,000 sharks were recorded. It is therefore suspected to be severely overfished in this country as most of Indonesia's fishing effort is focused on coastal nearshore areas where it would be suspected to inhabit (Smart, J. and Simpfendorfer, C. 2019). Recent catch data from India identifies sharks to species level and has no mention of the Winghead Shark as a bycatch or by-product species (e.g. Varghese et al. 2013). Severe population declines are therefore also suspected as they have previously been recorded there. This pattern is expected throughout the species' Asian range where fishing pressure on nearshore regions is intense and generally unregulated.<br><br>Within Australia, the Winghead Shark is lightly exploited in several net fisheries. Its elongated hammer-shaped head makes it susceptible to a wide range of mesh sizes and therefore it is predominantly caught in gillnets and trawls. However, it is only caught in low numbers in the Queensland East Coast Finfish Fishery (0.4% of total catch; Harry et. al 2011), Gulf of Carpentaria Inshore Finfish Fishery (<0.3% of total catch; DAFF 2012), Northern Prawn Fishery (0.02% of total catch; Stobutzki et al. 2002) and the Pilbara |

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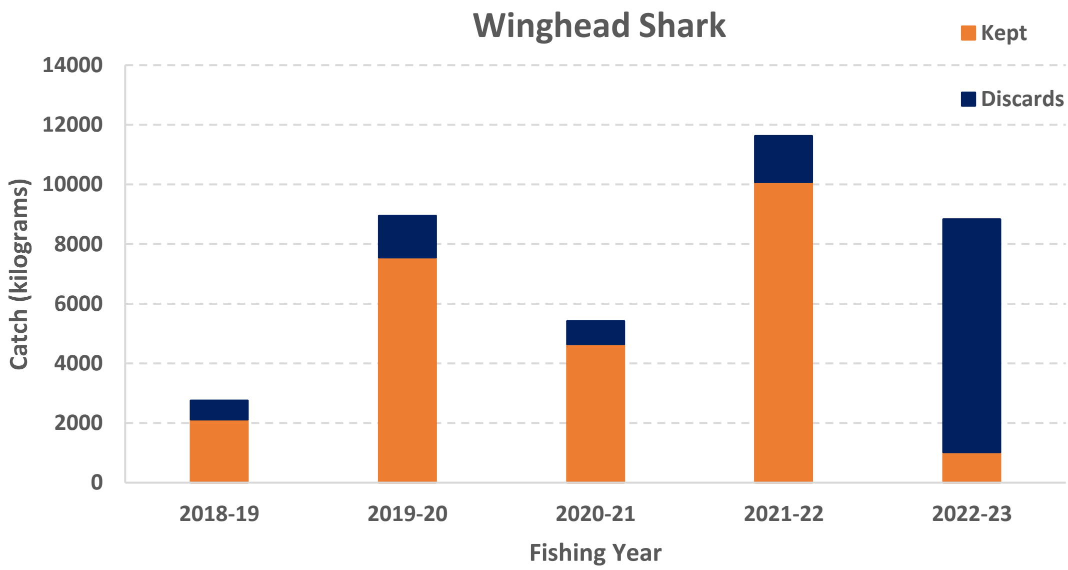
|---|---|
| | Trawl Fishery (Western Australia Department of Fisheries 2010).<br><br>The greatest catches of the Winghead Shark in Australia are taken in the Northern Territory Offshore Net and Line Fishery and has ranged between 10.942 t and 21.356 t between 2007 and 2012. Due to operational changes in the fishery, however, this catch has decreased to 12.786 t in 2012 and this trend is likely to continue (Smart, J. and Simpfendorfer, C. 2019). Limited and sporadic longlining effort in the ONLF in recent years has further reduced the catch of Winghead Shark in the NT. |
| **Stock status** | Expert advice found the current management arrangements in place in Australian-managed fisheries (including the ONLF) mostly meet the requirements of a positive NDF. All sharks species assessed had a positive NDF outcomes, with the exception of Winghead shark and hammerhead sharks species, which had positive NDF outcomes with conditions.<br><br>A Sustainability Assessment for Fishing Effects (SAFE) was conducted for Winghead Shark in NT waters. SAFE analysis is a quantitative approach which derives estimates of natural mortality rates based on life history parameters, and estimates of fishing mortality, accounting for species' spatial distribution within the fishery, susceptibility to fishing gear and the proportion of the distribution that was fished in the previous year. All mortality estimates resulted in a 'Low' SAFE risk for Winghead Shark. |
| **Fishing activity** |  |

## All other sharks (less than 5 tonnes average annual capture)

**All other sharks (less than 5 tonnes average catch) assessment information**

**Management controls**

Total allowable commercial catch:

- combined shark group of 246.441 tonnes (applies to Grey Reef and Lemon Sharks)
- combined other shark group of 126,447 kg (applies to all other species of shark).

Spatial restrictions on the use of pelagic net (from 2nm seaward) and pelagic longline (3nm seaward).

Pelagic net gear restrictions: mesh size between 160mm and 185mm; and a drop of not more than 100 meshes.

Total length of all pelagic and demersal long lines is not more than 15nm.

A maximum of 1000 snoods on a vessel.

No auto-baiting devices on a vessel.

Spatial closures (Reef Fish Protection Areas, Artificial Reefs, and Mary River Fish Management Zone).

**Stock status**

Expert advice found the current management arrangements in place in Australian-managed fisheries (including the ONLF) mostly meet the requirements of a positive NDF. All sharks species assessed had a positive NDF outcomes, with the exception of Winghead shark and hammerhead sharks species, which had positive NDF outcomes with conditions.

A Sustainability Assessment for Fishing Effects (SAFE) was conducted for:
Grey Reef Shark, Creek Whaler, Fossil Shark, Lemon Shark, Milk Shark, Tawny Shark and Whitecheek shark in NT waters. SAFE analysis is a quantitative approach which derives estimates of natural mortality rates based on life history parameters, and estimates of fishing mortality, accounting for species' spatial distribution within the fishery, susceptibility to fishing gear and the proportion of the distribution that was fished in the previous year. All mortality estimates resulted in a 'Low' SAFE risk for the above listed species.

**Fishing activity**

Table 14. Annual catch including discards (in tonnes) of all other sharks between 2018-19 and 2022-23.

| Species | Scientific name | 2018-19 | 2019-20 | 2020-21 | 2021-22 | 2022-23 | 5 year average |
|---|---|---|---|---|---|---|---|
| **Grey Reef Shark** | *C. amblyrhynchos* | 0.20 | 0.52 | 0.32 | 0.36 | 0.03 | 0.3 |
| **Lemon Shark** | *Negaprion actutidens* | 0.55 | 6.63 | 5.94 | 1.93 | 3.26 | 3.7 |
| **Creek Whaler** | *Carcharhinus fitzroyensis* | 0.11 | 1.30 | 0.73 | 1.17 | 1.32 | 0.9 |
| **Fossil Shark** | *Hemipristis elongata* | 0.00 | 0.17 | 0.08 | 0.19 | 0.40 | 0.2 |
| **Grey Carpetshark** | *Chiloscyllium punctatum* | 0.76 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2 |
| **Guitarfishes** | *Rhinobatidae spp.* | 0.00 | 0.04 | 0.20 | 0.00 | 0.00 | 0.0 |
| **Milk Shark** | *Rhizoprionodon acutus* | 2.88 | 2.41 | 2.40 | 5.57 | 2.93 | 3.2 |
| **Sharks - other** | - | 0.21 | 0.23 | 5.87 | 0.08 | 0.00 | 1.3 |
| **Tawny Shark** | *Nebrius ferrugineus* | 0.00 | 3.05 | 2.06 | 0.60 | 1.33 | 1.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Whitecheek Shark** | | 0.00 | 0.01 | 0.00 | 0.03 | 1.19 | 0.2 |

## Dusky shark (*Carcharhinus obscurus*) and Sandbar shark (*Carcharhinus plumbeus*)

| Dusky shark and Sandbar shark assessment information | |
|---|---|
| **Management controls** | Total allowable commercial catch:<br>• combined shark group of 246.441 tonnes (applies to Dusky and Sandbar Sharks)<br>Spatial restrictions on the use of pelagic net (from 2nm seaward) and pelagic longline (3nm seaward).<br>Pelagic net gear restrictions: mesh size between 160mm and 185mm; and a drop of not more than 100 meshes.<br>Total length of all pelagic and demersal long lines is not more than 15nm.<br>A maximum of 1000 snoods on a vessel.<br>No auto-baiting devices on a vessel.<br>Spatial closures (Reef Fish Protection Areas, Artificial Reefs, and Mary River Fish Management Zone). |
| **Stock status** | A Western Australian stock assessment for Sandbar shark was conducted in 2023 using data up until 2022. The stock assessment uses current and historical data from all of these fisheries. Minor catches historically reported from the Offshore Net and Line Fishery (Northern Territory) are assumed to be from the Western Australia biological stock, as are recently quantified catches from the Memorandum of Understanding (MoU) Box Shark Fishery [Marshall et al. 2016, Braccini et al. 2021]. Current level of fishing mortality should allow the stock to recover from its recruitment impaired state. The stock is classified a recovering stock.<br><br>There is no stock assessment for Dusky Shark. A Sustainability Assessment for Fishing Effects (SAFE) was conducted for Dusky Shark in NT waters. SAFE analysis is a quantitative approach which derives estimates of natural mortality rates based on life history parameters, and estimates of fishing mortality, accounting for species' spatial distribution within the fishery, susceptibility to fishing gear and the proportion of the distribution that was fished in the previous year. All mortality estimates resulted in a 'Low' SAFE risk for the above listed species.<br><br>Expert advice found the current management arrangements in place in Australian-managed fisheries (including the ONLF) mostly meet the requirements of a positive NDF. All sharks species assessed had a positive NDF outcomes, with the exception of Winghead shark and hammerhead sharks species, which had positive NDF outcomes with conditions. |
| **Fishing activity** | Table 15. Annual catch including discards (in tonnes) of all other sharks between 2018-19 and 2022-23. |

| Species | Scientific name | 2018-19 | 2019-20 | 2020-21 | 2021-22 | 2022-23 | 5 year average |
|---|---|---|---|---|---|---|---|
| **Dusky Shark** | *C. obscurus* | 0.01 | 6.29 | 0.79 | 0.84 | 0.00 | 1.6 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Sandbar Shark** | *C. plumbeus* | 0.00 | 0.04 | 0.14 | 0.10 | 0.00 | 0.1 |

## Combined finfish group (Longtail Tuna and finfish greater than 100kg average annual capture)

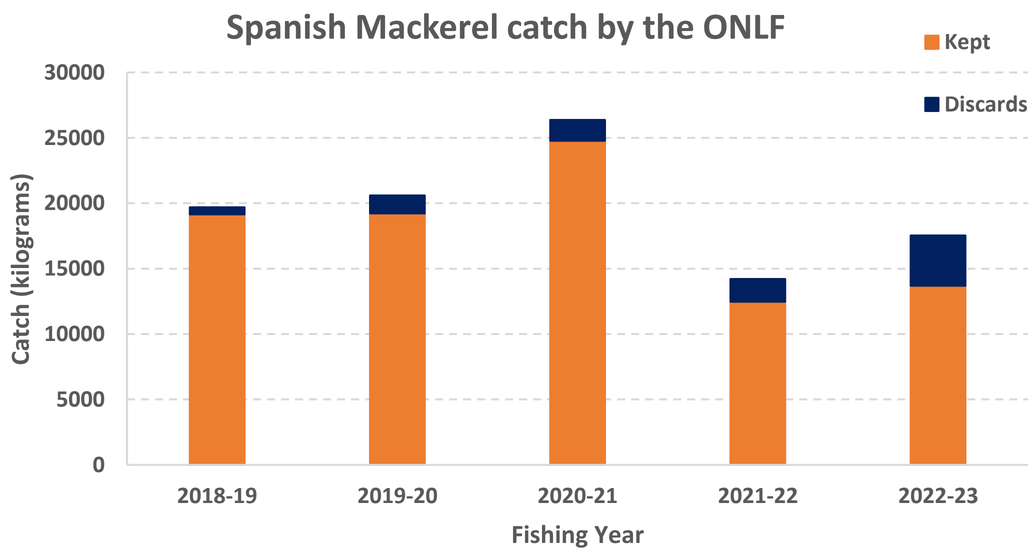
| Combined finfish group assessment information | |
|---|---|
| **Management controls** | Total allowable commercial catch of 59.397 tonnes (combined for all finfish).<br>Long tail tuna on board a vessel must not exceed 5% of the vessels total catch.<br>Spatial restrictions on the use of pelagic net (from 2nm seaward) and pelagic longline (3nm seaward).<br>Pelagic net gear restrictions: mesh size between 160mm and 185mm; and a drop of not more than 100 meshes.<br>Total length of all pelagic and demersal long lines is not more than 15nm.<br>A maximum of 1000 snoods on a vessel.<br>No auto-baiting devices on a vessel.<br>Spatial closures (Reef Fish Protection Areas, Artificial Reefs, Mary Ricer Fish Management Zone). |
| **Stock status** | A Sustainability Assessment for Fishing Effects (SAFE) was conducted for:<br>Black Pomfret, Cobia, Blue Threadfin, Giant Trevally, Golden Trevally, Long-tail Tuna, Mackerel Tuna, Queenfish, Sailfish and Shortfin Batfish in NT waters. SAFE analysis is a quantitative approach which derives estimates of natural mortality rates based on life history parameters, and estimates of fishing mortality, accounting for species' spatial distribution within the fishery, susceptibility to fishing gear and the proportion of the distribution that was fished in the previous year. All mortality estimates resulted in a 'Low' SAFE risk for the above listed species. |
| **Fishing activity** | Table 16. Annual catch including discards (in kilograms) of the combined finfish group between 2018-19 and 2022-23 (excluding Spanish Mackerel, Black Jewfish and Golden Snapper). |

| Species | Scientific name | 2018-19 | 2019-20 | 2020-21 | 2021-22 | 2022-23 | 5 year average |
|---|---|---|---|---|---|---|---|
| **Longtail Tuna** | *Thunnus tonggol* | 21,581.0 | 16,850.1 | 7,733.0 | 4,766.2 | 2,762.2 | 10,738.5 |
| **Mackerel Tuna** | *Euthynnus affinis* | 5,566.8 | 2,188.5 | 1,519.4 | 2,236.6 | 1,335.0 | 2,569.3 |
| **Queenfish** | *Scomberoides lysan* | 3,215.3 | 1,218.0 | 1,956.2 | 4,634.2 | 4,530.0 | 3,110.7 |
| **Black Pomfrets** | *Parastromateus niger* | 1,493.1 | 1,965.7 | 719.5 | 417.5 | 709.8 | 1,061.1 |
| **Giant Trevally** | *Caranx ignobilis* | 1,690.0 | 1,069.1 | 1,813.5 | 982.0 | 580.0 | 1,226.9 |
| **Trevallies - scad** | | 333.2 | 360.4 | 2,202.3 | 1,691.3 | 147.0 | 946.8 |
| **Blue Threadfin** | *Eleutheronema tetradactylum* | 417.2 | 1,358.3 | 659.9 | 341.1 | 522.2 | 659.7 |
| **Golden Trevally** | *Gnathanodon speciosus* | 671.0 | 417.6 | 512.0 | 799.0 | 573.0 | 594.5 |
| **Batfishes** | | 553.0 | 264.0 | 615.0 | 0.0 | 0.0 | 286.4 |
| **Cobia** | *Rachycentron canadum* | 416.1 | 422.0 | 340.0 | 204.0 | 214.5 | 319.3 |
| **Black Marlin** | *Istiompax indica* | 215.0 | 400.0 | 500.0 | 300.0 | 0.0 | 283.0 |
| **School Mackerel** | *Scomberomorus queenslandicus* | 0.0 | 1.0 | 424.0 | 0.0 | 0.0 | 85.0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Shortfin Batfish (moonfish)** | *Zabidius novemaculeatus* | 0.0 | 122.0 | 944.5 | 1029.5 | 1,331.0 | 685.4 |
| | **Spotted Mackerel** | *Scomberomorus munroi* | 58.0 | 67.8 | 225.0 | 120.0 | 182.3 | 130.6 |

## Spanish Mackerel (*Scomberomorus commerson*)

| **Spanish Mackerel assessment information** | |
|---|---|
| **Management controls** | Total allowable commercial catch of 59.397 tonnes (combined for all finfish).<br>Spanish Mackerel is included under the combined fin fish group.<br>Under the Spanish Mackerel Fishery Management Framework the ONLF has a formal catch share of 3 percent (13,500 kg).<br>30 Spanish Mackerel can be retained during a voyage. For each tonne of Grey mackerel taken during a voyage this voyage limit can increase by 10 Spanish Mackerel.<br>Spatial restrictions on the use of pelagic net (from 2nm seaward) and pelagic longline (3nm seaward).<br>Pelagic net gear restrictions: mesh size between 160mm and 185mm; and a drop of not more than 100 meshes.<br>Total length of all pelagic and demersal long lines is not more than 15nm.<br>A maximum of 1000 snoods on a vessel.<br>No auto-baiting devices on a vessel.<br>Spatial closures (Reef Fish Protection Areas, Artificial Reefs, Mary River Fish Management Zone). |
| **Distribution** | Spanish Mackerel are distributed in waters from the Indo-Pacific from the Red Sea to South Africa to southeast Asia, north to China and Japan and South to Australia. In Australian waters in WA and around northern and eastern Australia to St Helens in Tasmania but are more commonly found around the northern Australian coastline. Spanish Mackerel are an epi-pelagic, continental shelf species rarely found in waters deeper than 100m and are commonly associated with coral reefs, rocky shoals and current lines on outer reef areas and offshore water to inshore shallow water of low salinity and high turbidity. Spanish Mackerel school mostly with fish of a similar size and of the same sex. |
| **Growth and reproduction** | Spanish Mackerel grow rapidly to a large size. Females mature at between 45 - 50 cm fork length (FL), males between 40 - 45 cm FL, before two years of age. Females as small as 90cm FL may have already spawned for two or more seasons before they are subject to commercial fishing. Spanish Mackerel are batch spawners (females spawn every few nights during a spawning run) and spawning may be repeated over a protracted season in tropical waters. |
| **Stock structure** | Genetic analyses suggest that there are three biological stocks of Spanish Mackerel across northern Australia (Moore et al. 2003). However, evidence from otolith microchemistry, parasite analysis and limited adult movement (at scales greater than 100km) indicates that there are likely to be a number of smaller biological stocks with limited interaction (Buckworth et.al. 2007; Lester et.al., 2001). |
| **Vulnerability** | Although Spanish Mackerel are a fast growing and early maturing species, they are susceptible to over-fishing (when fishing pressure is high) because of their tendency to aggregate at known locations. |
| **Stock status** | Spanish Mackerel is the target species of the NT Spanish Mackerel Fishery. The harvest of Spanish Mackerel in the Northern Territory is managed through a catch-sharing |

| | |
|---|---|
| | arrangement between all user groups (Northern Territory Government 2009). This agreement aims to maintain the cumulative harvest of Spanish Mackerel within a precautionary allowable catch of 450 t per annum. The proportion of the allowable catch allocated to each user group was based on historical logbook data and catch estimates from the National Recreational and Indigenous Fishing Survey (Henry and Lyle 2003) as follows: 76% (342 t) to Spanish Mackerel Fishery licensees, 3% (13.5 t) to Offshore Net and Line Fishery licensees, 1% (4.5 t) to Demersal Fishery licensees, 3% (13.5 t) to Fishing Tour Operator licensees, 16% (72 t) to recreational fishers and 1% (4.5 t) to Indigenous fishers.<br><br>The cumulative catch by all sectors ranged from 319 to 560 t, at an annual average of 441 t for the 10 years spanning 2013–22. The proportion of the catch caught by each sector during this time approximated the allocations described above (i.e. 71%, 4%, < 1%, 3%, 13% and 2%, respectively).<br><br>The most recent assessment of the Spanish Mackerel resource in the Northern Territory (using data to 2019) indicated that stocks are unlikely to have dropped below 68% of the unfished biomass and that the biomass at the conclusion of 2019 was 72% of the unfished level (Grubert et al. unpublished). The above evidence indicates that the biomass of this stock is unlikely to be depleted.<br><br>The same assessment indicated that the relative fishing mortality rate (i.e. U2019/UMSY) in 2019 for the Northern Territory stock of Spanish Mackerel was 0.43, less than half of the rate required to achieve MSY. The current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.<br><br>On the basis of the evidence provided above, Spanish Mackerel in the Northern Territory is classified as a sustainable stock. |
| **Fishing activity** |  |

