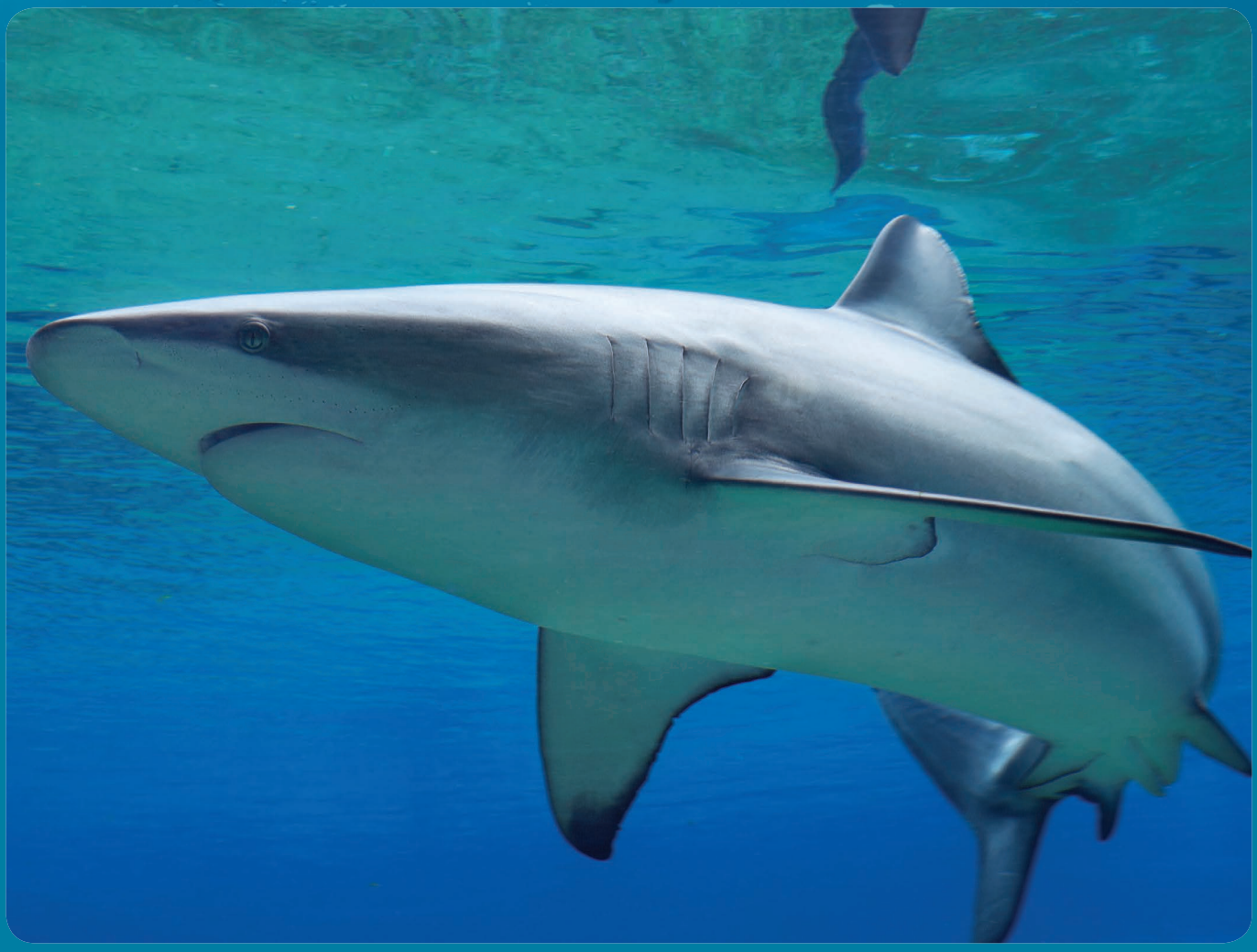
Shark and Ray Handling Practices

A guide for commercial fishers in southern Australia



Australian Government
Australian Fisheries Management Authority

Acknowledgements

The Australian Fisheries Management Authority (AFMA) would like to thank Richard Reina and the Chondrichthyan Bycatch Research Group at Monash University for assisting us in compiling the guide and providing a number of photographs from their studies.

We would also like to acknowledge Sandra Sharma from AFMA for her shark and ray handling illustrations.

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ISBN 978-978-187-704-9

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Produced by: Clayton McCloud
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Release of a Port Jackson shark following a lab capture study

Photo: Richard Reina

About the guide

Australian waters are home to a diverse and unique array of sharks, rays and related species. These play an important role in our aquatic ecosystems and some Australian fisheries. The Australian Fisheries Management Authority is committed to the conservation and management of sharks and their long-term sustainable use in Australian fisheries.

Around one quarter (322 species) of shark species are found in Australian waters. Of these, more than half are found nowhere else in the world. Given this diversity there is national and international interest in conserving and managing Australian sharks.