## Black Jewfish (*Protonibea diacanthus*)

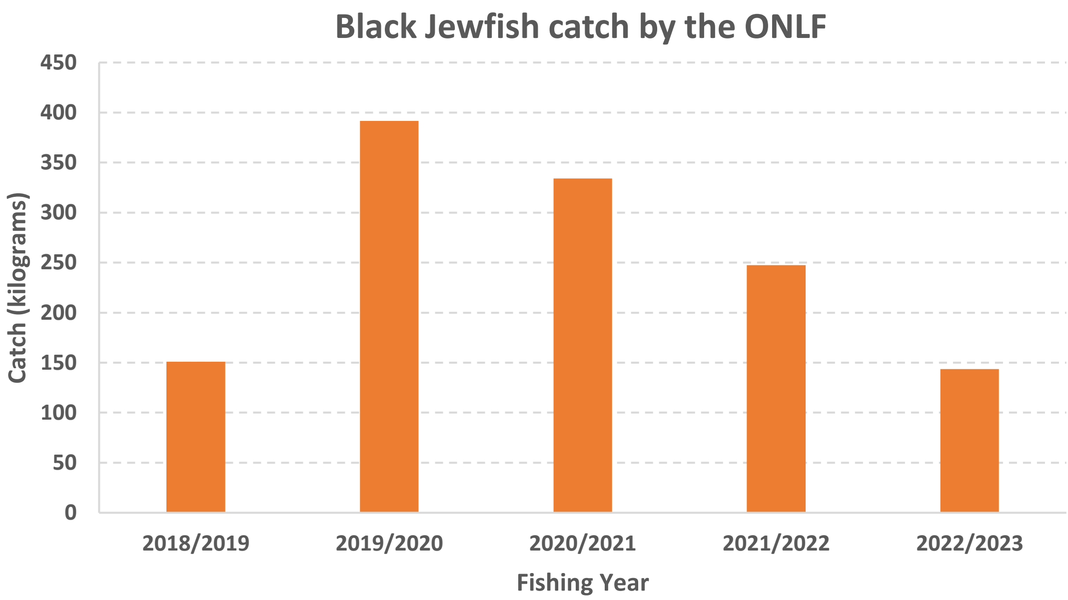
| Black Jewfish assessment information | |
|---|---|
| **Distribution** | Black Jewfish have a wide distribution throughout the tropical Indo-West Pacific (Froese and Pauly, 2015). In Australia, they are distributed along the northern coast from Hervey Bay in Queensland to Shark Bay in Western Australia (Bray, 2011). |
| **Growth and reproduction** | Black Jewfish are gonochoristic (i.e. separate sexes throughout life) and have a rapid growth rate reaching 60 cm total length (TL) in their first year and 90 cm TL in their second year, by which time 50% are sexually mature (Phelan 2008). Although this species can grow to 160 cm and weigh 45 kg, most individuals caught in NT waters are between 80 and 120 cm. The maximum recorded age for this species is 13 years (Phelan 2008). Data on the spawning and early life history of Black Jewfish is limited, although histological examination of ovaries indicates multiple batch spawning (Phelan 2008). Like other members of the sciaenid family they are likely to produce pelagic eggs and have a pelagic larval phase (Leis and Carson-Ewart 2000; Nelson 2006; Froese and Pauly 2015). The factors that influence recruitment success are poorly understood although it is likely that abundance of spawning females, and coastal environmental drivers such as rainfall and river flow are important. Spawning of Black Jewfish in Australia occurs between August and January, with a peak in December (Phelan 2008). |
| **Stock structure** | The stock structure for this species in coastal waters has been investigated in the north-western part of its range from the western Gulf of Carpentaria to its southern extent along the West Australian coastline using otolith chemistry, parasitology and genetic analysis (Saunders et al., 2017). These analyses revealed that Black Jewfish populations have variable larval connectivity but are generally limited to hundreds of kilometres and adults appear to show movement among sites separated by tens of kilometres but not separated by hundreds of kilometres. |
| **Vulnerability** | Black Jewfish are vulnerable to over-exploitation largely because of their predictable aggregating behaviour related to spawning (Phelan, 2001; Liu et al., 2008; Mok et al. 2009; Semmens et al. 2010). Black Jewfish have been shown to be highly susceptible to barotrauma when caught in waters deeper than ten metres (Phelan 2008; Welch et al 2014). |
| **Stock status** | Black Jewfish is the target species of the NT Coastal Line Fishery. Stock status is reported on three different spatial scales across the NT.<br><br>*Darwin Region stock status*<br>A 2014 stock assessment using a Stock Reduction Analysis indicated that Black Jewfish were overfished, and that overfishing was occurring [Saunders et al. 2016b]. However, the most recent assessment using data up to 2019, indicates that current biomass has increased significantly to 93% of unfished levels [Saunders 2020a] suggesting that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired. While this biomass estimate is probably overly optimistic, there is evidence that strongly supports a significant increase in the abundance of Black Jewfish and the recovery of the stocks within this management unit. This includes successive years of above-average recruitment (indicated by the reduction in average length of monitored catches and an increase in the number of fish caught), a previous stock assessment indicating that the biomass had recovered to 50% of unfished levels [Penny et al. 2018] as well as the management measures (catch limits and area closures) introduced in 2015 that have reduced catches from the peaks that occurred in the mid-2000s [NTG 2017]. The model outputs also indicate the current fishing mortality is only 24% of that required to attain Maximum Sustainable Yield indicating that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired. However, it |

should be noted that the observable age structure of this population, when compared to recent evaluation of the east coast stock, provides some evidence that the Darwin population may be age truncated [Randall et al. 2023; Williams et al. 2023]. On the basis of the evidence provided above, Black Jewfish in the Darwin Region management unit is classified as a sustainable stock.

*Gulf of Carpentaria stock status*
Black Jewfish are particularly vulnerable to fishing pressure due to their tendency to aggregate [Phelan 2008]. There is evidence that targeted fishing of Black Jewfish aggregations by traditional indigenous fishers in this management unit through the mid-late 1990s, while producing relatively low catches in absolute terms, was sufficient to significantly reduce abundance of large mature fish in the northern Cape York region [Phelan 2002]. The perceived overfishing of this aggregation area resulted in a two-year ban on fishing for Black Jewfish which was further extended as a permanent closure [Roelofs 2003]. No studies have been undertaken to measure recovery of this aggregation area, however, Williams et al. [2023] indicates that fishing does still occur but not at historical levels. The Northern Territory Demersal Fishery trawl fishery began increasing effort in 2012, resulting in higher levels of harvest of Black Jewfish in the western Gulf of Carpentaria. These catches are likely to be from the same stock as the Cape York aggregation so the impacts of this fishing activity may be connected. Additionally, while Black Jewfish are a popular recreational species in the Gulf of Carpentaria, there are no reliable estimates of recreational harvest [Roelofs 2003; Webley et al. 2015]. There is insufficient evidence to confidently classify the status of this management unit. On the basis of the evidence provided above, Black Jewfish in the Gulf of Carpentaria management unit is classified as an undefined stock.

*Regional Northern Territory stock status*
An assessment was undertaken using catch data from all commercial fisheries to 2019 applied to a modified catch-MSY model (developed by Martell and Froese [2013] and modified by Haddon et al. [2018]). The results from the assessment indicate that the inferred biomass exceeded the target reference point, with the 95% confidence intervals positioned above the target [Saunders 2020a]. This indicates that the stock was unlikely to be depleted and that recruitment is unlikely to be impaired. Similarly, the fishing mortality in 2019 (7.5 t) was 0.04 which was well below the limit reference point indicating that the current level of fishing mortality was unlikely to cause the stock to become recruitment impaired. The average catch over the last 10 years has remained low (12 t) and although catch increased from 2019 (14 t in 2022) this harvest level remains well below the limit reference point. On the basis of the evidence provided above, Black Jewfish in the Regional Northern Territory management unit is classified as a sustainable stock.

**Fishing activity**




## Shark and ray species bycatch

| Shark species assessment information | |
|---|---|
| **Statement of considerations** | Offshore Net and Line Fishery Harvest Strategy includes performance indicator to ensure fishing pressure on stocks of bycatch species is sustainable. |
| **Stock status** | A SAFE assessment is conducted for Spinner Shark. There are no assessments undertaken for other discard shark species captured in Table 17.<br><br>There is currently no information on population size, structure, or trend for shark species in the NT captured in Table 17. |
| **Vulnerability** | Table 17. Annual discards (in kilograms) of shark species between 2018-19 and 2022-23 (excluding species that are captured in the retained species assessment information). |

| Species | Scientific name | 2018-19 | 2019-20 | 2020-21 | 2021-22 | 2022-23 | 5 year average |
|---|---|---|---|---|---|---|---|
| **Hardnose Shark** | *Carcharhinus macloti* | 0 | 65 | 78 | 474 | 333 | 190.0 |
| **Whitetip Reef Shark** | *Triaenodon obesus* | 20 | 25 | 32 | 20 | 83 | 36.0 |
| **Spinner Shark** | *Carcharhinus brevipinna* | 0 | 35 | 75 | 19 | 21 | 30.0 |
| **Stingrays** | | 461 | 439 | 439 | 843 | 750 | 586.4 |

## Finfish species bycatch

| Finfish species assessment information | |
|---|---|
| **Statement of considerations** | Offshore Net and Line Fishery Harvest Strategy includes performance indicator to ensure fishing pressure on stocks of bycatch species is sustainable. |
| **Stock status** | There are no assessments undertaken for discard species captured in Table 18. |
| **Vulnerability** | Table 18. Annual discards (in kilograms) of finfish species between 2018-19 and 2022-23 (excluding species that are captured in the retained species assessment information). |

| Species | Scientific name | 2018-19 | 2019-20 | 2020-21 | 2021-22 | 2022-23 | 5 year average |
|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Milkfish** | *Chanos chanos* | 0 | 10 | 405 | 166 | 76 | 131.4 |
| | **Sailfish** | *Istiophorus platypterus* | 0 | 40 | 164 | 229 | 201 | 126.8 |
| | **Mouth Mackerel** | *Rastrelliger kangurta* | 0 | 14 | 84 | 25 | 12 | 27 |
| | **Tuna's and Mackerel's** | | 0 | 0 | 0 | 7 | 111 | 23.6 |

## Golden Snapper (*Lutjanus johnii*)

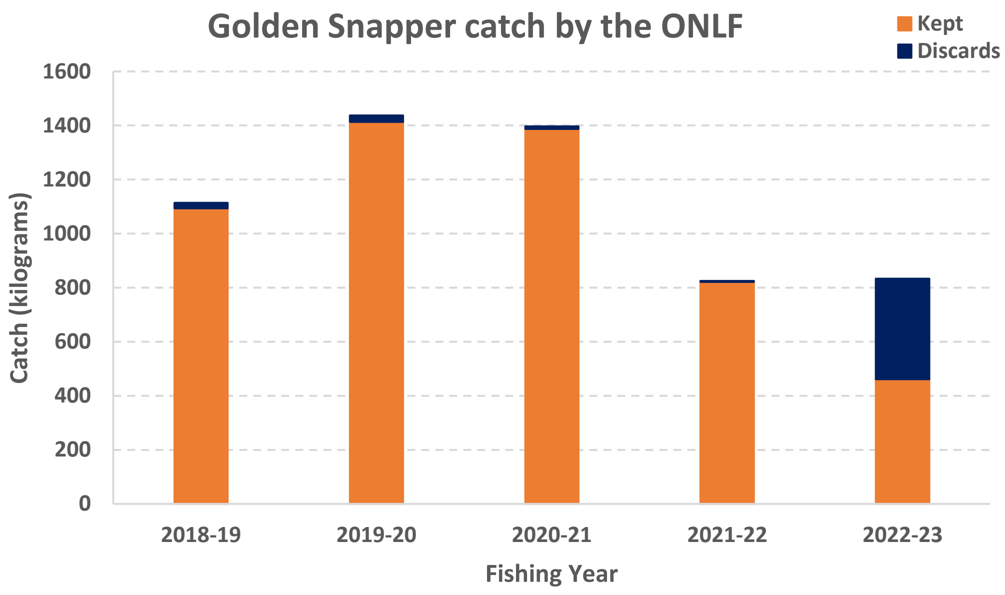
| **Golden Snapper assessment information** | |
|---|---|
| **Distribution** | Golden Snapper (*Lutjanus johnii*) are widely distributed throughout the Indo-West Pacific, inhabiting tropical inshore waters from East Africa to Fiji and northern Australia to Taiwan (Allen and Talbot 1985). In Australia, the species is found from the Pilbara region in north Western Australia across northern Australia to the mid-east coast of Queensland (Travers et al. 2006; Saunders et al. 2014b). |
| **Growth and reproduction** | Golden Snapper are gonochoristic (i.e. separate sexes throughout life) and grow relatively quickly in their first few years before slowing down and taking several years to reach maturity (NT Government, unpublished data). Growth rates of 25 cm total length (TL) by age one, 50 cm TL by age seven and 60 cm TL by age ten were recorded in the Northern Territory (NT Government, unpublished data). Golden Snapper were also found to be late maturing with the size at 50% maturity for male fish to be around 47 cm TL (age ~ 5 years) and 63 cm TL for females (age ~ 8 years) (Hay et al. 2005; NT Government, unpublished data). Golden Snapper can grow to at least 90 cm and 12.4 kg and live up to 20 years of age (Marriott and Cappo 2000). Observations by Hay et al. (2005) indicated that in the Northern Territory this species forms large spawning aggregations and has a protracted spawning period from September to late April. |
| **Stock structure** | The stock structure for this species has been investigated to the full extent of its Australian range from Western Australia to Queensland using a variety of techniques (Saunders et al. 2017). Like Black Jewfish, separate stocks of Golden Snapper exist within the waters of the Northern Territory, but at a finer scale of tens of kilometres (Saunders et al. 2017), not hundreds of kilometres. Clear differences in stock structures were also found between inshore and offshore stocks, indicating that there are clear geomorphic barriers. It is unknown whether these barriers are driven by currents or lack of suitable settlement habitat existing between inshore and offshore sites (Saunders et al. 2017). |
| **Vulnerability** | Golden Snapper are vulnerable to over-exploitation due to their aggregating behaviour related to spawning, slow growth rate, late sexual maturity and susceptibility to barotrauma when caught in waters deeper than ten metres (Welch et al. 2014). |
| **Stock status** | Stock status is reported on three different spatial scales across the NT.<br><br>*Darwin Region stock status*<br>In the Darwin Region, abundance, catch and catch rate have substantially declined over the past 10 years [NTG 2017]. The fisheries accessing these exploited stocks operate inshore and include the Coastal Line Fishery, the Barramundi Fishery, Fishing Tour Operators and recreational fishers. Catch limits and fishery area closures were implemented in 2015 to reduce harvest by an estimated 50% to allow for the biomass of Golden Snapper stocks to recover [Grubert et al. 2013]. Given the species' relatively slow growth rate, the management measures introduced in 2015 are unlikely to have yet supported measurable stock recovery. On the basis of the evidence provided above, |

Golden Snapper in the Darwin Region (Northern Territory) management unit is classified as a depleted stock.

*Gulf of Carpentaria stock status*
A preliminary assessment using catch data from all commercial fisheries applied to a modified catch-MSY model (developed by Martell and Froese [2013] and modified by Haddon [2018]), estimated that the 2019 biomass of Golden Snapper was 47% of unfished levels [Saunders and Roelofs 2020b] suggesting that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired. Similarly, the fishing mortality in 2019 was 0.12 which approximated the target level and was well below the limit reference point indicating that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired. Recent fishery independent surveys estimated biomass of Golden Snapper in 2021 was 1,000 t in the western Gulf of Carpentaria [Knuckey and Koopman 2022]. The harvest fraction in 2022 is less than 1% of the estimated biomass which indicates a relatively low fishing pressure. A similar survey in the eastern Gulf of Carpentaria also estimated biomass of Golden Snapper in 2021, however the coefficient of variation (CV) was high. The survey indicated that the harvest fraction likely represents a very small percentage of the available biomass [Knuckey et al. 2022]. Catch-MSY modelling has a higher degree of uncertainty and should not be solely relied on to make inferences about long-term biomass trends. However, Golden Snapper occupy a range of habitats, and spend their juvenile years in mangrove estuaries, this likely affords some protection from fishing pressure [Kiso and Mahyam 2003]. A weight of evidence approach suggests recruitment is unlikely to be impaired.On the basis of the evidence provided above, the Gulf of Carpentaria management unit is classified as a sustainable stock.

*Regional Northern Territory stock status*
A preliminary assessment using catch data from all fishing sectors applied to a modified catch-MSY model (developed by Martell and Froese [2013] and modified by Haddon [2018]), estimated that the 2022 biomass of Golden Snapper was well above the MSY reference levels [Pazhayamadom 2022] suggesting that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired. Similarly, the fishing mortality in 2022 was 0.06 which was well below the limit reference point indicating that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired. A recent trawl survey in 2021 indicates that the harvest fraction of Golden Snapper is less than 1.5% of the estimated biomass representing relatively low fishing pressure on the stock [Knuckey and Koopman 2022]. On the basis of the evidence provided above, Golden Snapper in the Regional Northern Territory management unit is classified as a sustainable stock.

**Fishing activity**




## Bottlenose Dolphin (*Tursiops truncatus* and *T. aduncus*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Common Bottlenose Dolphin | *Tursiops truncatus* | Protected Wildlife (T) | Cetacean, Migratory | Least Concerned |
| Indo-Pacific Bottlenose Dolphin | *Tursiops aduncus* | Protected Wildlife (T) | Cetacean, Migratory ((Arafura/Timor Sea populations) | Near Threatened |

| Bottlenose Dolphin assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with TEPS.<br>Marine protected species in the Northern Territory identification guide developed<br>Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data. |
| **Distribution and habitat** | Bottlenose Dolphins are broadly distributed throughout temperate and tropical waters globally, in both coastal (inshore and nearshore) and offshore waters.<br><br>The distribution of Bottlenose Dolphins in Australian waters is not well known. Two species are known from northern Australia; *Tursiops truncatus* and *Tursiops aduncus*. The IUCN listing assessments considers that the range of both species includes the waters off the NT including the entire Gulf of Carpentaria (Braulik et al. 2019; Wells et al. 2019) as does Wells and Scott's (2018) range map for *T. truncatus* . |

| | |
|---|---|
| | *T. truncatus* are usually found offshore in waters deeper than 30 m (Hale et al. 2000; Ross 2006) but also appears to be found in some coastal waters (Hale et al. 2000; Kemper 2004; Wells and Scott 2018).<br><br>*T. aduncus* are found primarily in shallow coastal and estuarine waters and in shallow reef complexes (Jefferson et al. 2015). The range map for *T. aduncus* in the authoritative Encyclopaedia of Marine Mammals (Wang 2018) includes inshore the inshore and offshore waters of the NT including the entire Gulf of Carpentaria in the probable range of that species and several locations along the northern coast in its known range. It is not known how far offshore the known range of the species extends.<br><br>Further genetic work is required to better define the distribution of the species, especially with regard to the taxonomic identity of particular populations to either *T. aduncus* or *T. truncatus.* (Braulik et al. 2019). |
| **Growth and reproduction** | Female *T. truncatus* becomes sexually mature at 5 to 13 years of age and males at 8 to 12 years of age (Wells & Scott 1999, 2002, 2018).<br><br>Wang et al. (2018) state that *T. aduncus of both sexes* becomes sexually mature at 10 to 15 years of age. The age for males tends to be slightly earlier than that for females. |
| **Population size** | Population estimates are only available for some areas of both species' range. For example, the eastern Pacific, the population is estimated at 243,000 individuals (Wade & Gerrodette 1993). The total population sizes in Australian waters are not known.<br><br>*T. truncatus* is among the most common cetacean species globally. They occur in tropical and temperate inshore, coastal, shelf, and oceanic waters (Wells et al. 2019).<br><br>*T. aduncus* occurs in relatively small populations or communities with limited geographic ranges, which can exacerbate the impact of human activities and demographic stochasticity on this species (Braulik et al. 2019). |
| **Vulnerability** | Both species of Bottlenose Dolphins are vulnerable to indirect catches in trawl, gillnet, purse-seine and trap fisheries, entanglements in debris.<br><br>*T. truncatus* is bycaught in fishing gear throughout their range but quantitative data on bycatch rates are lacking in most areas (Wells et al. 2019).<br><br>Estimates of abundance of *T. aduncus* from populations for which information on bycatch is also available indicate that human-caused mortality is frequently unsustainable (see references in Braulik et al. 2019). In the past 5 years, 6 interactions with Bottlenose Dolphins, including 4 mortalities, have been reported in logbooks in the ONLF. An additional interaction with an unspecified dolphin has been reported within the last 5 years.<br><br>In the past 20 years, no additional interactions with Bottlenose Dolphins have been reported in logbooks. However, an additional 8 interactions |

have been reported in logbooks for unspecified dolphins, including 6 mortalities.

Further, on-board observer and electronic monitoring coverage has identified an additional 4 undifferentiated dolphin interactions in the past 20 years, including 3 mortalities and one of unknown fate.

As both species of Bottlenose Dolphins are morphologically similar to each other and several other dolphins, misidentification is likely.

| Pelagic Net | | |
|---|---|---|
| Fishing Year | Dead | Alive |
| 2018/2019 | 0 | 0 |
| 2019/2020 | 2 | 1 |
| 2020/2021 | 0 | 0 |
| 2021/2022 | 1 | 1 |
| 2022/2023 | 1 | 0 |


Figure 12. Reported number of interactions of Bottlenose Dolphins in the NT ONLF from 2018/19 to 2022/23. The red shaded areas around the northwest coast are reef fish protection areas, which are no fishing zones for the ONLF.