There are formal fisheries management arrangements for the small number of shark species that are targeted by fishers, which are complemented by monitoring and research. A large part of the Australian shark catch is either as secondary catch in fisheries primarily targeting other species or they form part of multi species fisheries targeting many species. A certain proportion of these sharks are retained and others discarded, but there is limited information available on how well these discarded sharks survive once released.

Improving handling practices can have a significant impact on the survival of sharks and rays that have been captured and is a proactive measure that industry can follow. Other benefits of improved handling practices include the reduced risk of injury to crew as sharks can bite and rays can sting in self-defence when threatened.

Most people assume that because of their predatory nature and fearsome appearance sharks and rays are strong and resilient animals. Although this may be the case for a few species, many are vulnerable to injuries involving capture and landing during fishing activities. This guide presents information on the type of injuries sharks and rays can obtain during fishing, recommendations to help minimise the damage to non-target species, current research into shark survivability and information on the habitat and biology of commonly encountered species.

Spotted Wobbegong Shark (*Orectolobus maculatus*) - surrounded by schooling Slender Cardinalfish (*Rhabdamia gracilis*).
Copyright: Gary Bell/OceanwideImages.com

Shark anatomy and fishing related injuries

The life history traits of sharks and rays (long-lived, slow growing, late maturing and have few young) make them particularly vulnerable to exploitation. All reasonable efforts should be made to reduce mortality of sharks destined to be returned to the water. During fishing, sharks and rays may interact with a number of different gear types (trawl nets, gillnets and longlines), which all have impacts on their survival once landed. Research has shown that different species have different tolerances to the various gear types. For example, bronze whalers can survive approximately four times longer than smooth hammerhead sharks when caught on longlines.

The information below provides a summary of the type of injuries that sharks can obtain during the fishing process and some recommendations to minimise their injuries. Returning sharks and rays to the water as quickly as possible, using correct handling techniques, will give them the maximum chance of survival.

Hook damage

To reduce the risk of injury to non-target sharks, the use of circle hooks is encouraged. Unlike J-hooks, circle hooks are designed to significantly reduce the chance of swallowing and internal damage. Hooks can puncture gills and/or enter the digestive tract when swallowed. Hooks lodged in the gills can tear tissue, causing severe blood loss. Swallowed hooks can be lodged in the digestive tract and cause abscesses, leading to infection and disease, which can result in malnutrition and death. Hooks which break through the digestive tract can also become lodged in other organs such as the liver.

All sharks and rays should be removed from the line before entering de-hooking machines on auto-longliners. De-hooking by forced pulling can cause jaws to be split in two and/or dislodged from skull.

Torn jaw in a gummy shark (note healing of jaw)

Photo: Leonardo Guida

Gaffing

If you need to gaff a shark or ray it is recommended that you gaff on the underside of their jaw where the skin is soft and will not cause significant damage or blood loss. Furthermore, wounds at this location are likely to heal relatively quickly with no long-term impacts to the animal. Gaffing to the rear of the head or the gill region can result in death from damage to the brain and/or cause severe blood loss. Gaffing to other parts of the body along the trunk can cause additional organ damage and potentially result in death, depending on the location and depth of the wound.

Maiming

In some cases live sharks are maimed and discarded in order to facilitate quick removal from a tangled net and increase the processing catch. Sharks and rays that are caught in nets should be carefully untangled or cut free before being quickly returned to the sea.

Pressure changes and collapsed organs due to gravity

Some species are adapted to live at great depths and relatively quick changes in depth can cause trauma from rapid decrease in pressure when brought to the surface. Once removed from the water, the organs of sharks can become compressed, displaced and/or collapsed. The impact of gravity over a prolonged period may restrict blood flow by compressing the heart and circulatory system. It is important to support the bodies of sharks when returning them to the water.