## Snubfin Dolphin (*Orcaella heinsohni*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Snubfin dolphin (Inshore dolphin) | *Orcaella heinsohni* | Protected Wildlife (T) | Cetacean, Migratory. Under threatened listing assessment | Vulnerable |

| Snubfin Dolphin assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with threatened, endangered and protected species (TEPS).<br>Marine protected species in the Northern Territory identification guide developed<br>Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data. |
| **Distribution and habitat** | The Australian Snubfin Dolphin occurs throughout northern Australia and in the Kikori Delta of southern Papua New Guinea (Beasley et al. 2005). In Australia they are distributed from Fitzroy River, Qld, in the southeast, north along the Qld coast and across the NT to Roebuck Bay, WA (Grech et al. 2014; Palmer et al. 2014; Palmer et al. 2015; Beasley & Brown, 2018).<br><br>In the Kimberley region of Western Australia, the area of occupancy is estimated to be 700 km$^2$ (Bouchet et al. 2021). At broader spatial scales, the area of occupancy of Australian Snubfin Dolphins cannot be calculated due to the paucity of sighting records for a large proportion of the range. However, the area of occupancy is likely to be greater than 2000 km$^2$ (Peddemors & Harcourt 2006, pers. comm.).<br><br>All available data on the distribution and habitat preferences of Australian Snubfin Dolphins indicate that they mainly occur in protected, shallow, coastal waters close to creeks and river mouths (Beasley, Allen and Parra, 2012, and references therein). |
| **Growth and reproduction** | Limited data is available for the Australian Snubfin Dolphin, although age determined from 18 individuals in north Qld waters suggests they may live for at least 30 years (Beasley & Brown 2018). |
| **Population size** | The NT-wide abundance of Snubfin Dolphins was estimated to be 6058 individuals (Palmer et al. 2017), with a previous aerial survey estimating the western Gulf of Carpentaria population at about 1000 individuals (Freeland & Bayliss 1989). However, this latter estimate has been questioned due to the known difficulty of identifying dolphin species in turbid waters from the air, particularly since Australian Snubfin Dolphins are inconspicuous, have low surfacing profiles and are elusive (Parra et al. 2002).<br><br>Results from a recent Darwin region (Darwin and Bynoe Harbours, Shoal Bay) coastal monitoring program (Griffiths et al. 2020) spanning 2011- 2019, highlighted the small, mobile, and variable nature of coastal Snubfin Dolphin populations in the Darwin region (an area of 1086 km$^2$). Annual population estimates across this period ranged from 21 to 67 individuals. A negative trend in abundance was reported across the study period.<br><br>The small population sizes estimated for Australian Snubfin Dolphins makes detection of population trends extremely difficult (Parra et al. 2002), however, Base Population Viability Analysis (PVA) suggests there is a moderate risk of extinction for the regional Darwin population of the species over the next century (von Takack et al 2020). |

| | |
|---|---|
| **Vulnerability** | Past and current threats to Australian Snubfin Dolphins include habitat destruction and degradation, incidental capture in gillnets and traditional hunting by Indigenous Australian communities (Bannister el al. 1996). Other anthropogenic activities may also impact negatively on Australian Snubfin Dolphins, including increased boat traffic, pollution of the coastal habitat, and overfishing of potential prey stocks (Parra et al. 2002).<br>Coastal dolphins are highly susceptible to human activities and environmental change (Brooks et al. 2017; Parra et al. 2006). Their coastal distribution combined with small local population sizes (Bejder et al. 2012) is likely to result in high negative impact even from irregular human-induced mortalities.<br><br>In the ONLF fishery pelagic gillnets must not be used within 2 NM of the coastline and given the species occurrence mostly in protected shallow waters close to the coast (Parra 2006; Parra & Corkeron 2001; Parra et al. 2002) spatial overlap between the activity of the ONLF and key Snubfin Dolphin habitats is likely to be limited. However, some overlap may occur in specific near-shore areas where fishers operate, and interactions, including mortalities, have been reported in such areas.<br><br>During the past 5 years, 7 interactions with Snubfin Dolphins, including 6 mortalities, have been reported in the ONLF. An additional interaction with an unspecified dolphin has been reported within the last 5 years.<br><br>In the past 20 years, a further 2 interactions (both mortalities) with Snubfin Dolphins have been reported in logbooks. An additional 8 interactions with unspecified dolphins, including 6 mortalities, have been reported in logbooks during this period.<br><br>On-board observer and electronic monitoring coverage has identified an additional 4 undifferentiated dolphin interactions in the past 20 years, including 3 mortalities and one of unknown fate.<br><br>As Snubfin Dolphins are morphologically distinct from other cetaceans, misidentification by fishers or on-board observers is unlikely. Further, interactions reported as unspecified dolphins in logbooks and observer data are considered unlikely to be Snubfin Dolphins for the same reason. |

| Pelagic Net | | |
|---|---|---|
| **Fishing Year** | **Dead** | **Alive** |
| 2018/2019 | 0 | 0 |
| 2019/2020 | 0 | 0 |
| 2020/2021 | 1 | 0 |
| 2021/2022 | 0 | 0 |
| 2022/2023 | 5 | 1 |

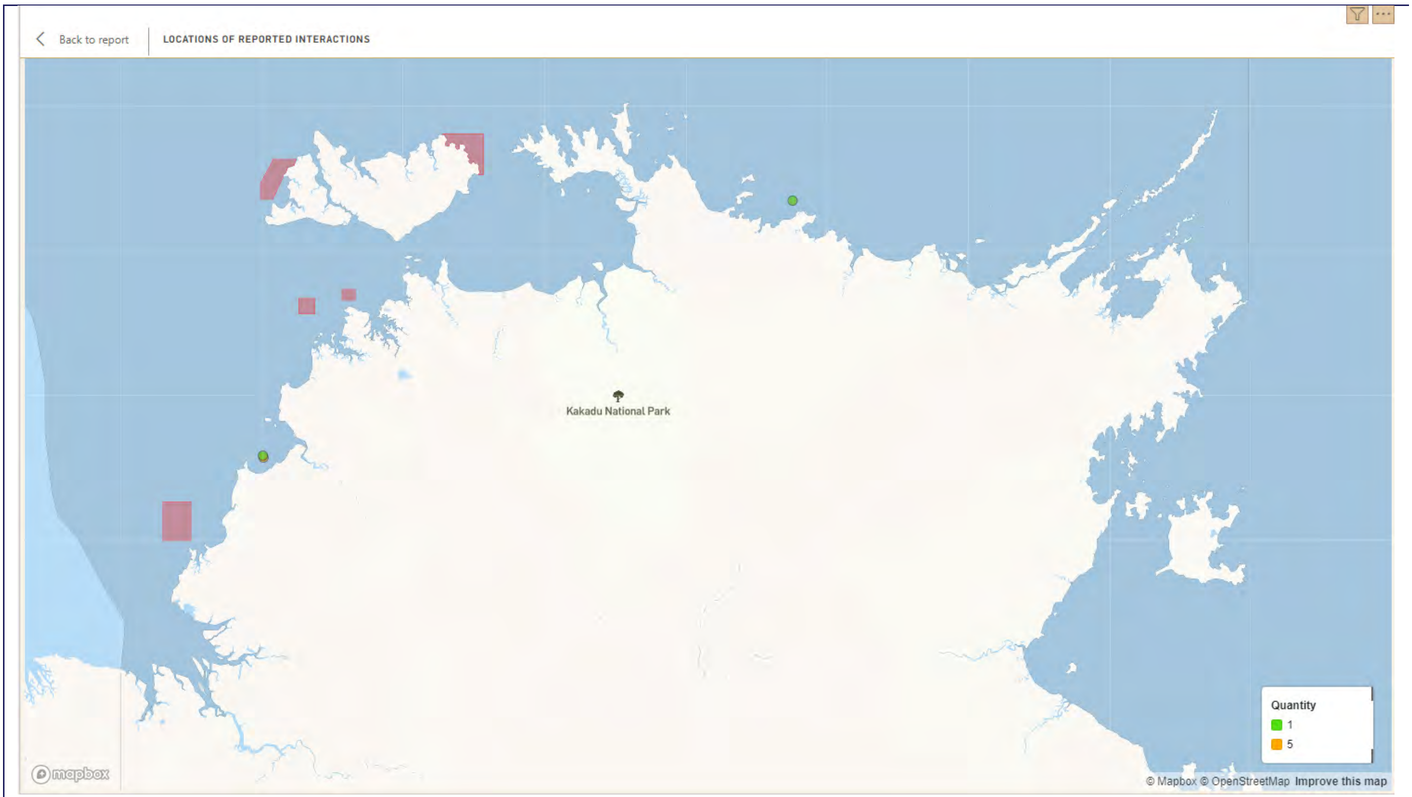



Figure 13. Reported number of interactions of Snubfin Dolphins in the NT ONLF from 2018/19 to 2022/23. The red shaded areas around the northwest coast are reef fish protection areas, which are no fishing zones for the ONLF.

## Humpback Dolphin (*Sousa sahulensis*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Humpback dolphin | *Sousa sahulensis* | Protected Wildlife (T) | Cetacean, Migratory. Under listing assessment by DCCEEW | Least Concern |

| Humpback Dolphin assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with TEPS.<br>Marine protected species in the Northern Territory identification guide developed<br>Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data. |
| **Distribution** | Australian Humpback Dolphins are found in tropical/subtropical waters of the Sahul Shelf from northern Australia to the southern waters of the island of New Guinea (Jefferson and Rosenbaum, 2014). In Australia, Humpback Dolphins were thought to be widely distributed along the northern Australian coastline from approximately the Queensland–New South Wales border to western Shark Bay, Western Australia (Parra & Cagnazzi 2016). However, no dedicated wide-scale surveys throughout this range have been conducted. A 2015 helicopter survey along the eastern half of the Northern Territory found Australian Humpback Dolphins were sparsely distributed across this region (Palmer et al. 2017). |

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|---|---|
| | Most studies to date indicate that Australian Humpback Dolphins occur mostly close to the coast (within 20 km from land), in waters less than 20 m deep, close to river mouths and in relatively sheltered offshore waters near reefs or islands (Allen et al., 2012; Corkeron et al., 1997; Palmer et al., 2014; Parra et al., 2004, 2006b, Parra & Cagnazzi 2016; Meager et al. 2018).<br><br>Stomach content analyses indicate Australian Humpback Dolphins feed mainly on fishes associated with coastal-estuarine waters (Parra and Jedensjö, 2014, cited in Parra & Cagnazzi 2016). A 2020 study in Western Australia (Hunt et al 2020) identified water depth and distance to coast as the most important variables influencing Humpback Dolphin presence, with dolphins showing a preference for shallow waters (5–15 m) less than 2 km from the coast.<br><br>In both Queensland and Northern Territory, Australian Humpback Dolphins have been also recorded as far as 20–50 km upstream in large rivers such as the East Alligator River, Northern Territory, and in the Fitzroy and Brisbane rivers in Queensland (Cagnazzi, 2011; Palmer et al., 2014; Parra et al., 2004, all cited in Parra & Cagnazzi 2016). |
| **Growth and reproduction** | Life history data are almost non-existent for Australian Humpback Dolphins. Body lengths range from 100 to 270 cm with females reaching average lengths of 230 cm and males 237 cm (Jefferson and Rosenbaum, 2014). Life history of this species is thought to be similar to that of Indo-Pacific Humpback Dolphins (*S. chinensis*), which has been studied in detail in Hong Kong and the Pearl River Estuary of China (Jefferson et al., 2012, cited in Parra & Cagnazzi 2016).<br><br>The gestation period of Indo-Pacific Humpback Dolphin lasts 10–12 months, lactation may last more than 2 years, female sexual maturity is reached at 9–10 years of age and male maturity at 12–14 years. Length at birth was estimated at 101 cm, and age at physical maturity is estimated at around 14–17 years of age (Jefferson et al., 2012, cited in Parra & Cagnazzi 2016). The generation length is estimated to be 25 years (Moore, in press). and they are expected to live to ages of over 40 years (Taylor et al., 2007, cited in Parra & Cagnazzi 2016). |
| **Population size** | At present, there is no range-wide estimate of the abundance of Australian Humpback Dolphins. Overall, available abundance estimates indicate that Australian Humpback Dolphins occur in small populations averaging 54–89 individuals and 0.1–0.19 individuals per km² (Parra & Cagnazzi 2016). Available data point toward Humpback Dolphins existing as a metapopulation of small and relatively isolated populations with limited gene flow among them (Brown et al., 2014; Brown et al. 2017; Parra et al., 2018).<br><br>In the NT, total abundance is estimated at 1753 individuals (Palmer et al. 2017).<br><br>Results from a recent Darwin region (Darwin and Bynoe Harbours, Shoal Bay) coastal monitoring program (Griffiths et al. 2020) spanning 2011-2019, highlighted the small, mobile, and variable nature of coastal |

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|---|---|
| | Humpback Dolphin populations in the Darwin region (an area of 1086 km$^2$). Annual population estimates across this period ranged from 61 to 107 individuals. A negative trend in abundance was reported across the study period.<br><br>Base Population Viability Analysis (PVA) suggests a high probability the regional Darwin population of Humpback Dolphins will remain extant for the next 100 years (von Takach et al 2020). |
| **Vulnerability** | Humpback Dolphins are vulnerable to habitat loss and depredation, indirect catches in trawl, gillnet, purse-seine and trap fisheries, vessel traffic and overfishing of prey resources (Parra & Cagnazzi 2016). Coastal dolphins are highly susceptible to human activities and environmental change (Brooks et al. 2017; Parra et al. 2006). Their coastal distribution combined with small local population sizes (Bejder et al. 2012) is likely to result in high negative impact even from irregular human-induced mortalities.<br><br>Given pelagic gillnets must not be used within 2 NM of the coastline and the species occurrence mostly in protected shallow waters close to the coast (Parra 2006; Parra et al. 2002), spatial overlap between ONLF fishing activity and key Humpback Dolphin habitats is likely to be limited. However, some overlap may occur in specific near-shore areas.<br><br>In the past 5 years, no interactions with Humpback Dolphins have been reported in the ONLF. Further, no interactions have been reported in the last 20 years, and on-board and electronic monitoring observers have not specifically reported any interactions with Humpback Dolphins.<br><br>On-board observer and electronic monitoring coverage has identified 4 undifferentiated dolphin interactions in the past 20 years, including 3 mortalities and one of unknown fate.<br><br>As Humpback Dolphins are morphologically similar to several other dolphin species, misidentification by fishers or on-board observers may impact reporting accuracy.<br><br>The table below shows reported interactions of dolphins in the last 10 years. Note that reporting improved around 2018/2019 to capture interactions at a species level. |

| | Pelagic Net | |
|---|---|---|
| Fishing Year | Dead | Alive |
| 2013/2014 | 1 | 0 |
| 2014/2015 | 2 | 0 |
| 2015/2016 | 1 | 1 |
| 2016/2017 | 1 | 0 |
| 2017/2018 | 1 | 1 |
| 2018/2019 | 0 | 1 |
| 2019/2020 | 0 | 0 |
| 2020/2021 | 0 | 0 |
| 2021/2022 | 0 | 0 |
| 2022/2023 | 0 | 0 |

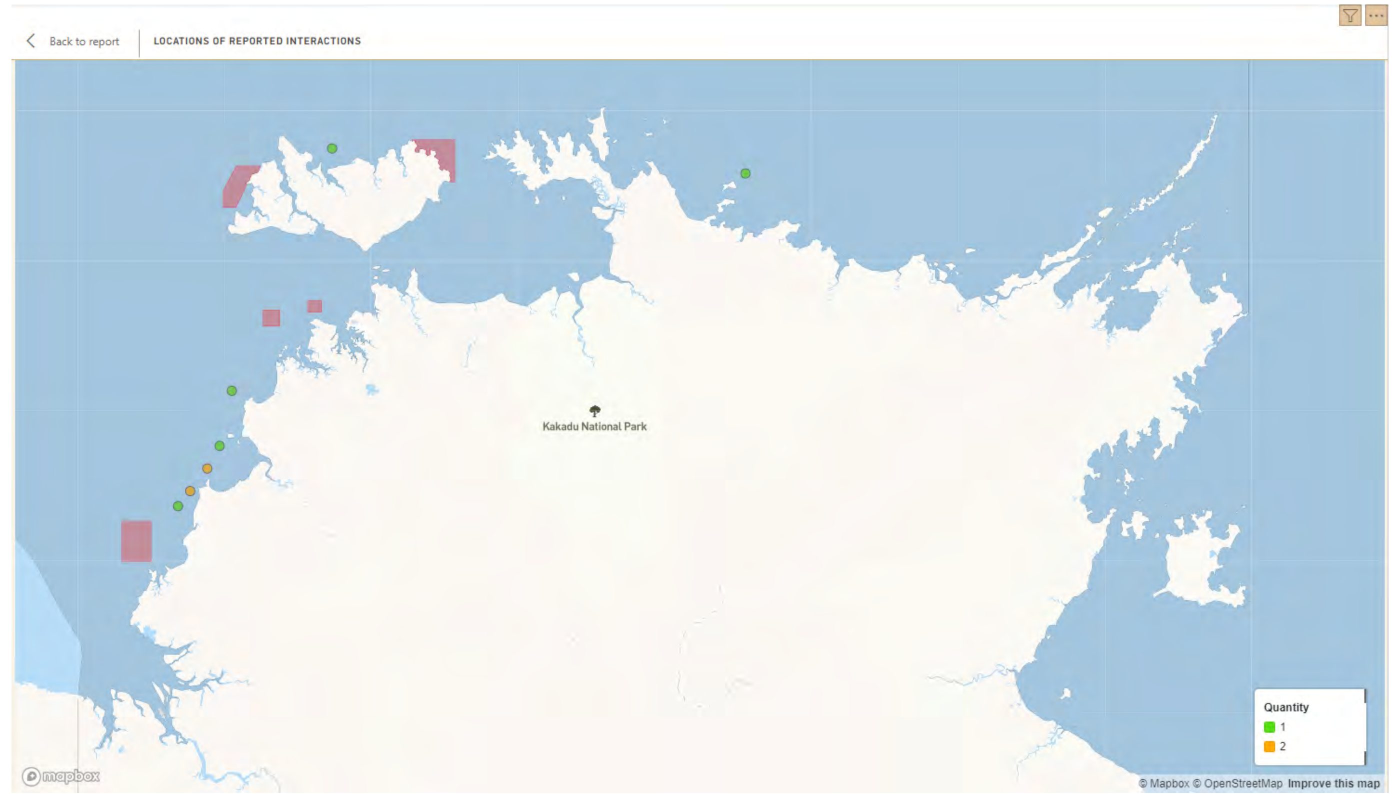


Figure 14. Reported number of interactions of Dolphins in the NT ONLF from 2013/14 to 2022/23. The red shaded areas around the northwest coast are reef fish protection areas, which are no fishing zones for the ONLF.

## Common Dolphin (*Delphinus delphis*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Common dolphin | *Delphinus delphis* | Protected Wildlife (T) | Cetacean | Least Concern |

| Common Dolphin assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with TEPS. |

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|---|---|
| | Marine protected species in the Northern Territory identification guide developed<br>Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data. |
| **Distribution** | Common Dolphins are found in offshore waters throughout much of the world. Although their Australian range map produced by DCCEEW includes waters off the Northern Territory, the IUCN range map does not (Braulik et al. 2019). The range map for the Common Dolphin in the authoritative Encyclopaedia of Marine Mammals (Perrin 2018) does not include the waters off the NT.<br><br>DCCEEW states that common dolphins are rarely seen in northern Australian waters). |
| **Growth and reproduction** | Information on reproduction is only available for populations outside of Australia. |
| **Population size** | There are no estimates of population size for Common Dolphins in Australian waters. Similarly, there is no information on population trends for this species. |
| **Vulnerability** | Main threats likely to affect Australian Common Dolphin populations include indirect catches in purse-seine, gillnet and trap fisheries, entanglements in debris (Shaughnessy et al. 2003), intentional killing (Kemper & Gibbs 2001), and pollution (Ross 2006). Death in fishing nets has been recorded in South Australia, Tasmania and Western Australia (Ross 2006). They are also caught in anti-predator nets set around tuna feedlots in South Australia (Kemper & Gibbs 2001) and in shark meshing to protect bathers in NSW.<br><br>In the past 5 years, 5 interactions have been reported with Common Dolphins in the ONLF, which have resulted in 5 mortalities. In the past 20 years, no additional interactions with Common Dolphins have been reported. However, an additional 8 interactions with unspecified dolphins, including 6 mortalities, have been reported in logbooks.<br><br>Further, on-board observer and electronic monitoring coverage has identified an additional 4 undifferentiated dolphin interactions in the past 20 years, including 3 mortalities and one of unknown fate.<br><br>Due to the very unlikely occurrence of this species in NT coastal waters, reported interactions with Common Dolphins may have resulted from misidentification of species more commonly encountered in those areas (e.g. one of the two species of Bottlenose Dolphin). |

| | Pelagic Net | |
|---|---|---|
| Fishing Year | Dead | Alive |
| 2018/2019 | 0 | 0 |
| 2019/2020 | 0 | 0 |
| 2020/2021 | 3 | 0 |
| 2021/2022 | 0 | 0 |
| 2022/2023 | 2 | 0 |

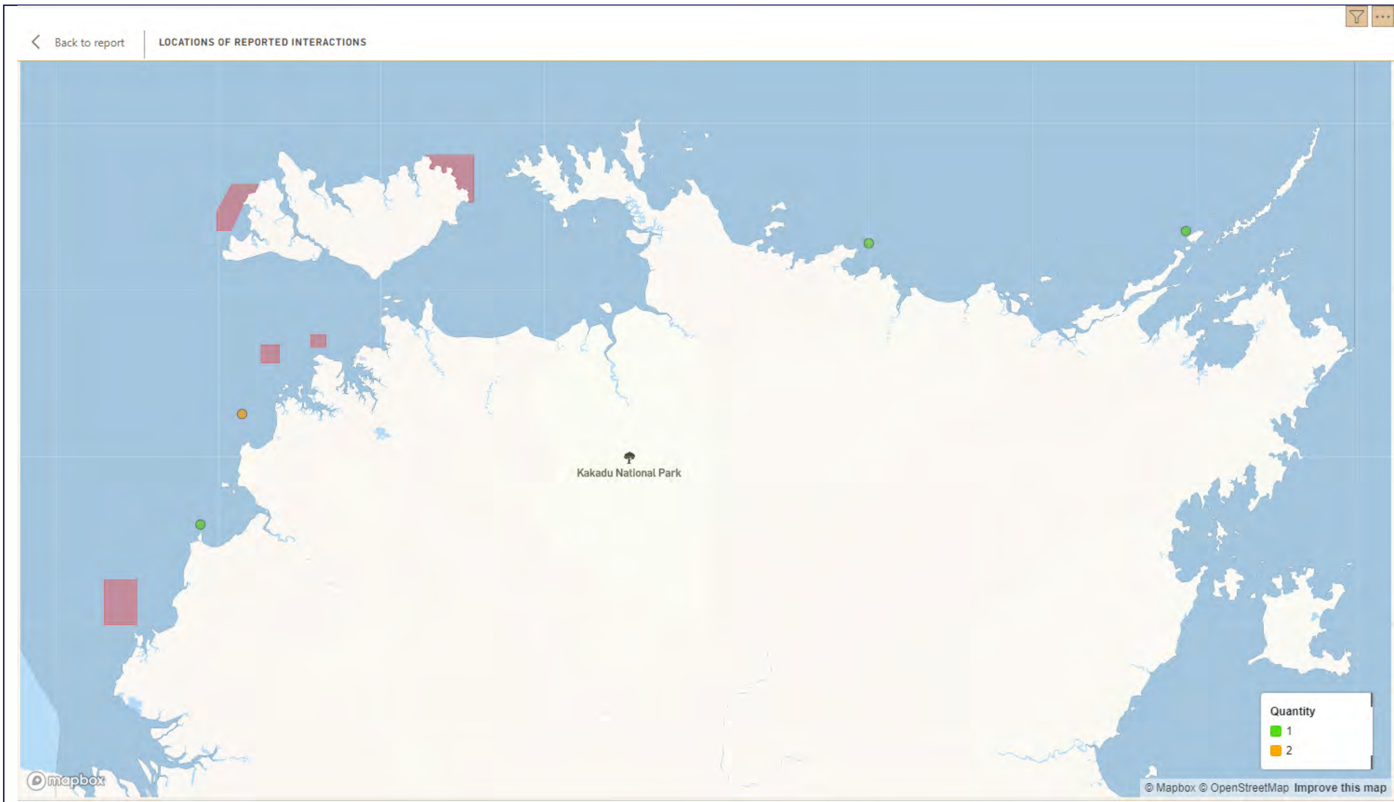


Figure 15. Reported number of interactions of Common Dolphins in the NT ONLF from 2018/19 to 2022/23. The red shaded areas around the northwest coast are reef fish protection areas, which are no fishing zones for the ONLF.