Air exposure and temperature shock

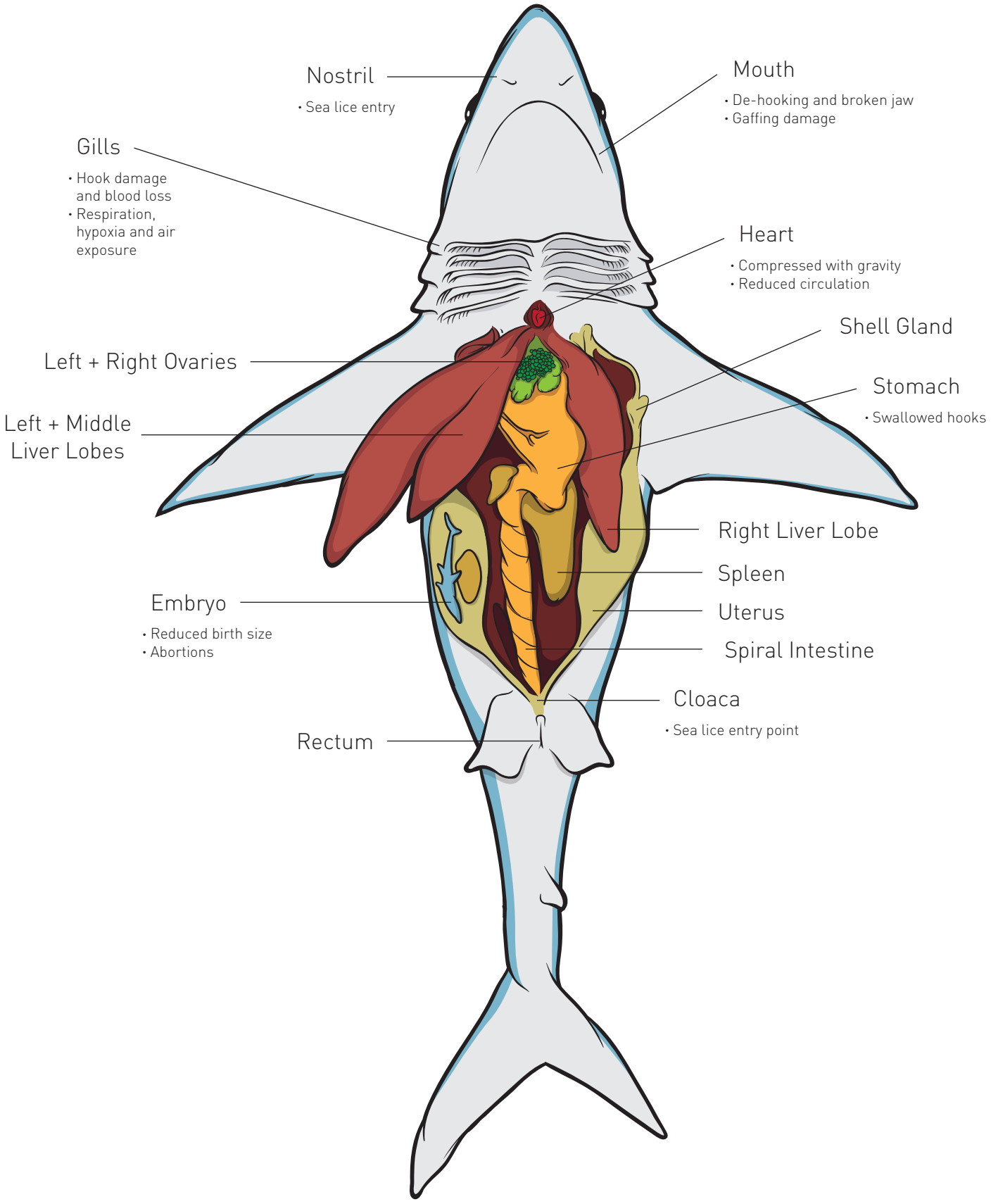
Sharks and rays can experience temperature shock when retrieved from the water. This is caused by wind chill and is more likely to occur in the colder seasons when the water temperature is warmer than the air temperature. Sharks and rays tend to have body temperatures similar to their surroundings and sudden temperature changes disrupt bodily functions, potentially causing mortality. All efforts should be made to return sharks to the water as quickly as possible.