## Dugong (*Dugong dugon*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Dugong | *Dugong dugon* | Protected Wildlife (T) | Marine, Migratory | Vulnerable |

| Dugong assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with TEPS.<br>Marine protected species in the Northern Territory identification guide developed<br>Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data. |
| **Distribution and habitat** | Dugongs are broadly distributed throughout near-shore coastal habitats in the tropical Indo-West Pacific region, from the eastern coast of Africa eastward to New Caledonia, including the Arabian/Persian Gulf, southern Asia, Papua New Guinea and Northern Australia. Throughout much of its range, populations have declined significantly, and extirpations have been reported in China, the Maldives, Hong Kong, Mauritius and Taiwan, and parts of Cambodia, Japan, the Philippines and Vietnam (Lawler et al. 2002; Lin et al. 2022; Panyawai & Prathep 2022). A recent global synthesis (Marsh et al. in press) indicates that the species is likely to have never occurred in the Maldives or Taiwan but that it is extinct in Mauritius and Rodriguez, as |

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| | well as parts of several other range states and Endangered or Critically Endangered in several other parts of its global range. IUCN has declared the 'subpopulations' in Japan and East Africa as Critically Endangered and the New Caledonian 'subpopulation' as Endangered. Marsh et al. (in press) have identified 11 additional 'subpopulations' that may qualify for IUCN listing.<br><br>The northern Australian Dugong population is the largest in world, occurring in coastal and island waters from Shark Bay in Western Australia (25° S) across the northern coastline to Moreton Bay in Queensland (27° S) (Marsh et al. 2002, 2011a, in press). The winter range includes about 24 000 km of Australia's coast, which represents about 19% of the global extent of occurrence along coastline habitats (Marsh et al. 2011a). Stranded Dugongs have been recorded as far south as ~36.5° S on the east coast, with occasional sightings south to 32–33.5° S (Newcastle region) in summer (Allen et al. 2004). A single individual has been recorded in the Cocos (Keeling) Islands (Hobbs et al. 2007). Dugongs spend most of their time in the neritic zone, especially near tidal and subtidal seagrass meadows.<br><br>Specific areas supporting Dugongs in the Northern Territory include: the northern coast (Daly River to Millingimbi, including Melville Island and Vernon Islands and the Darwin region); and the Gulf of Carpentaria, including the Sir Edward Pellew Group of Islands, the mouth of the Limmen Bight River, and the waters between Blue Mud Bay and Groote Eylandt (Marsh et al. 2008, in press; Grech et al. 2011). |
| **Growth and reproduction** | Dugongs are long-lived and slow breeding. The oldest known wild Dugong was a female from Western Australia estimated to be more than 70 years old (Marsh 1995). Neither mature males nor mature females are continuously in breeding condition. Marked fluctuations have been documented in the pregnancy rate, the age at first reproduction in both sexes (7 -17 years in females; > 10 years in males) and the incidence of reproductively active males (Marsh 1995, Marsh and Kwan 2008; Burgess et al. 2012). These fluctuations are thought to be due to changes in habitat quality associated with extreme weather events.<br><br>Dugongs are diffusely seasonal breeders and the seasonality of breeding is more pronounced in the sub-tropics (mostly spring, early summer calving) than in the tropics where there is limited evidence of seasonal breeding. Usually, a single calf is born after a gestation period of about 14 months and nursed for 18 months or more. Twins are rare.<br><br>Dugong populations increase slowly with evidence suggesting up to 5% increase per annum under optimal conditions. In the remote GBR World Heritage Area off Cape York the Dugong population is estimated to have increased by 2% per year over the last 17 years (Cleguer et al. 2024). |
| **Population size and status** | Dugong aerial surveys have been conducted in Australia since the 1970s. The results of the large-scale aerial surveys that have been |

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|---|---|
| | conducted over dugong habitats in Australia since the 1980s suggest that dugong conservation status varies regionally within Australian coastal waters from increasing along the remote coast of the GBR World Heritage Area, stable along the Gulf of Carpentaria coast of the Northern Territory and Shark Bay World Heritage Area, declining along the urban coast of the GBRWHA, and uncertain in most other parts of their Australian range due to inadequate monitoring.<br><br>The dugong population estimate for the entire Territory coast is an estimated 8,176 (± 958) individuals (Groom et al 2017).<br><br>The Gulf of Carpentaria is the most important region in the NT for Dugongs. Based on the most recent (2019) aerial survey, the estimated population size in this region is 3390 (SE ± 1092) individuals (Griffiths et al. 2020). Surveys conducted in this region in 1994, 2007, 2014 and 2019 indicate that populations have remained stable throughout this period (Griffiths et al. 2020).<br><br>From aerial surveys conducted in the Darwin Harbour the Darwin region population has been estimated to be between 100-300 individuals (Buckee et al. 2014). |
| **Vulnerability** | Main threats likely to affect Dugong populations include habitat degradation (including coastal development, port expansion and aquaculture), entanglement and incidental bycatch in fisheries gear, Indigenous hunting, vessel strikes (Marsh et al 2002, in press; Haynes et al. 2005), and anthropogenic noise and acoustic disturbance (Marsh et al 2002; Haynes et al. 2005). Incidental bycatch in nets, particularly gillnets is the greatest global threat (Marsh and Sobtzick 2019).<br><br>Harvest by Traditional Owners in their Sea Country is a Native Title Right. Harvest numbers for the NT are unknown.<br><br>The conservation status of dugong varies throughout its range in Australia. It is listed as Vulnerable globally on the IUCN Red List and Threatened in QLD (Vulnerable) and NSW (Endangered). It is not listed as Threatened nationally or in WA or NT. It is classified as Near Threatened in the NT and is a Listed Migratory species under the EPBC Act.<br><br>Based on the results reported in Griffiths et al. (2020) and by Groom et al. (2017), there is no evidence to suggest that the Dugong is threatened at the NT scale, although their status along the northern coast is uncertain as there has only been a single baseline transect survey of this entire region (Groom et al. 2017). However, given their inherent life history traits (low reproductive output, slow to reach maturity and long-lived) that leave them vulnerable to decline and IUCN listing, the risk of any interactions with Dugongs is high.<br><br>The data from all the aerial surveys of the NT coast (see Cleguer and Marsh 2023), indicates that 744 (65%) of the 1136 sightings recorded |

within the range of the NT ONLF as they were sighted more than 2 nm offshore (Hamel and Marsh unpublished data).

One dugong interaction has been reported in the NT Offshore Net and Line Fishery in the past 5 years, which occurred in the vicinity of the Wessel Islands. No additional interactions have been reported in the history of the Fishery. Further, no interactions with dugongs have been reported by on-board or electronic monitoring observers. Given that the dugong is readily identifiable, misidentification by fishers or on-board observers is unlikely to impact the accuracy of reported interactions.

| | Pelagic Net | |
|---|---|---|
| Fishing Year | Dead | Alive |
| 2018/2019 | 0 | 0 |
| 2019/2020 | 0 | 0 |
| 2020/2021 | 0 | 0 |
| 2021/2022 | 0 | 1 |
| 2022/2023 | 0 | 0 |

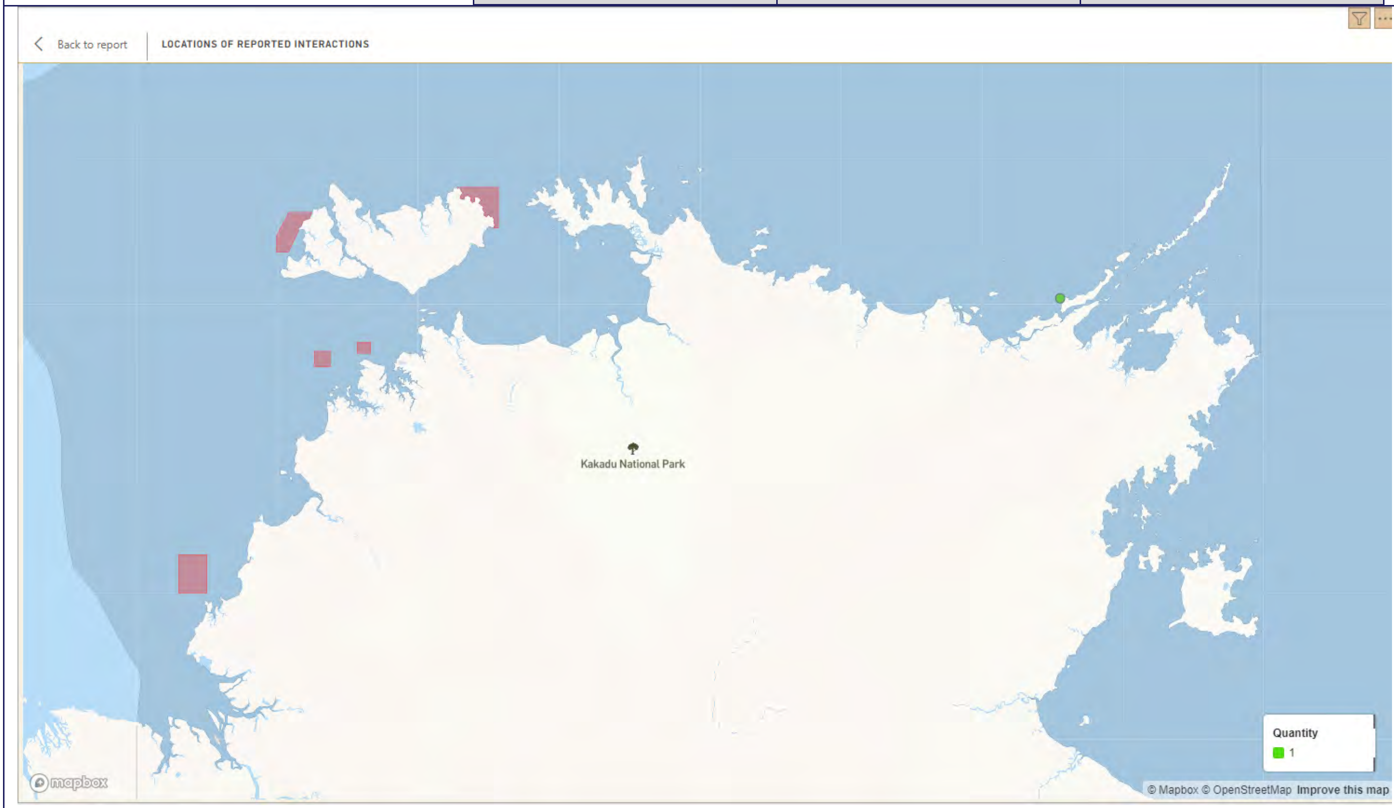


Figure 16. Reported number of interactions of Dugongs in the NT ONLF from 2021/22. There have been no other recorded historical reports of interactions with this species in the ONLF. The red shaded areas around the northwest coast are reef fish protection areas, which are no fishing zones for the ONLF.

## Northern River Shark (*Glyphis garricki)*

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Northern River Shark | *Glyphis garricki* | Aquatic Life, no-take/possession (F), Protected Wildlife (T), Endangered (T) | Endangered | Vulnerable |

| Northern River Shark assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with threatened, endangered and protected species (TEPS).<br>Marine protected species in the Northern Territory identification guide developed<br>Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.<br>Ecological Risk Mitigation Strategies were developed to include quarterly reporting with TEPS.<br>Handling and identification training for sawfish, rays and sharks undertaken with industry. |
| **Distribution and habitat** | The Northern River Shark has a patchy distribution across northern Australia (Western Australia and Northern Territory) and southern Papua New Guinea (Feutry et al. 2020). It is a euryhaline species, inhabiting freshwater, estuarine and continental shelf marine environments with high turbidity and fine muddy or silty substrates (Thorburn & Morgan, 2004; Pillans et al., 2009). Depth range is between 0-23m (Kyne et al., 2021b). Possible that long-term marine dispersal (sexually mature individuals have only been recorded in marine environments) (Pillans et al., 2009; Field et al., 2013); limited dispersal in juveniles (Feutry et al., 2020). |
| **Growth and reproduction** | Capture depths in Northern Territory and Western Australian rivers has ranged from 0.7 m to 2.3 m (Kyne, P. M. unpubl. data 2021). The exact location of pupping is not known, although it may be in the estuary.<br>Maximum size is 251 cm total length; male size-at-maturity is 141 cm total length; a female of 177 cm TL was mature although female size-at-maturity is likely smaller than this (Pillans et al. 2009, Feutry et al. 2020).<br>Reproduction is viviparous with yolk-sac placenta (Kyne et al., 2021), a litter size of 9 pups (based on one gravid female; Pillans et al. 2009), a possible biennial reproductive cycle, and a size-at-birth of 50–65 cm TL (Pillans et al. 2009).<br>Greater gaps for life history parameters for *Glyphis garricki* (Constance et al., 2024). |
| **Population size** | Fine-scale population structuring, five distinct regional groups – King Sound and Cambridge Gulf, WA, Daly River and Van Diemen Gulf NT, and Papua New Guinea; limited reproductive (potentially male-biased) dispersal; reproductive philopatry in both sexes (Feutry et al., 2020).<br>Based on Close-Kin Mark-Recapture, the population size is estimated to be 580-1100 mature individuals in the Van Diemen Gulf of the Northern Territory (Bravington et al. 2019). |
| **Vulnerability** | This species is caught as bycatch in subsistence, small-scale, commercial, and recreational fisheries and although retention is prohibited in Australia, it is retained in Papua New Guinea for its meat and fins by small-scale fishers. The Northern River Shark occupies large tidal rivers, |

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| | estuaries, and coastal waters, which increases the susceptibility to the impacts of human activities - particularly fishing and habitat modification (Grant et al. 2019). In Australia, the species is incidentally caught in commercial inshore gillnet, line, and pot fisheries, and is subject to minor levels of Indigenous harvest, and illegal recreational take (Field et al. 2013, DoE 2015b, Kyne and Feutry 2017, Kyne et al. 2021).<br><br>No interactions have been reported with Northern River Sharks in the Offshore Net and Line Fishery during the past 5 years.<br><br>In the past 20 years, no additional interactions have been reported with Northern River Sharks, however an additional 4 interactions, including 1 mortality, have been reported with *Glyphis spp.*<br><br>In the past 20 years, no interactions have been reported by on-board or electronic monitoring observers.<br><br>Given that Northern River Sharks are morphologically similar to a range of other Carcharhinid sharks, misidentification may potentially impact reporting accuracy. |

## Speartooth Shark (*Glyphis glyphis*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Speartooth Shark | *Glyphis glyphis* | Aquatic Life, no-take/possession (F), Protected Wildlife (T), Vulnerable (T) | Critically endangered | Vulnerable |

| Speartooth Shark assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with threatened, endangered and protected species (TEPS).<br>Marine protected species in the Northern Territory identification guide developed.<br>Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.<br>Ecological Risk Mitigation Strategies were developed to include quarterly reporting with TEPS.<br>Handling and identification training for sawfish, rays and sharks undertaken with industry. |
| **Distribution and habitat** | The Speartooth Shark has a relatively restricted and patchy distribution, occurring in parts of Northern Australia and southern Papua New Guinea. It is a euryhaline species, inhabiting macrotidal rivers, estuaries, and coastal areas. Recent surveys have increased the known distribution, including rivers of the western Top End (NT) and the Kimberley region of Western Australia (Kyne et al. 2021). Species distribution models suggest that the species may occur more-widely than currently known based on habitat suitability (Udyawer et al. 2021). Likely marine dispersal (adults) whereas there is high site fidelity with smaller individuals occupying smaller home ranges (Lyon et al., 2017). Juveniles may remain in river nurseries for several years (Feutry et al., 2017). Short-term movement ecology suggests movement up and |

| | |
|---|---|
| | downstream follow daily tidal movement, with individuals moving on average 12km and up to 25km per tidal cycle (Pillans et al., 2008; Pillans et al. 2009). Long-term movement ecology suggests downstream at onset of freshwater inflow (wet season), upstream to lower estuaries during dry season (juveniles) (Dwyer et al., 2020; Lyon et al., 2017; Pillans et al., 2022). Larger individuals trend towards river mouth (Pillans et al., 2009). Depth range is between 0 – 23m (Kyne et al., 2021b). |
| **Growth and reproduction** | Maximum size is unknown but is at least 260 cm total length (TL); size-at-maturity is also unknown with a ~228cm TL male (White et al., 2015) and ~250cm TL females (Ebert et al., 2021a) suggesting a large size-at-maturity (White et al. 2015). Reproduction is viviparous with yolk-sac placenta, possible litter size of 6–7 pups (based on anecdotal reports from PNG fishers), may be both annual and biennial reproductive cycle within populations (Patterson et al., 2022). Parturition may be between September – December (Pillans et al., 2009; Lyon et al., 2017). A size-at-birth of 50–65 cm TL (Pillans et al. 2009, White et al. 2015, White et al. 2017a). Age-at-length is under investigation in this species (P.M. Kyne and M.I. Grant unpubl. data 2021) and Kyne et al. (2021) used a generation length of 18 years. This is further supported by consideration of age data from northern Australia for the euryhaline and sympatric Bull Shark where female age-at-maturity is 9.5 years and maximum age is 26 years, resulting in a generation length of 18 years (Tillet et al. 2011). Age at maturity is > 12 years (Kyne et al., 2022b). |
| **Population size** | The Speartooth Shark shows a high degree of population structuring. Molecular analysis from northern Australia show two genetically distinct units which might be considered to be subpopulations: Wenlock River, Queensland, and Van Diemen Gulf, Northern Territory (NT) (Feutry et al. 2014, Feutry et al. 2017). The species displays strong female philopatry to each of these rivers with males likely moving between rivers less than 150 km apart in the Van Diemen Gulf (Feutry et al. 2014, Feutry et al. 2017, Patterson et al. 2022).<br>Based on Close-Kin Mark-Recapture, the population size is estimated to be 892 adults for the Adelaide River, and 1128 adults for the Alligator Rivers (Patterson et al. 2022). |
| **Vulnerability** | This species is caught as bycatch in subsistence, small-scale, commercial, and recreational fisheries and although retention is prohibited in Australia, it is retained in Papua New Guinea for its meat and fins by small-scale fishers. The Northern River Shark occupies large tidal rivers, estuaries, and coastal waters, which increases the susceptibility to the impacts of human activities - particularly fishing and habitat modification (Grant et al. 2019). In Australia, the species is incidentally caught in commercial inshore gillnet, line, and pot fisheries, and is subject to minor levels of Indigenous harvest, and illegal recreational take (Field et al. 2013, DoE 2015b, Kyne and Feutry 2017, Kyne et al. 2021).<br><br>Two interactions with Speartooth Sharks have been reported in the last five years, both of which were mortalities. However, these interactions were reported by an operator who was misidentifying Sandbar Sharks as Speartooth Sharks, which was confirmed via electronic monitoring review for other reported interactions. The reported interactions were all reported outside the typical distribution of this species. Thus, it is |

considered to be unlikely that the reported interactions were indeed Speartooth Sharks.

In the past 20 years, no additional interactions have been reported with Northern River Sharks, however an additional 4 unvalidated interactions, including 1 mortality, have been reported with *Glyphis spp.*

In the past 20 years, an additional 7 interactions with Speartooth Sharks, including 5 mortalities and 1 of unknown fate, have been reported by observers.

Given that Speartooth Sharks are morphologically similar to a range of other Carcharhinid sharks, and fishers are known to have misreported other sharks as Speartooth Sharks, misidentification is known to impact reporting accuracy.

| | Longlines | | Pelagic Net | |
|---|---|---|---|---|
| Fishing Year | Dead | Alive | Dead | Alive |
| 2018/2019 | 0 | 0 | 0 | 0 |
| 2019/2020 | 0 | 0 | 0 | 0 |
| 2020/2021 | 0 | 0 | 0 | 0 |
| 2021/2022 | 0 | 0 | 2* | 0 |
| 2022/2023 | 0 | 0 | 0 | 0 |

*misreported species of Speartooth Sharks. Species were identified as Sandbar Sharks and validated through electronic monitoring.