Vitality notes

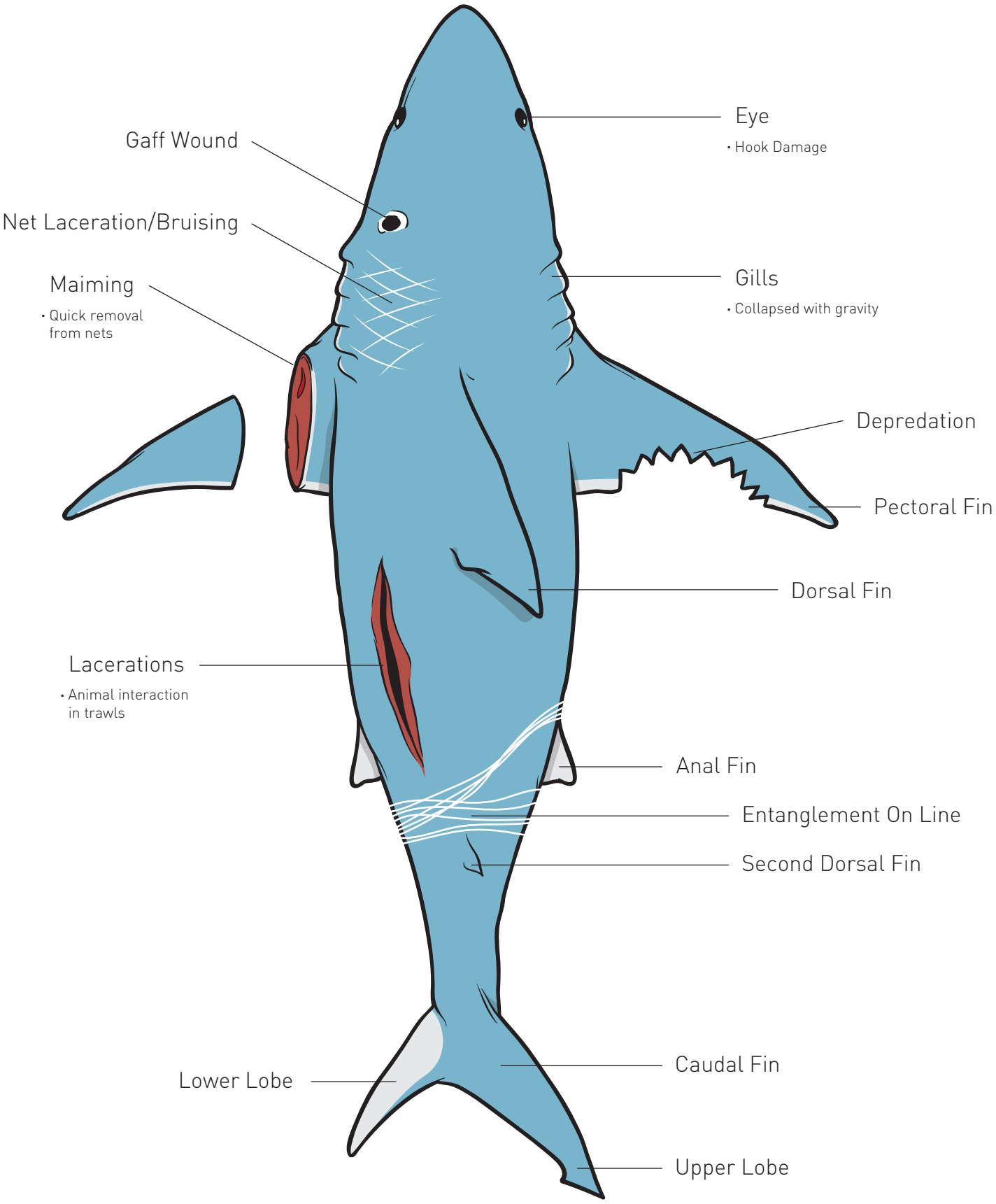
The vitality of a shark or ray can be quickly assessed by noting several features. Common features which indicate impending death include stiffening of the body with muscle tone becoming increasingly defined, lightening of skin colour, slow response to touch and movement becoming sluggish or non-existent. In some sharks (the carcharinids) the nictating membrane, or 'eyelid', is slow to close (or doesn't close at all) when the eye is touched.

Shark anatomy and fishing related injuries

Ventral View

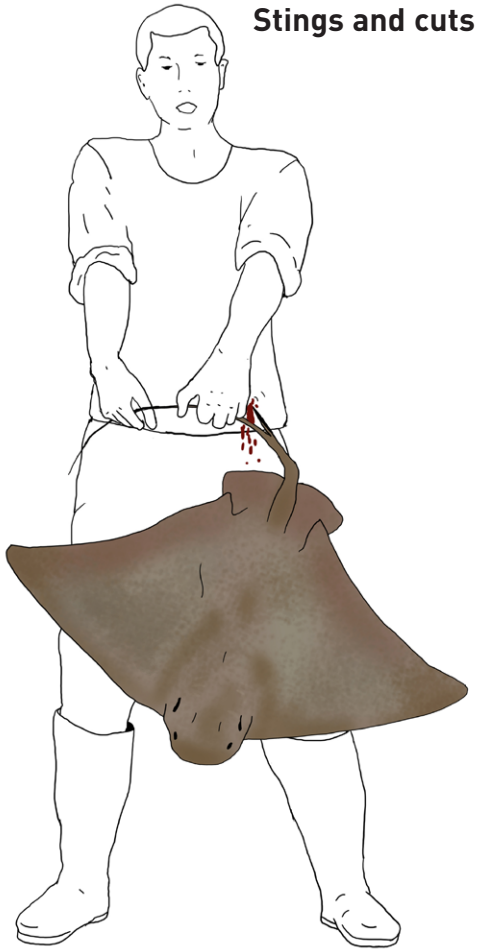


Dorsal View


Eye
• Hook Damage
Gaff Wound
Net Laceration/Bruising
Maiming
• Quick removal from nets
Gills
• Collapsed with gravity
Depredation
Pectoral Fin
Dorsal Fin
Lacerations
• Animal interaction in trawls
Anal Fin
Entanglement On Line
Second Dorsal Fin
Caudal Fin
Lower Lobe
Upper Lobe