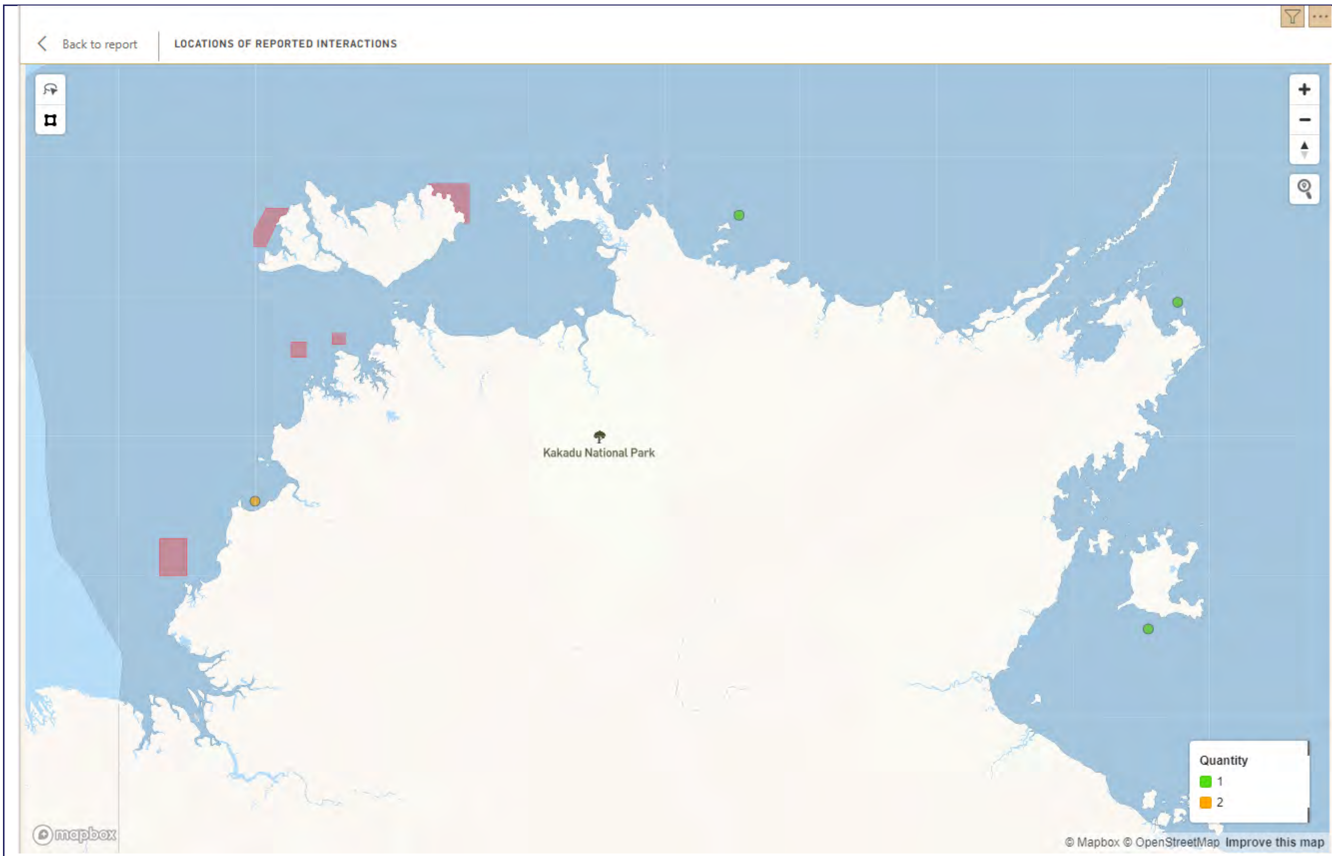


Figure 17. Reported number of interactions of River Sharks in the NT ONLF from 2013/14 to 2022/23. Note, the interactions shown above were reported as Glyphis spp in 2014. The red shaded areas around the northwest coast are reef fish protection areas, which are no fishing zones for the ONLF.

### Dwarf Sawfish (*Pristis clavata*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Dwarf sawfish | *Pristis clavata* | Aquatic Life, no-take/possession (F), Protected Wildlife (T), Vulnerable (T) | Vulnerable; Migratory | Critically Endangered |

| Dwarf Sawfish assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with threatened, endangered and protected species (TEPS).<br>Marine protected species in the Northern Territory identification guide developed<br>Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.<br>Ecological Risk Mitigation Strategies were developed to include quarterly reporting with TEPS.<br>Handling and identification training for sawfish, rays and sharks undertaken with industry. |
| **Distribution and habitat** | Dwarf sawfish can be found in waters of Australia (Northern Territory, Western Australia and Queensland), Indonesia and Papua New Guinea (Espinoza et al., 2022, Kyne et al. 2013a). |

| | |
|---|---|
| | Habitat partitioning between adults and juveniles (Constance et. al. 2024). Short-term movements may follow the tidal cycle and direction (Constance et al., 2024)<br><br>Seasonal migration in response to environmental factors such as freshwater flow, salinity and temperature (Morgan et al., 2021, Constance et al., 2024). *P. clavata* appear to avoid low salinity/freshwater environments (Morgan et al., 2021).<br>*P. clavata* appears to make diel movements between different depths, occupying shallower depths at night and deeper water in the mornings (Morgan et al., 2021).<br>The species inhabits shallow (<20 m in depth) coastal waters and estuarine habitats (Thorburn et al. 2008, Stevens et al. 2008). Shallow edges of estuaries are important for juveniles as nursery habitat and for predator avoidance (Morgan et al., 2021). Larger *P. clavata* use deeper water than smaller *P. clavata* (Morgan et al., 2021).<br>Recreational fishing may also have a relative minor impact on the species and there is an unquantified Aboriginal harvest. |
| **Growth and reproduction** | Acoustic telemetry data indicated extended residency and return to the same areas of habitat across years, indicating site fidelity (Morgan et al., 2021).<br><br>Genetic research indicates restricted maternal and paternal dispersal in Australian waters (Phillips et al., 2011, Phillips et al., 2017a, b).<br><br>Size at birth = 65 cm; Max size 310 cm; male size at maturity 255-260 cm (Last and Stevens 2009). |
| **Population size** | Populations in Western Australia, the NT, and Queensland are distinct maternal and paternal genetic stocks given the population genetic structure observed and the unique genetic biodiversity observed regionally (Phillips et al., 2011, Harrison and Dulvy, 2014). There may be finer scale genetic structuring, including within NT waters, but further research to understand the geographic locations and scale of population structuring is needed (Phillips et al., 2017b). |
| **Vulnerability** | The long, toothed rostrum of sawfish makes them particularly vulnerable to entanglement in fishing gear. The sharp teeth on the rostrum create a safety issue for fishers trying to safely disentangle and release sawfish.<br><br>Sawfish handling training can improve handling safety and efficacy e.g. through the use of situational risk assessment, the use of hands-free-release ropes on the sawfish rostrum and tail (Ronstan bail shackle clips, or the drawstring knot), and sending the animal in to tonic immobility (Sharks and Rays Australia, 2024).<br><br>Sawfish fins are among the most valuable in the fin trade and this may lead to the removal of animals (Haque et al., 2023).<br><br>Frequent capture in gill net and trawl fisheries is a cause of decline globally and domestically (Haque et al., 2023, Simpfendorfer and Rigby, 2023). Outside of Australia, the harvest of fins, meat and rostra has been a source of the removal of animals (Haque et al., 2023). In Australia, where sawfish trade |

is prohibited, incidental capture in net fisheries results in the removal of animals through incidental mortality.

Sawfish can survive interactions with gill nets, which may be in part due to them being able to ventilate their gills when stationary (Wueringer et al., 2017).

In the past 5 years, 28 interactions with Dwarf Sawfish, and 3 mortalities, have been reported in the ONLF. As Dwarf Sawfish are morphologically similar to other sawfishes, misidentification may potentially impact reporting accuracy.

Regional natal philopatric reproductive behaviour of males and females increases the risk of localised depletion (Phillips et al., 2017b).

| | Longlines | | Pelagic Net | |
|---|---|---|---|---|
| Fishing Year | Dead | Alive | Dead | Alive |
| 2018/2019 | 0 | 0 | 0 | 1 |
| 2019/2020 | 0 | 0 | 0 | 0 |
| 2020/2021 | 0 | 1 | 0 | 0 |
| 2021/2022 | 0 | 0 | 3 | 23 |
| 2022/2023 | 0 | 0 | 0 | 0 |

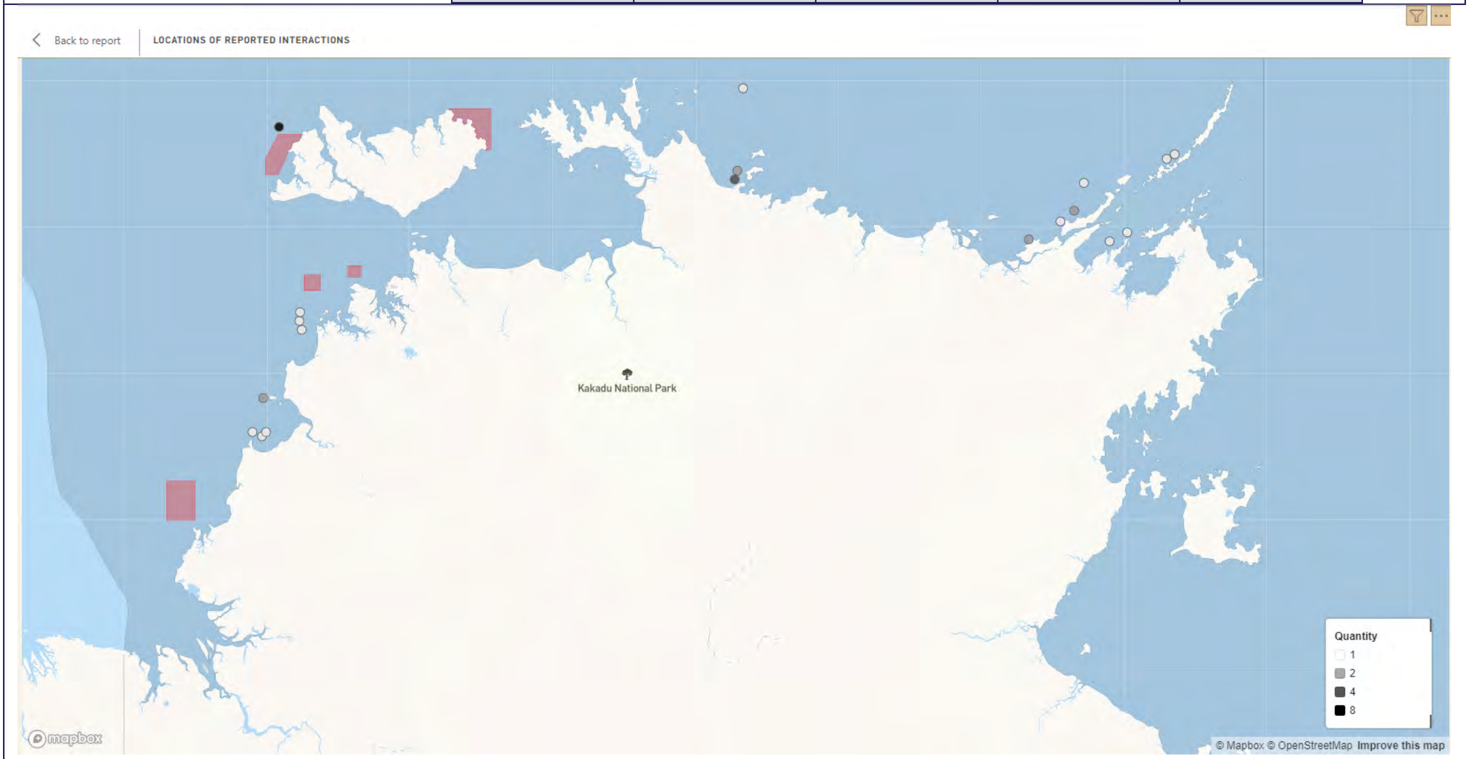


Figure 18. Reported number of interactions of Dwarf Sawfish in the NT ONLF from 2013/14 to 2022/23. The red shaded areas around the northwest coast are reef fish protections areas, which are no fishing zones for the ONLF.

## Green Sawfish (*Pristis zijsron*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Green Sawfish | *Pristis zijsron* | Aquatic Life, no-take/possession (F), Protected Wildlife, Vulnerable (T) | Vulnerable; Migratory | Critically Endangered |

| Green Sawfish assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with threatened, endangered and protected species (TEPS).<br>Marine protected species in the Northern Territory identification guide developed<br>Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.<br>Ecological Risk Mitigation Strategies were developed to include quarterly reporting with TEPS.<br>Handling and identification training for sawfish, rays and sharks undertaken with industry. |
| **Distribution and habitat** | • In the NT, Green Sawfish have been recorded in very shallow waters (<1 m in depth) in inshore coastal environments including estuaries, river mouths and along sandy and muddy beaches, to offshore trawl grounds in over 70 m of water (Thorburn et al. 2004; Stevens et al. 2005).<br>• Tropical and subtropical waters of the Indo-Pacific (Harry et al., 2022).<br>• Habitat partitioning between adults and juveniles (Constance et al., 2024).<br>• Short-term movements may follow the tidal cycle and direction (Constance et al., 2024).<br>• Seasonal migration in response to environmental factors such as salinity and temperature (Constance et al., 2024)<br>The Green Sawfish is the largest extant sawfish reaching up to 7.3 meters in length and 50 years of age. |
| **Growth and reproduction** | Regional natal philopatric reproductive behaviour of males and females increases the risk of local extirpation (Phillips et al., 2017b).<br><br>Given the life history of Green Sawfish (i.e. they prefer clearer water at the juvenile stage and move to depths of over 70 m when mature).<br><br>Productivity of green sawfish is low compared to elasmobranch species ($r$=0.473 yr$^{-1}$) (Tobin et al., 2010). Growth rates in juvenile sawfish on the Western Australian coast is significantly slower than populations on the north-eastern coast (Lear et al., 2023).<br>Size at birth 80cm; both sex mature at 300 cm (Last and Stevens 2009). |
| **Population size** | No data is available for green sawfish population trends in the Northern Territory and the Gulf of Carpentaria, although reports of green sawfish still occur in the region, with evidence of recruitment in these areas identified in 2022 (Harry et al., 2022).<br><br>Genetic research indicates restricted maternal and paternal dispersal in Australian waters (Phillips et al., 2017a, b). There may be finer scale genetic |

structuring, including within NT waters, but further research to understand the geographic locations and scale of population structuring is needed (Phillips et al., 2017b).

Green Sawfish populations have undergone a significant range contraction:

- Green sawfish were estimated to have disappeared from 38% of their global range in 2016 (Dulvy et al., 2016).
- Possibly extinct in 11 out of 36 range states (Harry et al., 2022)

The geographic distribution of Green Sawfish has declined in Australian waters. On the East Coast of Australia records south of Cairns are now rare, and it is possibly extinct in New South Wales (Harry et al. 2011, Wueringer 2017). In 2002, it was reported that populations of Green Sawfish had been significantly reduced in NT waters (Pogonoski et al. 2002).

**Vulnerability**

Global declines are mainly attributed to overexploitation and fisheries impacts (particularly trawl and gillnet fisheries), and extensive habitat degradation (Tobin et al., 2010, Harry et al., 2022). Populations on the East Coast of Australia may have undergone local extirpations so severe that it may not be possible for the species to recover to ecologically functional abundance (Tobin et al., 2010, Harry et al., 2022).

Sawfish fins are among the most valuable in the fin trade and this may lead to the removal of animals (Haque et al., 2023).

Green sawfish have extremely high susceptivity to net fishery capture across all habitats, with high post release mortality (Tobin et al., 2010). The long, toothed rostrum of sawfish makes them particularly vulnerable to entanglement in fishing gear. The sharp teeth on the rostrum create a safety issue for fishers trying to safely disentangle and release sawfish. Sawfish can survive interactions with gill nets, which may be in part due to them being able to ventilate their gills when stationary (Wueringer et al., 2017).

In the past 5 years, 83 interactions with Green Sawfish, and 2 mortalities, have been reported in the ONLF. As Green Sawfish are morphologically similar to other sawfishes, misidentification may potentially impact reporting accuracy.

| | Longlines | | Pelagic Net | |
|---|---|---|---|---|
| Fishing Year | Dead | Alive | Dead | Alive |
| 2018/2019 | 0 | 0 | 1 | 9 |
| 2019/2020 | 0 | 1 | 0 | 11 |
| 2020/2021 | 0 | 2 | 0 | 29 |
| 2021/2022 | 0 | 0 | 0 | 14 |
| 2022/2023 | 0 | 0 | 1 | 15 |

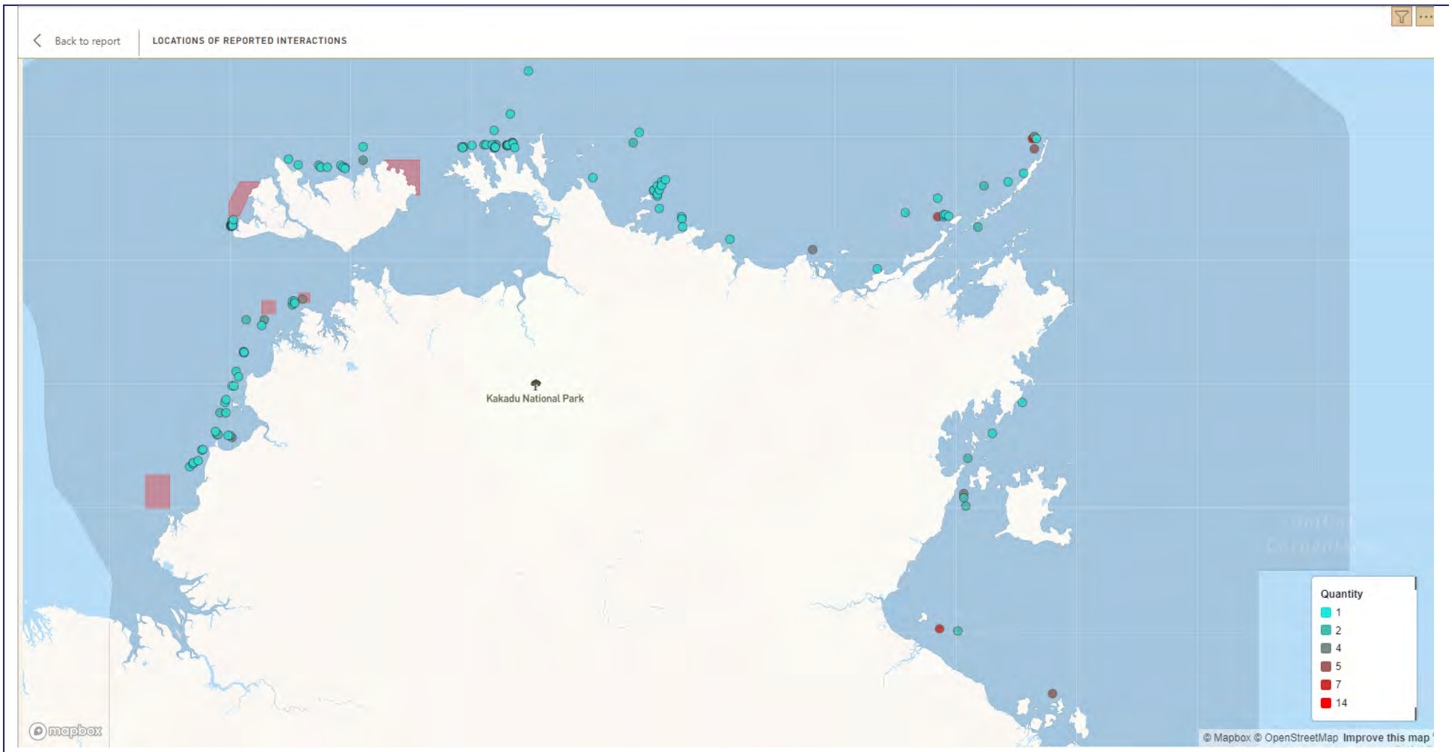


Figure 19. Reported number of interactions of Green Sawfish in the NT ONLF from 2013/14 to 2022/23. The red shaded areas around the northwest coast are reef fish protections areas, which are no fishing zones for the ONLF.

### Largetooth Sawfish (*Pristis pristis*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Largetooth Sawfish | *Pristis pristis* | Aquatic Life, no-take/possession, Protected Wildlife, Vulnerable (T) | Vulnerable; Migratory | Critically Endangered |

| Largetooth Sawfish assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with threatened, endangered and protected species (TEPS).<br>Marine protected species in the Northern Territory identification guide developed<br>Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.<br>Ecological Risk Mitigation Strategies were developed to include quarterly reporting with TEPS.<br>Handling and identification training for sawfish, rays and sharks undertaken with industry. |
| **Distribution and habitat** | The Largetooth Sawfish occurs in circum-tropical waters across the Western Atlantic, eastern Pacific, Eastern Atlantic and the Indo-West Pacific (Espinoza et al., 2022). Largetooth sawfish are extant in Australia (Western Australia, Northern Territory and Queensland).<br>Largetooth Sawfish adults are known to live in waters up to 100 km offshore. Largetooth Sawfish move to mouths of rivers and in estuaries to pup during the wet season and move back to offshore waters. It is |

| | |
|---|---|
| | understood that juvenile Largetooth Sawfish migrate upstream into the freshwater and then move downstream and into the marine environment as they mature (Thorburn et al. 2004; Peverell 2008).<br><br>There is evidence for habitat partitioning between adults and juveniles (Constance et al., 2024). Short-term movements may follow the tidal cycle and direction (Constance et al., 2024) |
| **Growth and reproduction** | Size at birth 70-90 cm; males and females mature at 300 cm (Last and Stevens 2009). |
| **Population size** | Largetooth Sawfish considered depleted in the Australian Shark and Ray Report Card (see Simpfendorfer and Rigby, 2023).<br>All sawfish face a very high risk of global extinction due to steep declines in their abundance and declines in their range of occurrence (Dulvy et. al., 2016).<br><br>The distribution of the Largetooth Sawfish in now patchy throughout the Indo-West Pacific. Australia remains as the most significant stronghold in the Indo-West Pacific (Espinoza et al., 2022).<br>In Australian waters a decline of over 80% is suspected over the last three generation lengths (68 years) (Kyne et al. 2021). However, low levels of fishing, human population density, and habitat modification suggests threats to the species are low in the northern coast of Western Australia and in the Northern Territory, and sightings of this species also remain fairly common in this region (Espinoza et al., 2022). |
| **Vulnerability** | Sawfish have high relative susceptibility to fishing gear, the long, toothed rostrum of sawfish makes them particularly vulnerable to entanglement in fishing gear (Tobin et al., 2010). The sharp teeth on the rostrum create a safety issue for fishers trying to safely disentangle and release sawfish.<br>• Sawfish fins are among the most valuable in the fin trade (Haque et al., 2023).<br>• Sawfish can survive interactions with gill nets, which may be in part due to them being able to ventilate their gills when stationary (Wueringer et al., 2017).<br>• Habitat degradation is a major concern, in some areas (Espinoza et al., 2022).<br><br>*P. pristis* is extremely sensitive to changes in freshwater availability. They are sensitive to water resource development, particularly developments that reduce water flow and dampen floods (Plaganyi et al., 2024). Drought is a threat to *P. pristis* too. Animals have been found to have significantly poorer body condition associated with long dry seasons, low volumes of wet season flooding and limited overbank flooding (Lear et al., 2021). Actions that impact water flow such as water course diversions, dams, barrages, road crossings and water extraction for mining and agriculture can severely impact or lead to the local extirpation of sawfish (see Plagányi et al., 2024). Recruitment benefits from freshwater flow associated with large flood events (Lear et al., 2021).<br><br>Genetic research indicates restricted maternal dispersal in Australian waters (Phillips et al., 2017a, b). Each river system should be treated as a |

distinct maternal stock for management purposes (Feutry et al. 2015, Phillips et al., 2011, Phillips et al., 2017b). There is potentially no female immigration between regions, due to strong maternal philopatry, and therefore likely limited capacity for recovery via immigration following localised declines or extinctions (Feutry et al. 2015, Phillips et al., 2011). The strong maternal philopatry observed may be linked to juvenile reliance on freshwater habitat (Phillips et al., 2017b).

In the past 5 years, 3 interactions with Largetooth Sawfish, and no mortalities, have been reported in the ONLF. As Largetooth Sawfish are morphologically similar to other sawfishes, misidentification may potentially impact reporting accuracy.

| Pelagic Net | | |
|---|---|---|
| Fishing Year | Dead | Alive |
| 2018/2019 | 0 | 1 |
| 2019/2020 | 0 | 0 |
| 2020/2021 | 0 | 0 |
| 2021/2022 | 0 | 0 |
| 2022/2023 | 0 | 2 |


Figure 20. Reported number of interactions of Largetooth Sawfish in the NT ONLF from 2013/14 to 2022/23. The red shaded areas around the northwest coast are reef fish protections areas, which are no fishing zones for the ONLF.

## Narrow Sawfish (*Anoxypristis cuspidata*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Narrow Sawfish | *Anoxypristis cuspidata* | Not listed | Migratory, Under threatened listing assessment | Critically Endangered |

| Narrow Sawfish assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with threatened, endangered and protected species (TEPS).<br>Marine protected species in the Northern Territory identification guide developed<br>Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.<br>Ecological Risk Mitigation Strategies were developed to include quarterly reporting with TEPS.<br>Handling and identification training for sawfish, rays and sharks undertaken with industry. |
| **Distribution** | Narrow Sawfish have an indo-Pacific distribution and are found in Queensland, Western Australia and Northern Territory in Australia. Benthopelagic ray that inhabits estuarine, inshore and offshore waters up 128m deep, commonly in 0-40m deep (2023 Shark and ray Report Card).<br><br>Habitat partitioning occurs between juveniles and adults, and between male and female adults. Juveniles are found inshore and utilise nursery grounds (Constance et al., 2024, White et al., 2013). Mature individuals found offshore and inshore (Constance et al., 2024).<br><br>Genetic research indicates female natal philopatry and male biased dispersal (d'Anastasi 2010, Green et al. 2018, Feutry et al, 2021). Three tagged females at liberty for 1 to 24 months were found within approximately 20km of their tagging locations in the Northern Territory, suggesting site fidelity (G. Johnson, pers. comm. 2010, d'Anastasi 2010). |
| **Growth and reproduction** | Size at birth 70 cm; males size at maturity 200 cm, females size at maturity 225 cm.<br>Pupping occurs in wet season until beginning of dry (May) (Constance et al., 2024). |
| **Population size** | In Australia declines of 30-49% are suspected, however, fishing mortality has been reduced over the last two decades due to protections and management changes that may have slowed declines (Kyne et al. 2021, Haque et al., 2023, Simpfendorfer and Rigby, 2023).<br><br>Historic population declines are largely unquantified and likely occurred prior to the 2000's in Australia primarily due to interactions with trawl and gill net fisheries (Kyne et al. 2021).<br><br>Internationally, populations have undergone a significant range contraction, Narrow sawfish were estimated to have disappeared from 30% of their global range in 2016 (Dulvy et al., 2016). |
| **Vulnerability** | Narrow sawfish have high susceptibility to net fishery capture due to the long, toothed rostrum of sawfish makes them particularly vulnerable to |

entanglement in fishing gear. The sharp teeth on the rostrum create a safety issue for fishers trying to safely disentangle and release sawfish.

It has been suggested that Narrow Sawfish likely have higher post-release mortality rates than other sawfish, however, more research is needed to properly quantify post-release mortality rates for this species (Salini et al. 2007).

Sawfish fins are among the most valuable in the fin trade and this may lead to the removal of animals (Haque et al., 2023).

In Australia, where sawfish trade is prohibited, incidental capture in net fisheries results in the removal of animals through incidental mortality (Haque et al., 2023). Sawfish can survive interactions with gill nets, which may be in part due to them being able to ventilate their gills when stationary (Wueringer et al., 2017).

In an assessment of animals caught in the Queensland Gulf of Carpentaria set net fisheries (subdivided into inshore and offshore), distinct differences were found between catch in the two fisheries zones. Inshore catch (operating out to 7 nm) recorded no mature animals with a slightly skewed sex ratio of 1.15 females to 1 male. Offshore catch (operating from 7 nm to 25 nm) recorded only mature adults, with a stronger skew in sex ratio of 2.1 females to 1 male (Peverell, 2005, Tobin et al., 2010).
The philopatric behaviour of females increases the risk of local extirpation (Green et al. 2018, Feutry et al, 2021, Phillips et al., 2017b).

In the past 5 years, 106 interactions with Narrow Sawfish, and 11 mortalities, have been reported in the ONLF. As Narrow Sawfish are morphologically similar to other sawfishes, misidentification may potentially impact reporting accuracy.

| Pelagic Net | | |
|---|---|---|
| Fishing Year | Dead | Alive |
| 2018/2019 | 7 | 7 |
| 2019/2020 | 0 | 23 |
| 2020/2021 | 1 | 21 |
| 2021/2022 | 2 | 17 |
| 2022/2023 | 1 | 27 |

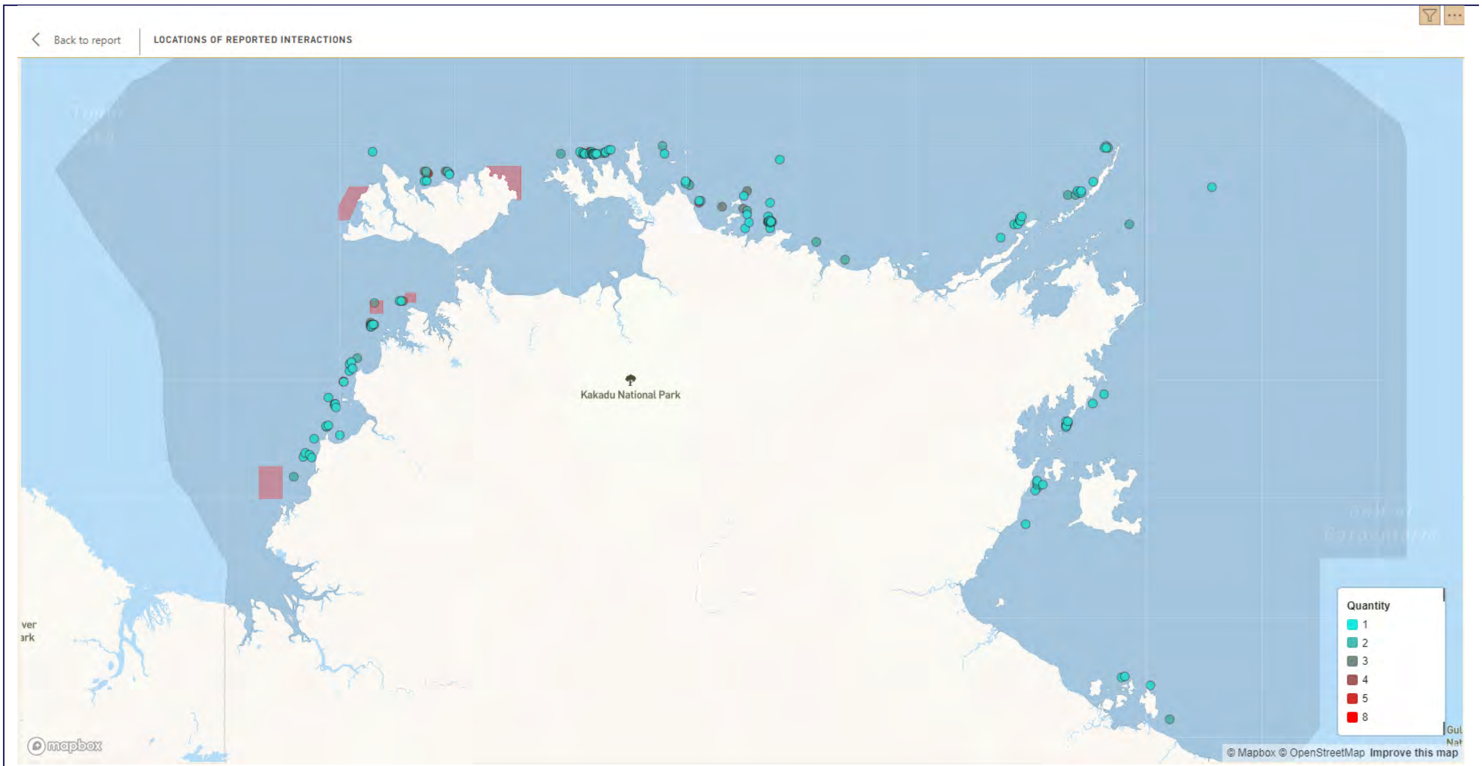


Figure 21. Reported number of interactions of Narrow Sawfish in the NT ONLF from 2013/14 to 2022/23. The red shaded areas around the northwest coast are reef fish protections areas, which are no fishing zones for the ONLF.

## Manta Ray (*Mobula alfredi* and *Mobula birostris*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status |
|---|---|---|---|
| Giant Manta Ray | *Mobula birostris* | Not Listed (F) (T) | Listed migratory |
| Reef Manta | *Mobula alfredi* | Not Listed (F) (T) | Listed migratory |

| Manta Rays assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with threatened, endangered and protected species (TEPS).<br>Marine protected species in the Northern Territory identification guide developed<br>Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.<br>Ecological Risk Mitigation Strategies were developed to include quarterly reporting with TEPS.<br>Handling and identification training for sawfish, rays and sharks undertaken with industry.<br>Guidelines for handling and releasing manta and devil rays developed. |
| **Distribution** | The Giant Manta Ray is circumglobal in tropical to temperate waters (Lawson et al. 2017). It occurs across northern Australia in a wide range from Montague Island (New South Wales) to Shark Bay (Western Australia) (Last and Stevens 2009, Last et al. 2016, Armstrong et al. 2020). The Giant Manta Ray is mainly pelagic from the surface to a depth of 1,000 m (Marshall et al. 2019). |

<table>
<tr><td></td><td>The Reef Manta has an Indo-west Pacific distribution including Red Sea, South Africa, north to Japan and as far east as the Hawaiian Islands. Found across Northern Australia.</td></tr>
<tr><td>Growth and reproduction</td><td>Giant Manta Ray<br>References Last et al. 2016, Stevens et al. 2018, Marshall et al. 2019, Marshall et al. 2024).
<table>
<tr><td>Longevity and maximum size</td><td>Longevity: estimated 45 years<br>Max size: 700 cm DW</td></tr>
<tr><td>Age and/or size at maturity (50%)</td><td>Males: 9 years, 350–400 cm DW<br>Females: 9–12 years, 380–500 cm DW</td></tr>
<tr><td>Litter size</td><td>One large pup (122-200 cm DW) born possibly every 4-5 years.</td></tr>
</table>
<br>Reef Manta Ray
<table>
<tr><td>Longevity and maximum size</td><td>Longevity: estimated 45 years<br>Max size: 500 cm DW</td></tr>
<tr><td>Age and/or size at maturity (50%)</td><td>Males: 9 years, 270-300 cm DW<br>Females: 8-17 years, 300–350 cm DW</td></tr>
<tr><td>Litter size</td><td>One large pup (130-150 cm DW) born possibly every 1-7 years.</td></tr>
</table></td></tr>
<tr><td>Population size</td><td>Giant Manta Ray<br>The Giant Manta Ray is migratory with a global population although most movement appears to be regional within ocean basins (Marshall et al. 2019).<br><br>Reef Manta Ray<br>There is limited information of the connectivity of Reef Manta Rays in Australia. However, Reef Manta Rays appear to display a high degree of site residency and limited movement between widely separated areas (Marshal et al. 2019).</td></tr>
<tr><td>Vulnerability</td><td>The Manta Ray is targeted and caught incidentally in industrial and artisanal coastal and pelagic fisheries, including purse seines and gillnets, and is retained for its highly valued gill plates and for its meat (except in Australia) (Marshall et al. 2019). In Australia, it is very occasionally incidentally caught by the Commonwealth Eastern and Western Tuna and Billfish Fisheries. It was assessed as at low risk from these two fisheries (Zhou et al. 2009, Sporcic et al. 2018). It is occasionally encountered in the Queensland and New South Wales shark control programs (Sumpton et al. 2011, DPI 2021), and may infrequently interact with other Australian fisheries. It would be released as it is a protected species in all Australian Commonwealth waters since 2012 when it was listed as a migratory species under the Environment Protection and Biodiversity Conservation Act 1999, and is protected in most state and Territory waters.<br><br>Current and ongoing high levels of exploitation and demand for its meat and high-value gill plates throughout much of its distribution, including regionally within Southeast Asia where rapid localised depletions have occurred (Marshall et al. 2019).<br><br>In the past five years, a total of 124 interactions with Manta Rays. Of those 124 interactions 19 reported dead in pelagic net, 104 released alive in pelagic net and 1 released alive in longlines.</td></tr>
</table>

| | Longline | | Pelagic Net | |
|---|---|---|---|---|
| Fishing Year | Dead | Alive | Dead | Alive |
| 2018/2019 | 0 | 0 | 0 | 8 |
| 2019/2020 | 0 | 0 | 0 | 16 |
| 2020/2021 | 0 | 0 | 18 | 37 |
| 2021/2022 | 0 | 1 | 1 | 35 |
| 2022/2023 | 0 | 0 | 0 | 8 |

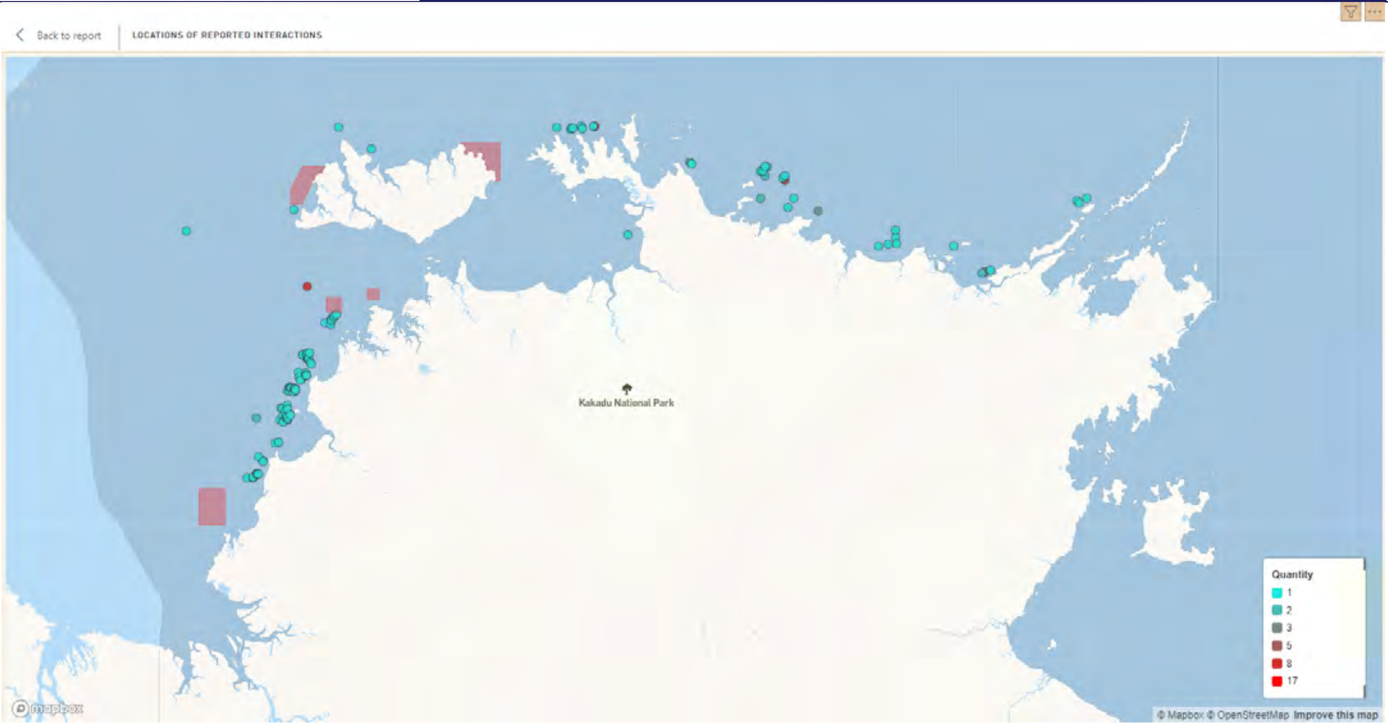

Figure 22. Reported number of interactions of Manta Rays in the NT ONLF from 2013/14 to 2022/23. The red shaded areas around the northwest coast are reef fish protections areas, which are no fishing zones for the ONLF.

## Pygmy Devilray (*Mobula eregoodoo* and *Mobula kuhlii*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status |
|---|---|---|---|
| Pygmy Devilray | *Mobula eregoodoo* | Not Listed (F) (T) | CITES Appendix II |

| Pygmy Devilray assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with threatened, endangered and protected species (TEPS).<br>Marine protected species in the Northern Territory identification guide developed<br>Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.<br>Ecological Risk Mitigation Strategies were developed to include quarterly reporting with TEPS.<br>Handling and identification training for sawfish, rays and sharks undertaken with industry. |

Guidelines for handling and releasing manta and devil rays developed.

**Distribution**

The Long-horned Pygmy Devilray is found patchily in tropical to subtropical waters of the Indo-West Pacific from South Africa to Australia (Notarbartolo di Sciara et al. 2020). It occurs across northern Australia in a wide range from Evans Head (New South Wales) to Exmouth (Western Australia), though records are patchy and it may be misidentified with the closely related Kuhl's Devilray (M. kuhlii) from which it has only recently been taxonomically separated (Broadhurst et al. 2018, Notarbartolo di Sciara et al. 2020, Kyne et al. 2021).
The Long-horned Pygmy Devilray is pelagic in inshore and offshore waters, including in coral reef habitats, on the continental shelf at depths of 0–50 m (Notobartolo di Sciara et al. 2020).

**Growth and reproduction**

***Mobula eregoodoo*** (Rigby et al. 2022)

| | |
|---|---|
| Longevity and maximum size | Longevity: unknown<br>Max size: 130 cm DW |
| Age and/or size at maturity (50%) | Males: 99 cm DW<br>Females: 93 cm DW |
| Litter size | One large pup (43 cm DW) born possibly every 1-3 years. |

***Mobula kuhlii*** (Rigby et al. 2022)

| | |
|---|---|
| Longevity and maximum size | Longevity: unknown<br>Max size: 135 cm DW |
| Age and/or size at maturity (50%) | Males: ~115 cm DW<br>Females: ~116 cm DW |
| Litter size | One large pup (31-34 cm DW) born possibly every 1-3 years. |

**Population size**

Little is known of stock structure and connectivity of devilrays in Australia.
In Australia, the population is suspected to be stable due to relatively low fishing effort within its range (Kyne et al. 2021).

**Vulnerability**

In Australia, devilrays are incidentally caught in gillnet fisheries. Mobula spp. are very infrequently caught in gillnets in the Queensland East Coast Inshore Fishery (Harry et al. 2011) and Gulf of Carpentaria Inshore Fishery. However, fishing related risks are being managed and interaction rates in these two inshore fisheries are not expected to have a significant or long-term impact on their sustainability (Jacobsen et al. 2021a, b).

- Low productivity.
- Across northern Australia, many parts of the species' range have low fishing effort and the species would receive refuge in the extensive network of marine parks (Parks Australia 2023).

| | Pelagic Net | |
|---|---|---|
| **Fishing Year** | **Dead** | **Alive** |
| 2018/2019 | 0 | 2 |
| 2019/2020 | 4 | 84 |
| 2020/2021 | 11 | 169 |
| 2021/2022 | 6 | 268 |

| | | | |
|---|---|---|---|
| | 2022/2023 | 10 | 398 |

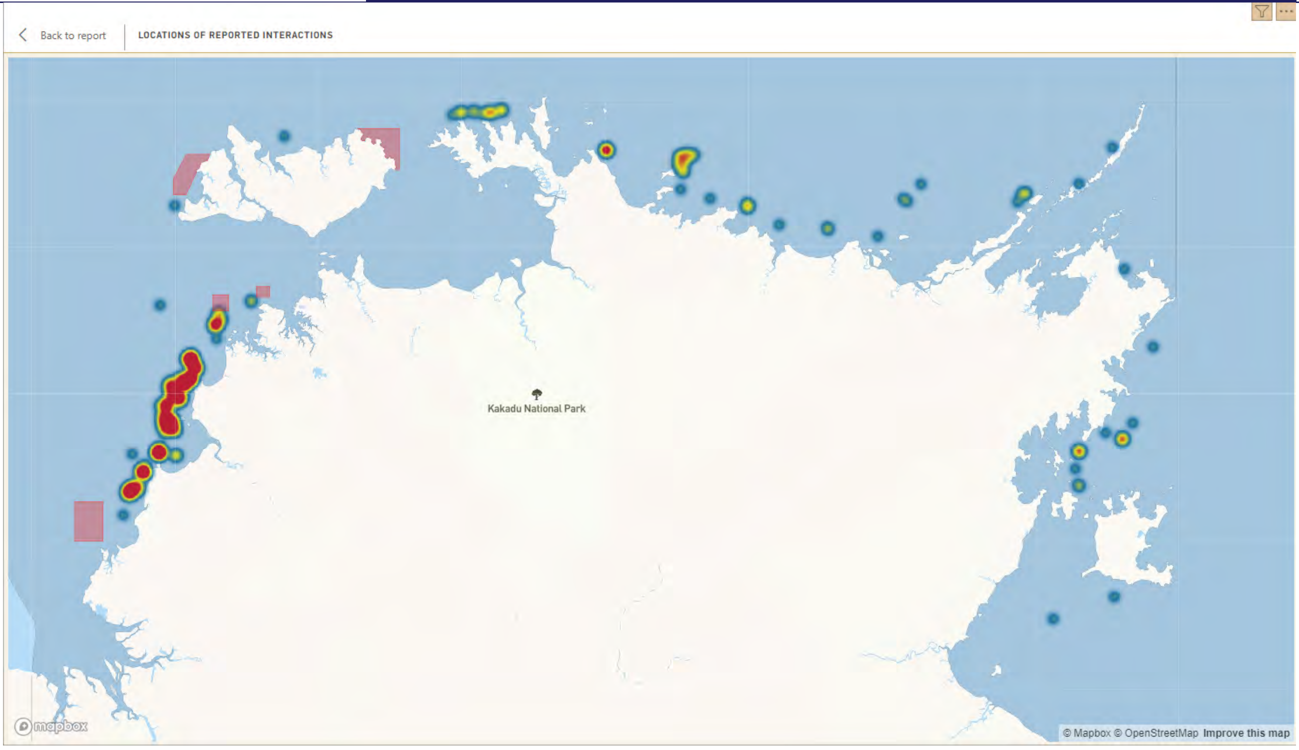


Figure 23. Reported number of interactions of Pygmy Devilray in the NT ONLF from 2013/14 to 2022/23. The red shaded areas around the northwest coast are reef fish protections areas, which are no fishing zones for the ONLF.