Crew Safety

Stings and cuts

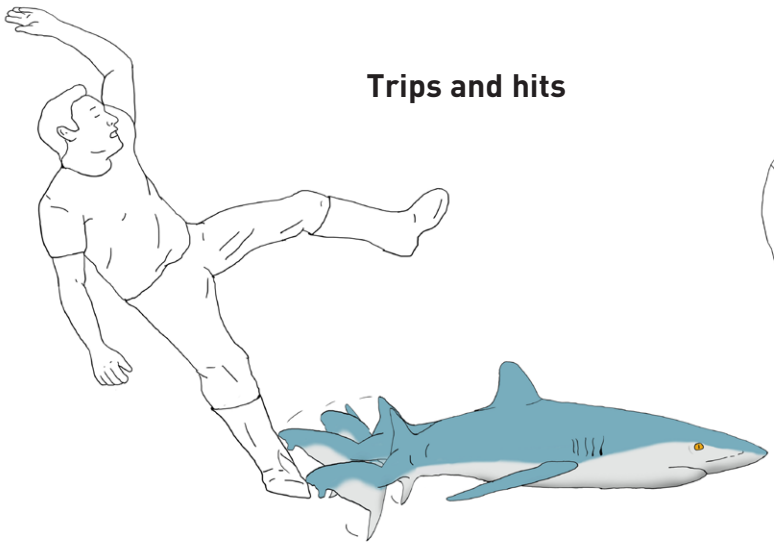


Commercial fishing is one of the most dangerous occupations in the world. As well as working with nets, lines, hooks and catch, crew have to navigate external decks, internal corridors, steep stairways, enter holds and freezers, doing so in varying weather conditions, at night and in adverse conditions.

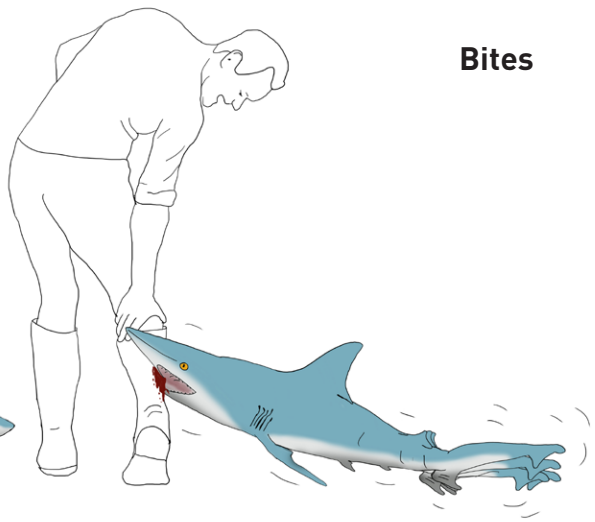
Sharks and rays add to that risk when caught. They are unpredictable animals and individuals behave differently when they are on board a boat. Potential injuries include being struck, tripped or bitten by sharks or stung and cut by rays.

- Crew should always put their personal safety first when releasing sharks, rays and other large fish. Wear gloves and avoid working around the jaws of sharks and tails of rays.
- Keep animals in the water if possible (i.e. do not bring them on the deck and release them in the water to reduce stress).
- For longline fisheries, cut sharks off close to the hook so that they are not trailing large amounts of line.
- If a shark must be brought on the deck then minimise the time it takes to return it to the water to increase survival.

Trips and hits

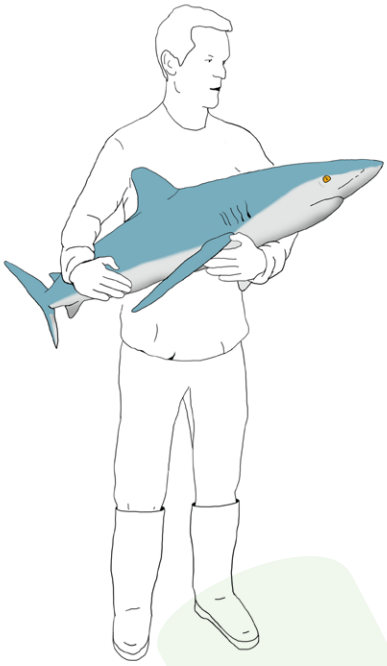


Bites

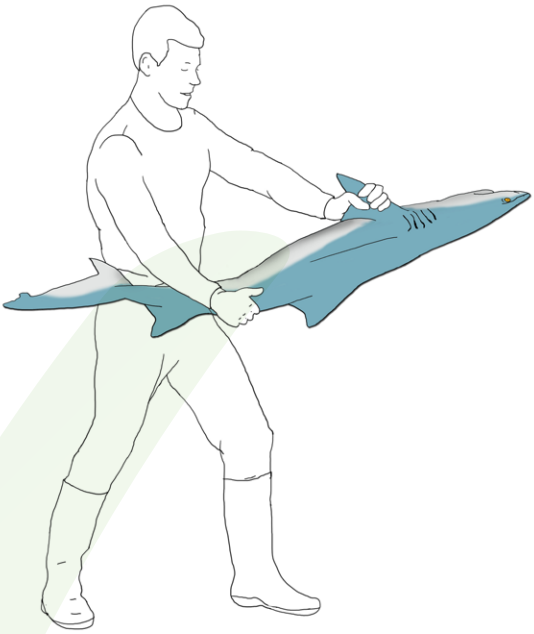


Handling of Small to Medium Sharks

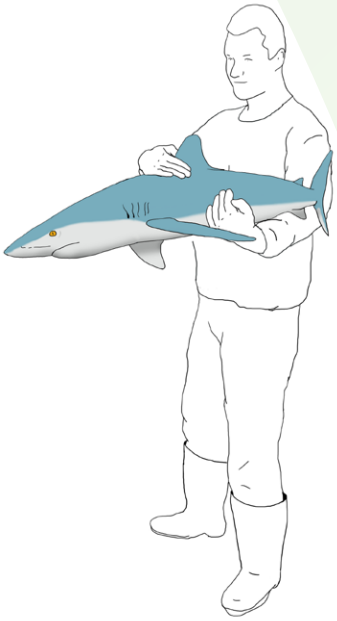
Generally, small sharks are fragile and need to be handled very carefully. It is best to handle and release them with both hands.