## Flatback Turtle (*Natator* depressus)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Flatback Turtle | *Natator depressus* | Protected Wildlife (T) | Vulnerable, Marine, Migratory | Data Deficient |

| Flatback Turtle assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with threatened, endangered and protected species (TEPS).<br>Marine protected species in the Northern Territory identification guide developed<br>Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.<br>Ecological Risk Mitigation Strategies were developed to include quarterly reporting with TEPS. |
| **Distribution** | Flatback Turtles are restricted to tropical waters of Australia and New Guinea. They have an extensive distribution around the coastline of the Northern Territory (NT).They have an extensive distribution around the coastline of the Northern Territory (NT), and have been recorded breeding at a large number of mainland and island sites (Chatto 1998).<br>Flatback Turtles inhabit shallow, soft-bottomed sea beds and feed on soft corals and soft-bodied animals such as jellyfish and sea cucumbers. Breeding can occur during any month of the year, though breeding may peak in winter (Chatto 1998). |

| | |
|---|---|
| **Growth and reproduction** | While absolute age has not been determined in wild turtles, Flatback Turtles are presumed to be slow growing, taking decades to grow from hatchlings to breeding adults (Limpus 2007). As part of a long-term growth/aging study, the first adult, tagged as a hatchling at the Mon Repos rookery, returned for her first breeding at 21 years of age (Limpus 1985 cited in Limpus 2007). The reproductive half-life is estimated at 10.1 years (Parmenter & Limpus 1995).<br>In northern Australia, nesting occurs throughout the year with most nesting between June and August (Guinea 1994a; Guinea & Whiting 1999). In western Northern Territory, some nesting occurs year round though nesting density reaches a peak in July (Fry 1913 in Limpus 2007). This dry season peak of nesting activity may be adaptive to protect the eggs from the high lethal sand temperatures that occur in the wet season (Guinea 1994 in Limpus 2007).<br>Post-hatchlings are surface-water dwelling, feeding on macroplankton. These post-hatchlings are predated on by fish and sharks and White-bellied Sea Eagles (Haliaeetus leucogaster). The duration of the post-hatchling life stage is unknown (Limpus 2007).<br>Unlike other sea turtle species, Flatback Turtles lack an oceanic phase and remain in the surface waters of the continental shelf (Limpus et al. 1994e; Walker 1994). Once the pelagic stage of its life is completed, the Flatback Turtle moves to sub-tidal soft bottomed habitats inshore, feeding on benthic organisms. Little is known about their foraging habits and habitat. |
| **Population size** | Dutton and colleagues (2002) and Limpus (2007) identify seven genetic stocks. The NT stock include the following areas. Cobourg Peninsula, Field Island, Quail Island, Bare Sand Island and the Cape Domett nesting population of Bonapart Gulf in Western Australia may be part of this stock. |
| **Vulnerability** | Flatback Turtles face a number of threats associated with the following broad categories of human activity: commercial and recreational fishing; coastal infrastructure and development (including industrial, residential and tourism development); Indigenous harvest; feral animal predation; and climate change. Some specific threats, such as light pollution, may be associated with more than one of these broad categories.<br>Analysis of logbook data for the ONLF indicated that 9 Flatback Turtles were recorded for the period 2019-20 to 2022-23, with all animals being released alive. As Flatback Turtles are morphologically similar to other turtles, misidentification may potentially impact reporting accuracy. |

| Fishing Year | Pelagic Net Dead | Pelagic Net Alive |
|---|---|---|
| 2018/2019 | 0 | 0 |
| 2019/2020 | 0 | 6 |
| 2020/2021 | 0 | 0 |
| 2021/2022 | 0 | 2 |
| 2022/2023 | 0 | 1 |


Figure 24. Reported number of interactions of Flatback Turtle in the NT ONLF from 2013/14 to 2022/23. The red shaded areas around the northwest coast are reef fish protections areas, which are no fishing zones for the ONLF.

## Green Turtle (*Chelonia mydas*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Green Turtle | *Chelonia mydas* | Protected Wildlife (T) | Vulnerable, Marine, Migratory | Endangered |

| Green Turtle assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with threatened, endangered and protected species (TEPS).<br>Marine protected species in the Northern Territory identification guide developed<br>Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.<br>Ecological Risk Mitigation Strategies were developed to include quarterly reporting with TEPS. |
| **Distribution** | Green turtles occur in seaweed-rich coral reefs and inshore seagrass pastures in tropical and subtropical areas of the Indo-Pacific region. In Australia, the nesting distribution extends from Western Australia's North West Shelf to the Southern Great Barrier Reef.<br>Green Turtles nest, forage and migrate across tropical northern Australia, key nesting and inter-nesting areas (where females live between laying successive clutches in the same season) in the NT include:<br>• Coburg Peninsula<br>• Between Nhulunbuy and northern Blue Mud Bay (East Arnhem Land)<br>• Groote Island<br>• Offshore Islands including Crocker Island, Goulburn Island<br>• Sir Edward Pellew Islands |

| | |
|---|---|
| | • Tiwi Islands<br>• Wessel and English Islands<br>• Rocky Island<br>It is estimated that most (and possibly all) of the Green Turtles that nest in north-east Arnhem Land remain in the Gulf of Carpentaria to feed (Kennett et al. 1998). In Western Australia, Green Turtles tagged during nesting in on Lacepede Island move to foraging grounds in the Kimberley region of Western Australia, Arnhem Land, the Gulf of Carpentaria, and Indonesia (Prince 1993; Prince 1994b). Satellite tracking has shown that Green Turtles nesting on Barrow Island and Sandy Island (Scott Reef, Western Australia) feed between 200 km and 1000 km from their nesting beaches (Pendoley 2005). |
| **Life history** | In the NT, Green Turtles nest mainly on wide beaches backed by large dune systems, and may occur at high densities in such sites. Individuals disperse widely from nesting beaches to feeding areas in coastal and oceanic waters.<br>Adult Green Turtles are primarily herbivorous, feeding mostly on seagrass and algae, while juveniles are carnivorous. |
| **Population size** | The total Australian population of Green Turtles is estimated to be more than 70 000 individuals, distributed across seven regional populations. |
| **Vulnerability** | In Australia, the main current threats to Green Turtles are disturbance (e.g. light disturbance) and habitat damage due to coastal development; by-catch from fisheries and shark control measures; predation on nests; boat strikes; entanglement and ingestion of marine debris; and in some areas, indigenous harvesting (DEWHA 2008; Lanyon et al. 1989). Potential threats include changes to the sea surface temperature, particularly changes to the Southern Oscillation Index, which determines breeding intervals; chance disasters (e.g. oil spills); and feral predator invasions (DEH 2005b).<br>Analysis of logbook data for the ONLF indicated that 14 Green Turtles were recorded for the period 2019-20 to 2022-23. One mortality was recorded and all other animals were released alive. As Green Turtles are morphologically similar to other turtles, misidentification may potentially impact reporting accuracy. |

| | Pelagic Net | |
|---|---|---|
| Fishing Year | Dead | Alive |
| 2018/2019 | 0 | 1 |
| 2019/2020 | 0 | 6 |
| 2020/2021 | 0 | 1 |
| 2021/2022 | 0 | 3 |
| 2022/2023 | 0 | 3 |

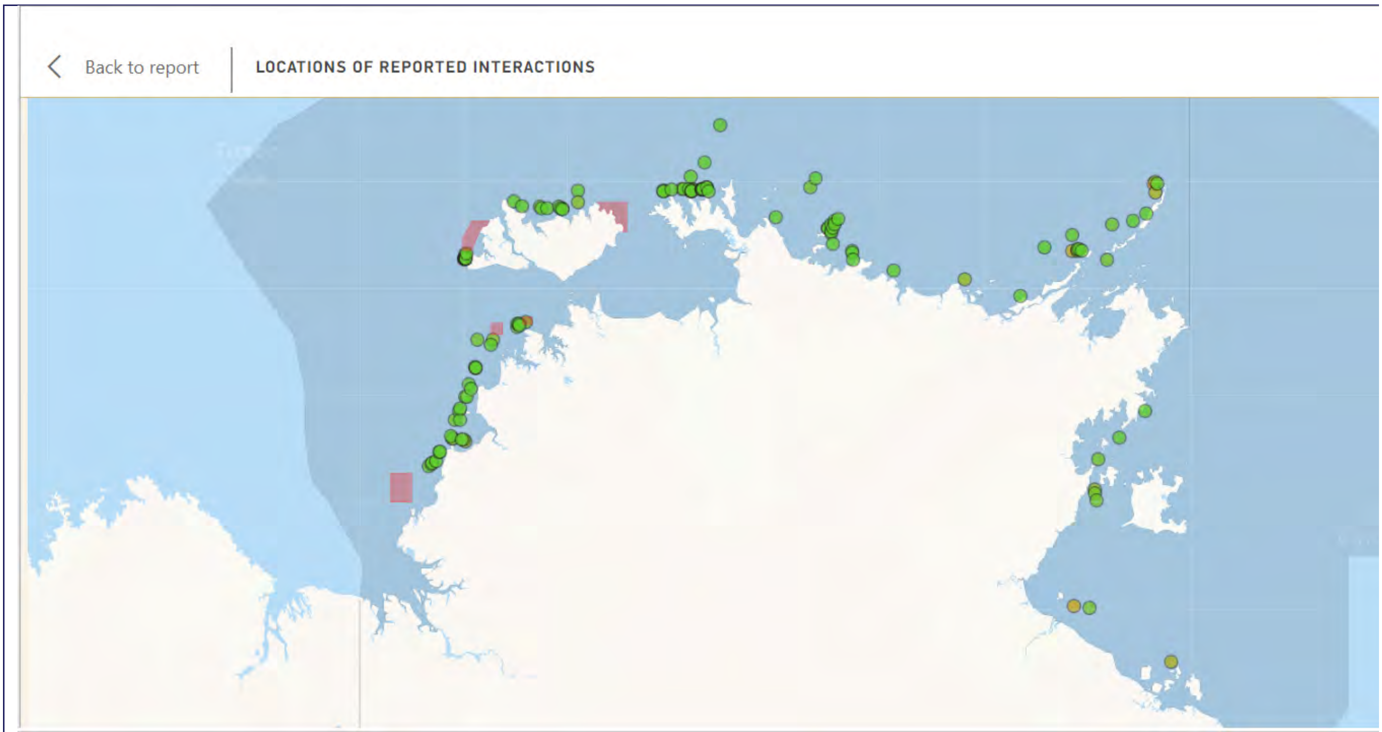


Figure 25. Reported number of interactions of Green Turtle in the NT ONLF from 2013/14 to 2022/23. The red shaded areas around the northwest coast are reef fish protections areas, which are no fishing zones for the ONLF.

## Hawksbill Turtle (*Eretmochelys imbricate*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Hawksbill Turtle | *Eretmochelys imbricata* | Protected Wildlife, Vulnerable (T) | Vulnerable, Marine, Migratory | Critically Endangered |

| Hawksbill Turtle assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with threatened, endangered and protected species (TEPS).<br>Marine protected species in the Northern Territory identification guide developed Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.<br>Ecological Risk Mitigation Strategies were developed to include quarterly reporting with TEPS. |
| **Distribution** | Hawksbill Turtles occur in tropical, subtropical and temperate waters of all oceans of the world. In Australia, there are two main genetically isolated subpopulations: one on the west coast and the other in the Top End and north-eastern Queensland.<br>In the NT, most nesting occurs on islands rather than mainland beaches. Principal nesting sites are concentrated around north-eastern Arnhem Land and Groote Eylandt |
| **Life history** | Nesting usually occurs from late winter to early summer. Individuals disperse widely from nesting beaches to feeding areas in coastal and oceanic waters; though some individuals may be largely resident around preferred feeding areas. Hawksbill Turtles are omnivorous, eating a wide variety of plants and animals including sponges, gastropods, seagrass and algae. |

**Population size**

The total population of Hawksbill Turtles in Australia is unknown. However, Australia supports the largest hawksbill turtle nesting aggregations worldwide, with estimates of over 4000 females nesting annually in Queensland, over 2500 in the Northern Territory, and ~2000 in Western Australia (Miller et al. 1995; Meylan and Donnelly 1999; Limpus 1998; Limpus et al. 2000 all cited in Hoenner et al. 2016).

In Australia, there are two genetically separate subpopulations; one in the northern Great Barrier Reef, Torres Strait and Arnhem Land; and the other on the North West Shelf of Western Australia. This genetic distinctiveness means that individuals from the two subpopulations interbreed very rarely (Broderick et al. 1995).

**Vulnerability**

The major cause of mortality of juvenile and adult Hawksbill Turtles in NT waters is entanglement in marine debris. The NT Marine WildWatch program collates stranding records of marine fauna and indicate less than 10 Hawksbill Turtles are killed annually, although this estimate is likely to be under-reported. Other potential threats include by-catch in commercial fisheries, and predation of eggs and young by domestic and feral Dogs *Canis familiaris*, feral Pigs *Sus scrofa* and monitors *Varanus spp*.

The global population size of the Hawksbill Turtle has declined, evidently mostly as a result of harvesting for food. Hawksbill Turtles in NT waters are part of a larger subpopulation and heavy harvesting continues in neighbouring countries, such as Indonesia. There is some local Indigenous harvest of Hawksbill Turtles in NT waters but this is not considered to have a significant impact on the species.

Analysis of logbook data for the ONLF indicated that 54 Hawksbill Turtles were recorded for the period 2019-20 to 2022-23. One mortality was recorded and all other animals were released alive. As Hawksbill Turtles are morphologically similar to other turtles, misidentification may potentially impact reporting accuracy.

| Fishing Year | Longlines | | Pelagic Net | |
|---|---|---|---|---|
| | Dead | Alive | Dead | Alive |
| 2018/2019 | 0 | 0 | 0 | 0 |
| 2019/2020 | 0 | 1 | 0 | 3 |
| 2020/2021 | 0 | 0 | 0 | 20 |
| 2021/2022 | 0 | 0 | 0 | 16 |
| 2022/2023 | 0 | 0 | 1 | 15 |


Figure 26. Reported number of interactions of Hawksbill Turtle in the NT ONLF from 2013/14 to 2022/23. The red shaded areas around the northwest coast are reef fish protections areas, which are no fishing zones for the ONLF.

## Loggerhead Turtle (*Caretta caretta)*

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Loggerhead Turtle | *Caretta caretta* | Protected Wildlife, Vulnerable (T) | Endangered, Marine, Migratory | Vulnerable |

| Loggerhead Turtle assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with threatened, endangered and protected species (TEPS).<br>Marine protected species in the Northern Territory identification guide developed<br>Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.<br>Ecological Risk Mitigation Strategies were developed to include quarterly reporting with TEPS. |
| **Distribution** | The Loggerhead Turtle has a global distribution in tropical and warm temperate marine waters. In Australia, the species breeds primarily in the southern Great Barrier Reef and adjacent mainland in Queensland and on Dirk Hartog Island (Shark Bay) and Muiron Island (North West Cape) in Western Australia. The eastern and western subpopulations are genetically distinct. Breeding has not been recorded in the Northern Territory.<br>Loggerhead Turtles that breed in Australia migrate to the Pacific Islands and southern Asia. Individuals that forage in NT waters appear to originate from both the eastern and western breeding subpopulations. The species is reportedly not |

| | |
|---|---|
| | uncommon in NT waters, at least from Fog Bay around to north-east Arnhem Land |
| **Life history** | Loggerhead Turtles forage in subtidal and intertidal coral and rocky reefs and seagrass meadows in inshore waters, as well as in deeper soft-bottomed habitats. They feed on shellfish, crabs, sea urchins and jellyfish.<br>Females migrate up to 2,600 km from feeding areas to traditional nesting beaches, where they lay up to six clutches of around 125 eggs each season with 3–4 years between breeding. After hatching, young turtles take drift in surface waters where they feed on macro zooplankton. Once partially grown (carapace length of about 75 cm), immature turtles move to inshore areas. |
| **Population size** | The Loggerhead Turtle is considered to comprise of two distinct genetic stocks in Australia - the eastern Australian genetic stock and the western Australian genetic stock (Dutton et al. 2002). Interbreeding does not occur between Western Australian and Queensland breeding aggregations (Bowen et al. 1995). |
| **Vulnerability** | Simulation models suggest that increased predation of eggs by Red Foxes *Vulpes vulpes* and juvenile mortality from incidental capture in coastal otter-trawl fisheries and oceanic longline fisheries have led to observed declines.<br>Loggerhead turtles have a greater propensity than other sea turtles to consume baited longline hooks.<br>Analysis of logbook data for the ONLF indicated that 1 Loggerhead Turtle, released alive, was recorded for the period 2019-20 to 2022-23. As Loggerhead Turtles are morphologically similar to other turtles, misidentification may potentially impact reporting accuracy. |

| | Pelagic Net | |
|---|---|---|
| **Fishing Year** | **Dead** | **Alive** |
| 2018/2019 | 0 | 0 |
| 2019/2020 | 0 | 0 |
| 2020/2021 | 0 | 0 |
| 2021/2022 | 0 | 1 |
| 2022/2023 | 0 | 0 |


Figure 27. Reported number of interactions of Loggerhead Turtle in the NT ONLF from 2013/14 to 2022/23. The red shaded areas around the northwest coast are reef fish protections areas, which are no fishing zones for the ONLF.

### Olive Ridley Turtle (*Lepidochelys olivacea*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Olive-Ridley Turtle | *Lepidochelys olivacea* | Protected Wildlife, Vulnerable (T) | Endangered, Marine, Migratory | Vulnerable |

| Olive Ridley Turtle assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with threatened, endangered and protected species (TEPS).<br>Marine protected species in the Northern Territory identification guide developed Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.<br>Ecological Risk Mitigation Strategies were developed to include quarterly reporting with TEPS. |
| **Distribution** | Olive Ridley Turtles occur in tropical and subtropical waters of all oceans of the world. In Australia, the vast majority of the nesting sites occur in the NT.<br>Nesting sites in the NT have been recorded from Melville Island to Groote Eylandt. The largest nesting colonies occur on Melville Island, islands to the east of Croker Island and some islands off north-east Arnhem Land. |
| **Life history** | In the NT, Olive Ridley Turtles breed at a wide range of sites on islands and, less commonly, mainland beaches. Nests are often constructed just above the high-tide mark; consequently, they may suffer more breeding losses through tidal inundation than do other species of marine turtle.<br>Olive Ridley Turtles typically occur in shallow protected waters, though studies outside the NT indicate that individuals may disperse widely from nesting beaches to feeding |

areas. The species is carnivorous and feeds on benthic molluscs, crabs, echinoderms and gastropods.

**Population size**

In Australia detailed information on the size of nesting and foraging populations is unknown although the nesting population (number of adult females breeding each year) is expected to be in the order of a few thousand females annually (Limpus 2008). Taylor and colleagues (2006) suggest a "very rough" estimate of breeding females in the Northern Territory as between 1000–5000.

There is no data on adult sex ratios or breeding rates to help determine total population size (Limpus 2008).

**Vulnerability**

As with other marine turtles, there is a broad range of factors that threaten the Olive Ridley Turtle. These include by-catch in commercial fisheries; Indigenous harvest; predation of eggs and young by domestic and feral Dogs, feral Pigs, and monitors, marine pollution, including entanglement in ghost nets; and disturbance at breeding sites.

Analysis of logbook data for the ONLF indicated that 5 Olive Ridley Turtles, all released alive, was recorded for the period 2019-20 to 2022-23. As Olive Ridley Turtles are morphologically similar to other turtles, misidentification may potentially impact reporting accuracy.

| | Pelagic Net | |
|---|---|---|
| Fishing Year | Dead | Alive |
| 2018/2019 | 0 | 0 |
| 2019/2020 | 0 | 0 |
| 2020/2021 | 0 | 3 |
| 2021/2022 | 0 | 2 |
| 2022/2023 | 0 | 0 |


Figure 28. Reported number of interactions of Olive Ridley Turtle in the NT ONLF from 2013/14 to 2022/23. The red shaded areas around the northwest coast are reef fish protections areas, which are no fishing zones for the ONLF.

## Leatherback Turtle (*Dermochelys coriacea*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Leatherback Turtle | *Dermochelys coriacea* | Protected Wildlife, Critically Endangered (T) | Endangered, Marine, Migratory | Vulnerable |

| Leatherback Turtle assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with threatened, endangered and protected species (TEPS).<br>Marine protected species in the Northern Territory identification guide developed Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.<br>Ecological Risk Mitigation Strategies were developed to include quarterly reporting with TEPS. |
| **Distribution** | The Leatherback Turtle has a near-global distribution, though it nests mostly in tropical areas and feeds mostly in temperate seas and oceans. There are very few records of nesting in Australia.<br>No large nesting sites have been recorded in Australia. Scattered nesting has been reported along the south Queensland coast from Bundaberg to Round Hill Head though this nesting population is now considered locally extinct (no nesting since 1996). In the NT, annual nesting was recorded at Cobourg Peninsula up to 2011 and occasional nesting along the coast of Arnhem Land from Coburg Peninsula to Maningrida, including Croker Island and the southern Gulf of Carpentaria;<br>there have been no records of Leatherback Turtles nesting in NT since 2011. |
| **Life history** | The Leatherback Turtle is typically an oceanic species. They forage within the water column, preying primarily on jellyfish, but seaweed, fish, crustaceans and other marine invertebrates are also consumed. In Australia, Leatherback Turtles forage mostly in subtropical and temperate waters of Queensland, Western Australia, New South Wales, Victoria and Tasmania. They have also been recorded feeding off the NT coast. Major breeding sites occur in New Guinea and Malaysia. Some animals from these areas migrate to Australian temperate waters to feed. |
| **Population size** | Genetic data has indicated that there are several distinct genetic stocks for the species (Dutton et al. 1999). In the Indian Ocean, the South African/Mozambique rookeries form a distinct stock and no genetic analyses have been completed for rookeries in Sri Lanka, Andaman Islands, Thailand, Western Indonesia or northern Australia. There are two populations in the western Pacific Ocean: Malaysia, and West Papua, PNG and Solomon Islands (see Hamann et al 2006 for a review). |
| **Vulnerability** | Leatherback Turtles are vulnerable to commercial fishing activities and predation of eggs by domestic and feral Dogs *Canis familiaris* and monitors *Varanus* spp. Outside NT waters, Leatherback Turtles suffer significant mortality from long-line fishing in the Pacific Ocean: this species can comprise 60% of total turtle bycatch. In southern Australian states, Leatherback Turtles are killed by being caught in crab pots. Hunting of Leatherback Turtles in Indonesia also threaten the species.<br>Analysis of logbook data for the ONLF indicated that 1 Leatherback Turtle, released alive, was recorded for the period 2019-20 to 2022-23. |

| | Pelagic Net | |
|---|---|---|
| **Fishing Year** | **Dead** | **Alive** |
| 2018/2019 | 0 | 0 |
| 2019/2020 | 0 | 0 |

| | | | |
|---|---|---|---|
| | 2020/2021 | 0 | 0 |
| | 2021/2022 | 0 | 1 |
| | 2022/2023 | 0 | 0 |

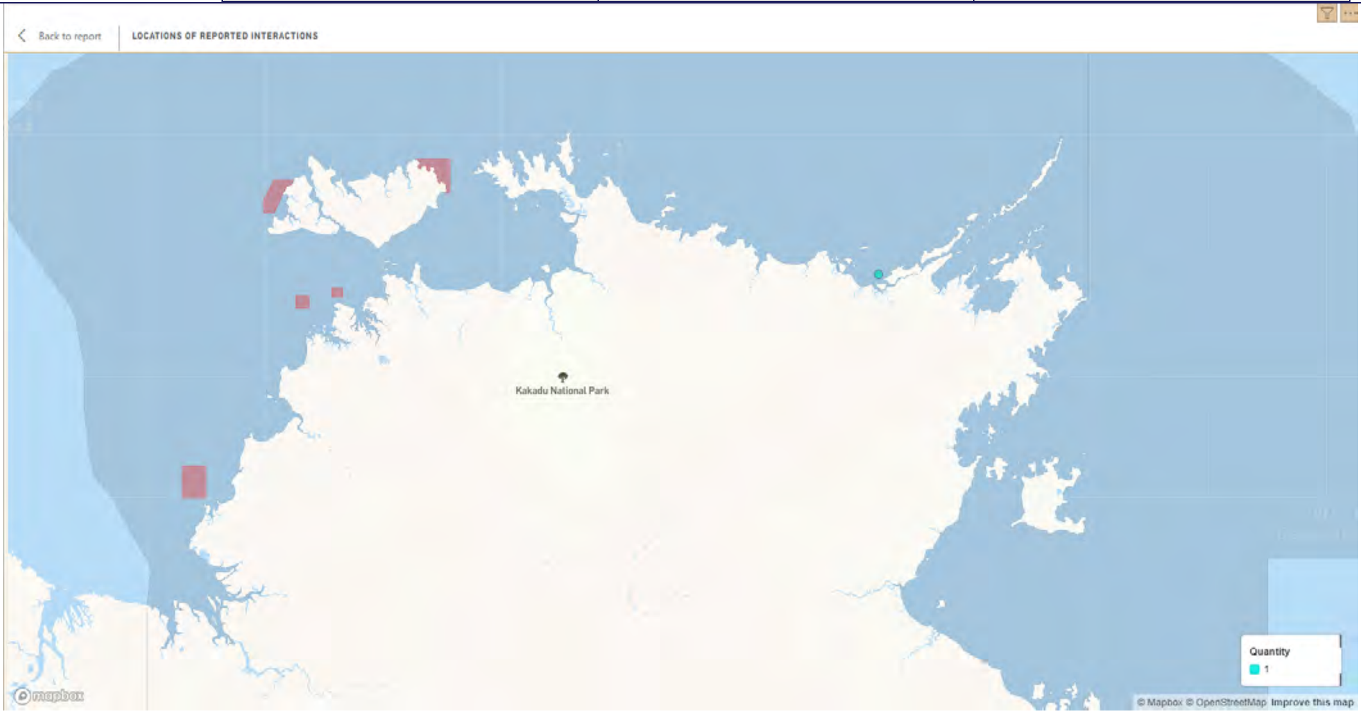


Figure 29. Reported number of interactions of Leatherback Turtle in the NT ONLF from 2013/14 to 2022/23. The red shaded areas around the northwest coast are reef fish protections areas, which are no fishing zones for the ONLF.

## Saltwater Crocodile (*Crocodylus porosus*)

| Common name | Scientific name | Fisheries Act (F), TPWC Act (T) Status | EPBC Act Status | IUCN Redlist |
|---|---|---|---|---|
| Saltwater Crocodile | *Crocodylus porosus* | N/A (F), Critically Protected? (T) | Marine, Migratory | Least Concern |

| Saltwater Crocodile assessment information | |
|---|---|
| **Statements of considerations** | Observer program (on-board and electronic monitoring) record interactions with threatened, endangered and protected species (TEPS).<br>Marine protected species in the Northern Territory identification guide developed Offshore Net and Line Fishery Harvest Strategy includes performance indicator to monitor interaction levels of TEPS through logbook and observer data.<br>Ecological Risk Mitigation Strategies were developed to include quarterly reporting with TEPS. |
| **Distribution** | Saltwater Crocodiles are distributed broadly throughout the tropical Indo West-Pacific region from India to Northern Australia, although many Asian populations have been extirpated due to hunting. In the northern Australia, Saltwater Crocodiles are common throughout all coastal drainages, particularly wetlands and rivers, although the species is occasionally encountered offshore during transit. (Fukuda et al. 2008). |

| | |
|---|---|
| | A large portion of the NT coastal region is an ideal habitat for saltwater crocodiles, particularly in the coastal wetlands and river. They can be found in the Top End, ranging from WA, across the NT and QLD. |
| **Life history** | Studies in Arnhem Land, Northern Territory, found that the Saltwater Crocodile nests during the wet season, between November and May, with a peak between January and February. Courtship occurs 4 to 6 weeks before nesting and continues through the nesting period (Webb et al. 1987). Large males control a territory through aggression and signalling, and consequently fertilise most reproductively active females within it. During courting, the females approach the males and an elaborate process of swimming together, body contact and rubbing follows (Grigg & Gans 1993).<br><br>The Saltwater Crocodile is a mound nester, preferring areas with tall vegetation and permanent water close by. One clutch with an average of 52-60 eggs is laid per season (Cogger 2014; Webb et al. 1978). Eggs are ovoid in shape and measure approximately 8 cm in length, 5 cm in width and weigh 113 g (Webb et al. 1983; Webb & Manolis 1989). Incubation time varies between 65 and 114 days, with the adult female remaining nearby to defend the nest throughout this period (Magnusson 1979b). The temperature of the nest is determined by heat generated within the nest and the external ambient temperature (Magnusson 1979c). The temperature of the nest determines the sex of the hatchlings. Males are produced between 31–33 °C and females dominate the ratios above and below these temperatures (Magnusson 1982). High annual egg mortality is caused by rainfall washing away nests and exposing eggs (Magnusson 1982; Webb et al. 1977).<br><br>Once the eggs hatch, the adult female excavates the nest after hearing the calls of the hatchlings and carries them to the water (Webb et al. 1987). Once in the water, hatchlings are stimulated by the calls of other hatchlings and form crèches (Magnusson 1980b), which are guarded by the mother for up to two months (Webb et al. 1977). Hatchlings may move up to 9 km during the first month in the water (Magnusson 1979a).<br><br>The Saltwater Crocodile is estimated to live beyond 70 years of age (Webb et al. 1984). |
| **Population size** | Currently, there is estimated to be over 100,000 saltwater crocodiles in the NT (NT.GOV.AU).<br>Leach and colleagues (2009) summarised research into Salt-water Crocodile populations and found the population trend to be increasing. Four main observations led to this conclusion:<br>• The biomass of animals in some waterways continues to increase, including in rivers where the increase in abundance has plateaued. This is consistent with the expectation of the maturing size and age structure of a large, slow-growing species that is continuing to recover from the threshold of extinction in the 1970s.<br>• There is an increase in the number of individuals that are living in marginal habitat, such as the coasts and seas (Nichols & Letnic 2008 cited in Leach et al. 2009).<br>The number of animals removed from the Intensively Managed zone in the Darwin Harbour has increased in recent years, indicating that animals are increasingly dispersing in search of territory (Delaney et al. 2008 cited in Leach et al. 2009). |
| **Vulnerability** | In Australia, threats to the Saltwater Crocodile include mortality due to fishing nets and the effects of habitat destruction (Taplin 1987). In Arnhem Land, Northern Territory, feral animals such as the Buffalo (*Bubalus bubalis*) impact wetland habitats by increasing drainage and reducing vegetation (Webb et al. 1983). |

Globally, habitat destruction and illegal hunting of the species are the major threats (Ross 1998).

| | Pelagic Net | |
|---|---|---|
| **Fishing Year** | **Dead** | **Alive** |
| 2018/2019 | 0 | 0 |
| 2019/2020 | 0 | 0 |
| 2020/2021 | 0 | 0 |
| 2021/2022 | 0 | 0 |
| 2022/2023 | 0 | 2 |

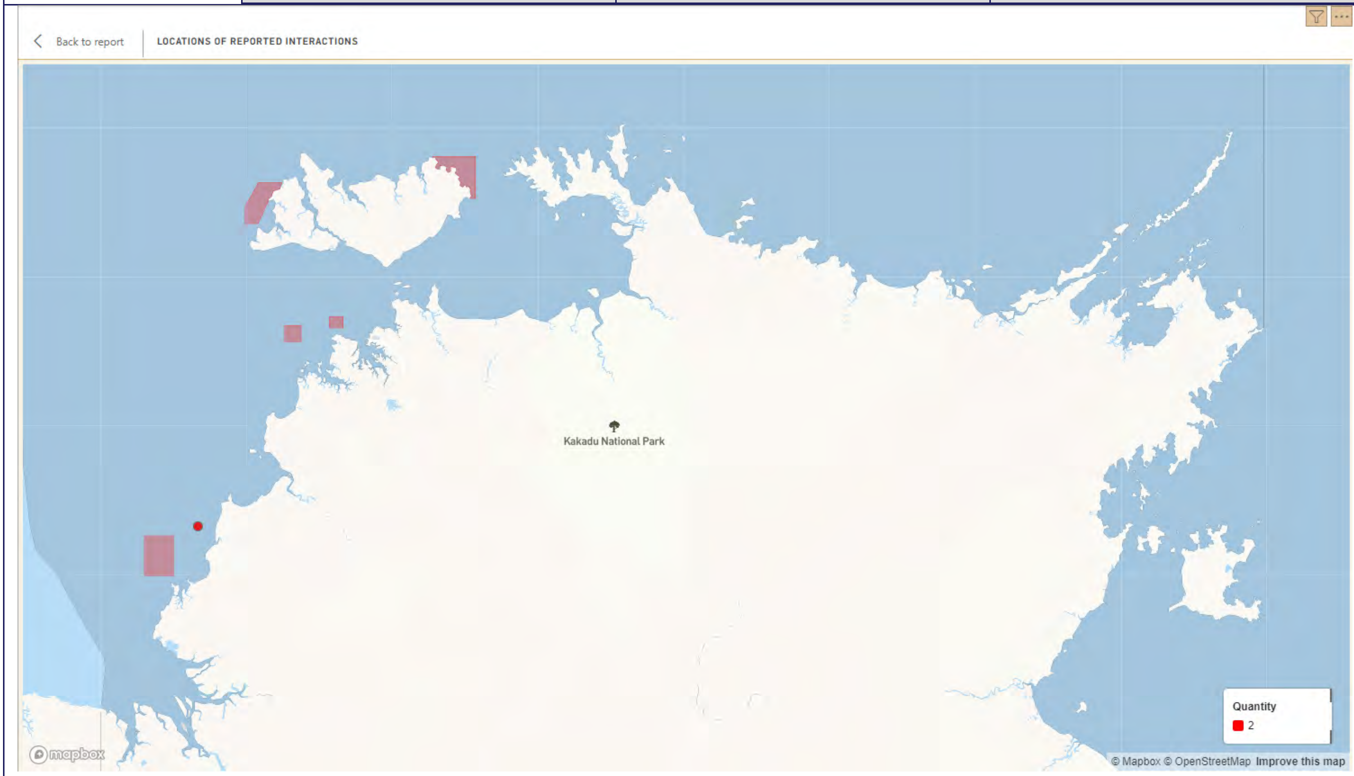


Figure 30. Reported number of interactions of Saltwater Crocodile in the NT ONLF from 2013/14 to 2022/23. The red shaded areas around the northwest coast are reef fish protections areas, which are no fishing zones for the ONLF.

## Seabirds grouped (undifferentiated)

| | |
|---|---|
| **Statements of consideration** | Forty-three seabird species listed under the EPBC Act are known to occur within the North Marine Region (DSEWPAC 2012).<br><br>The North Marine Region is considered to be particularly important for four species as substantial proportions of their populations use the region and adjacent waters for breeding, foraging and other life-history phases. This includes the Bridled Tern and Roseate Tern, which are primarily distributed across Arnhem Land and the southern Gulf of Carpentaria and breed on islands. |

| | |
|---|---|
| | A review of the logbook and observer data indicates that there are no interactions with seabirds in the ONLF, and fishing is conducted in a manner that avoids mortality of, or injuries to, seabirds.<br><br>No auto-baiting devices on a vessel. |

### Boat strike

| | |
|---|---|
| **Statements of consideration** | The ONLF is comprised of a relatively small fleet. When vessels are actively fishing using pelagic nets, the vessels are drifting.<br><br>There is no data on the number of boat strikes involving TEPS or any species in NT waters and there have been no observations of a bot strike during any on-board observer trips. |

## 12.3. Workshops

### Expert panel workshop

The expert panel workshop was held on 8 August 2014 to determine the risk ratings for the ONLF using an objective examination of all threats based on current or proposed risk mitigation using all available lines of evidence. Experts that participated in the panel workshop and their affiliations are provided in the table below (Table 16).

Table 19. Experts in attendance at the expert panel workshop and their affiliation

| Expert | Affiliation |
|---|---|
| Dr Rik Buckworth | Mackerel species. Research scientist at CSIRO and consultant at Buckworth Consultancy. |
| Mr Paul Lewis | Mackerel species as a research scientist at Department of Primary Industries and Regional Development (DPIRD). |
| Prof Colin Simpfendorfer | Specialising in shark and ray biology, ecology and fisheries. Colin is a member of the Threatened Species Scientific Committee (TSSC), undertakes the Non-Detrimental Findings and develops the Shark Report Card. |
| Dr Joni Pini-Fitzsimmons | Elasmobranch and ray expert, specialising in bycatch mitigation in the Northern Territory, and elasmobranch behavioural and spatial ecology on the East coast. |
| Dr Alastair Harry | Elasmobranch expert, specialising in fisheries and conservation at DPIRD. |
| Prof Helene Marsh | Marine mammal expert specialising in dugong conservation biology on the East coast. Helene is the former Chair of TSSC. |
| Dr Luciana Ferreira | Specialising in marine megafauna movement, distribution and ecology of sharks, marine turtles and whales. |
| Dr Grant Johnson | Expertise in shark species in the NT, and is a research scientist at the Australian Institute of Marine Science. |
| Dr Scott Whiting | Expertise in turtle species, as a research scientist at Western Australian Department of Biodiversity, Conservation and Attractions. He has over a decade of experience working in the NT. |

### Stakeholder Workshop

Comments from the stakeholder workshop held on 27 September 2024 are contained in the table below (Table 17). The workshop is an opportunity for stakeholders to provide feedback to the Fisheries Division on the risk rating classifications by the expert panel. The comments contained in the table have been used to make amendments to the Ecological Risk Rating report and may assist in the development of future risk mitigation actions in the ONLF.

The workshop was facilitated by Dr Rick Fletcher and included the following attendees:

| | | |
|---|---|---|
| Dr Chris Calogeras | Mr David Ciaravolo | Ms Eliza Kimlin |
| Mr Daniel Vairo | Mr Brian Page | Mr Blake Taylor |

| | | |
|---|---|---|
| Mr Hemi Poutu | Ms Nga Ho | Dr Brien Roberts |
| Mr Dan Capps | Mr Jamie Damaso | Ms Melanie Brenton |

Table 20. Comments from the stakeholder workshop (27 September 2024).

| Section/Species | Comments |
|---|---|
| General | • While there are between 7 to 11 vessels fishing annually, there is only about 4 vessels actively fishing in the Western zone at any point in time. This number is even fewer for vessels operating in the Gulf of Carpentaria (Eastern Zone).<br>• Sharks must be landed with fins naturally attached, except when there is electronic monitoring on-board the vessel. To maximise storage space, sharks are generally processed with head and guts removed. Operators are not permitted to land just the shark fins.<br>• Operators target Grey Mackerel and smaller sharks (such as Blacktip Sharks) due to market profitability. Larger sharks are more likely to be caught using longlines. There is additional cost in setting up vessels for longlining operations. No vessels in the fleet are currently equipped to undertake longlining, however the fishing method may be utilised in the future. |
| Grey Mackerel | • It would be helpful to include information on the reason for the two separate Grey Mackerel mangement zones.<br>• Update the stock assessment for Grey Mackerel in the Western Zone to the most recent 2021 assessment in the ERA Performance Report and Background Information. This does not change the biomass and mortality figures provided in the line of evidence (as it is a typographical error), but does make it more contemporary to the reader which would help to reduce uncertainty.<br>• Concern was raised over the age of the stock assessment data used in the line of evidence for the Eastern Zone (i.e. using data up to 2011). Further explanation as to why the most recent stock assessment outcomes published in the Status of Australian Fish Stocks Report (SAFS) was not used in the assessment would be useful.<br>• Participants suggested the wording from the most recent stock assessment should be included as a line of evidence. |
| Blacktip Sharks | • Providing information on the Shark Report card would be helpful to understand its utility as a line of evidence. |
| Tiger sharks | • Tiger sharks are not generally targeted by operators. The heads of individuals are too big to get caught in pelagic nets. Tiger sharks are more likely to be caught via longline.<br>• There is a possibility for future targeting of Tiger Sharks, but it is unlikely to occur within 5 years given the current market demand. The Harvest Strategy conducts annual SAFE assessments which would detect targeted fishing for this species more frequently than an ecological risk assessment process. |
| Great Hammerhead | • Great Hammerheads were acknowledged to be highly scrutinised at the global level. The domestic catch by the ONLF is negligible and well under the catch limit. The catch limit of 50 tonnes under the Harvest Strategy is |

| | |
|---|---|
| | considered precautionary given it is a very small percentage of its total biomass. |
| Winghead Shark | • Most operators know Winghead Sharks prefer murky water and avoid operating in these areas to reduce their interactions with this species. |
| Dugongs | • A comment was made that operators have not seen a dugong in 20 years.<br>• Operators do not work in seagrass habitats, preferring to operate in areas with rubble, shoals and rock. |
| Sawfish | • Sawfish can be caught on both longline and pelagic net, but pelagic net is associated with higher capture.<br>• Operators tend to avoid muddy, murky habitat where Dwarf Sawfish generally inhabits.<br>• Operators observe that pelagic net fishing has a high survivability of entangled sawfish:<br>o Nets are attached to the vessel, set in the water for around an hour then hauled.<br>o This is a short time (compared to other net fisheries) and animals are observed to swim away when released.<br>o If a sawfish becomes entangled close to the vessel they can be seen in the pelagic net.<br>o Pelagic nets are not to be set within 2 metres of the sea floor.<br>• There is a lack of information on post-release survival to validate observations by operators. However, there is an FRDC project (2022-068) currently investigating post release survival. |
| Mobulid ray species | • Operators would support and participate in research for Mobulid ray species such as a tagging program to understand post-release mortality. |
| River Sharks | • It was clarified that River Sharks are also included in the FRDC project (2022-068)<br>• An identification guide to improve accuracy of reported interactions for this species is to be developed with industry and NT Fisheries. This is intended to be used as part of the induction process for operators.<br>• Correct the risk ratings assigned in the lines of evidence table. The risk rating remains Low but should use the higher combination score of C1 x L4. |
| Pygmy Devilray | • Operators confirmed there are high numbers of Pygmy Devilray captured in the pelagic nets.<br>• Operators observe that there are negligible mortalities of animals which are released alive due to fishing method.<br>• Pelagic nets attached to the vessel, set in the water for an hour and then hauled. Animals usually swim away when released.<br>• Consider research projects such as tagging, to verify post-release survival rates with logbook data as a priority for management. |

| | |
|---|---|
| Turtles | • Amend the way reported interactions are written in the line of evidence. It is confusing to understand i.e. (less than 6 individuals per species all released alive).<br>• Additional clarification as to why Hawksbill turtles have a separate line of evidence would be of benefit given they are all released alive.<br>• It was clarified that operators report the number of interactions and whether the animals are released dead or alive. The logbooks do not record other status like injury.<br>• It was raised that there may be different reporting requirements under the Commonwealth legislation for TEPS than what is currently being reported on ONLF logbooks.<br>• Industry informed that education of operators and crew in the past few years has improved the accuracy of reporting Turtles compared to previous years.<br>• Turtles entangled in the net can be seen at the surface when hauling and the best practice is for the crew to haul the net slowly to avoid the turtle flopping onto the deck and injury.<br>• Industry are in the process of revising their code of practise |
| Trophic structure | • Operators tend to process while they catch the fish. Due to fishing practises processing does not take place in the one particular area, rather it is continuous and spread more broadly. |

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