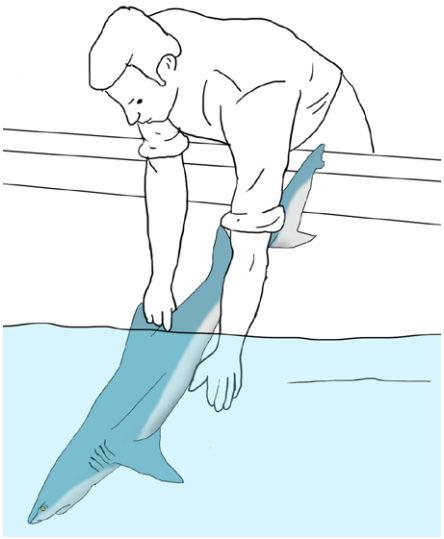
Both hands supporting the body



Holding the pectoral fin and tail



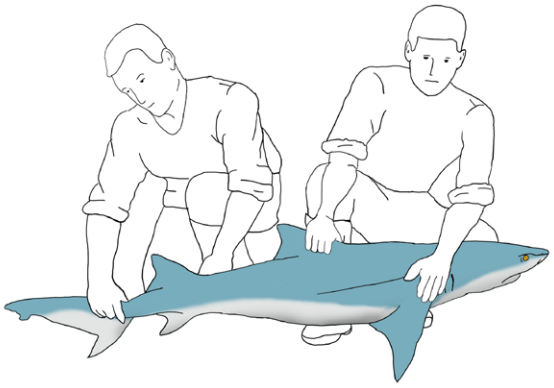
Holding the dorsal fin and supporting body



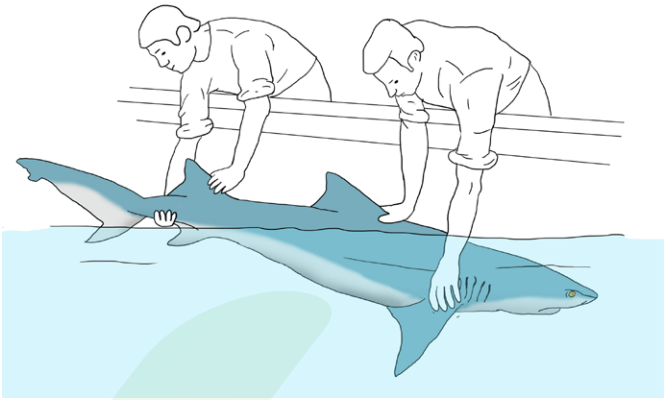
Release the shark into the water head first. Do not throw it!

Handling of Large Sharks

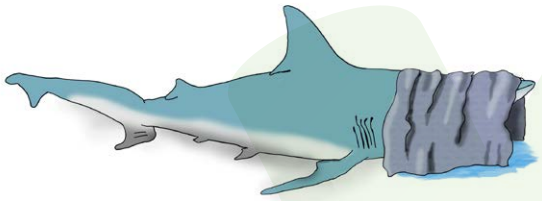
It is best to handle medium to large sharks with two persons.



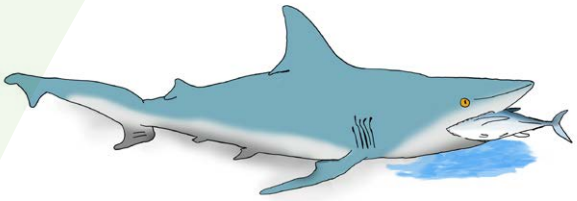
To release a large shark one person can hold the dorsal fin and pectoral fin, while the other person holds the tail



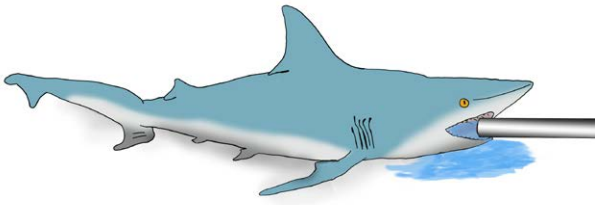
Lower the shark gently into the water



You can calm a shark down by covering its eyes with smooth, wet and dark cloth



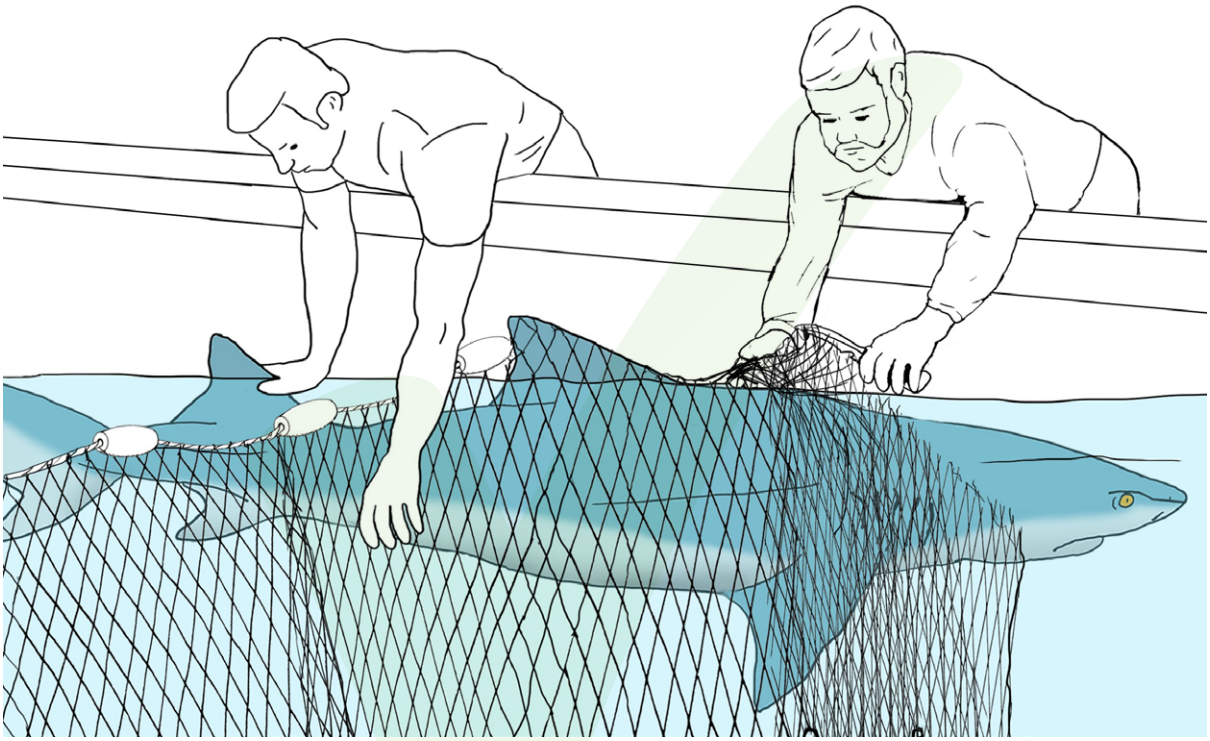
To prevent bites place an object, such as a fish or big stick in the jaws



If you need to delay the release place a sea hose in its mouth

Handling of Very Large Sharks

All efforts should be made to free very large sharks without bringing them on board the vessel. Keeping sizeable sharks in the water whilst removing fishing gear greatly assists the likelihood of a successful release post capture. Extreme care should be taken when working near the head of the shark as even fatigued animals can inflict serious injury. Where possible, always approach the shark from behind, particularly if it has been brought on board.

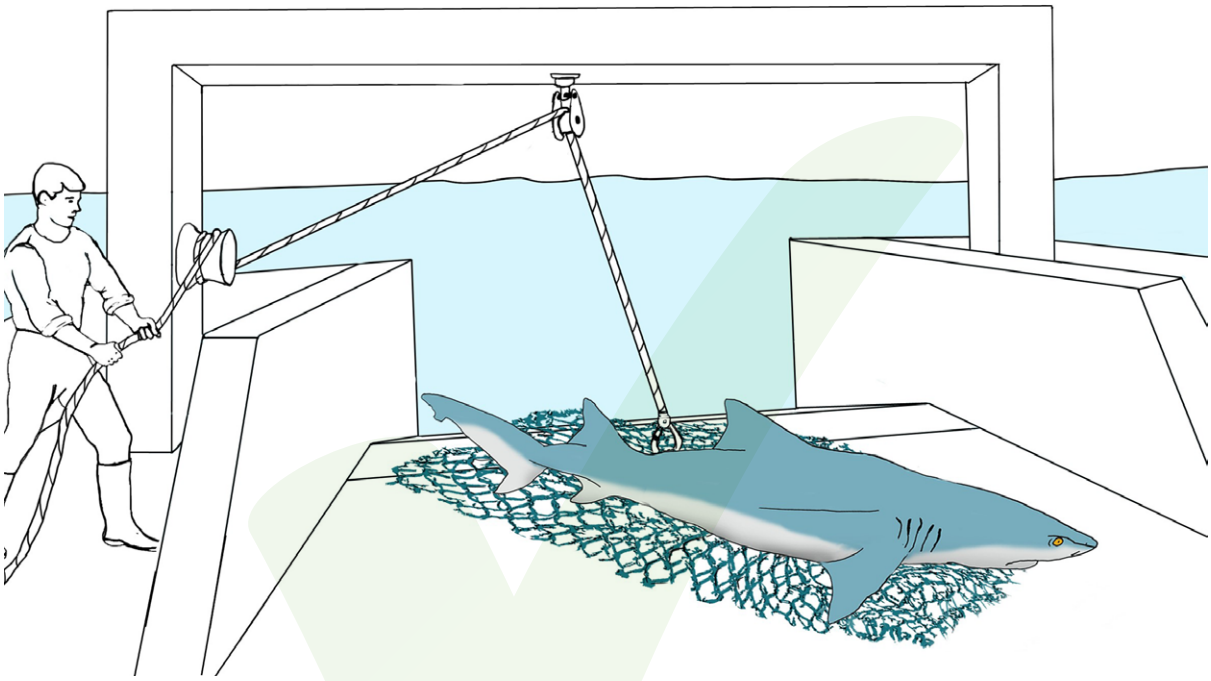


Correct handling practice: removing sharks from gear without bringing them on board.

Incorrect handling practice: Do not stand next to or in front of the shark, remain behind the head.

Handling of Very Large Sharks

If there are no other options but to bring the shark on board, crew should prepare by laying out a section of unused trawl mesh or a large tarp on the deck. The animal should be removed from fishing gear onto the mesh or tarp.



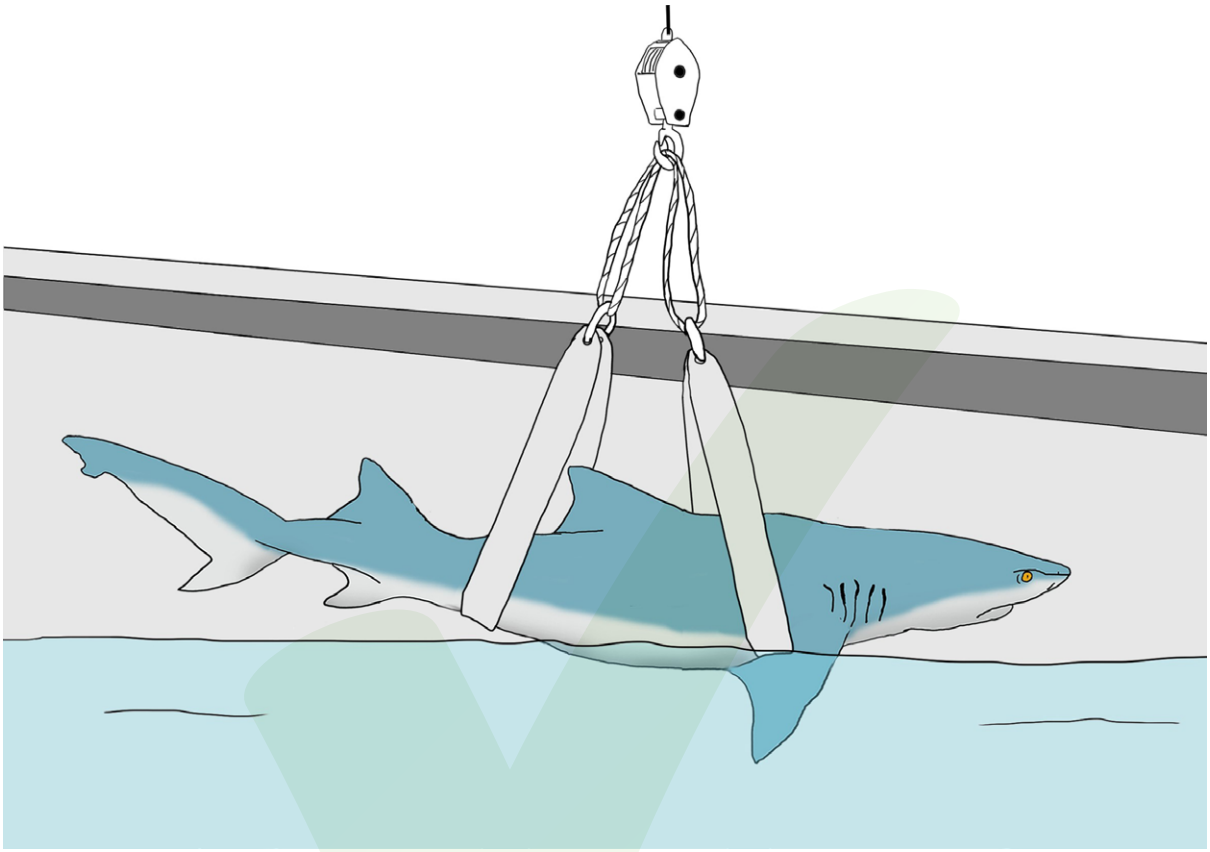
Correct handling practice: shark brought on board onto trawl mesh

Once the shark is on board, placing a wet towel over the shark's eyes will calm it down and reduce the likelihood of injury, though care must always be taken. The shark should be kept wet, and a running hose in the mouth should irrigate the gills while the gear is being removed.

Sharks in good condition should be returned to the water with minimal lifting and head first. Manoeuvre the shark towards the stern using the mesh or tarp to help spread the pressure more evenly throughout the animal's body, and release head first down the stern ramp.

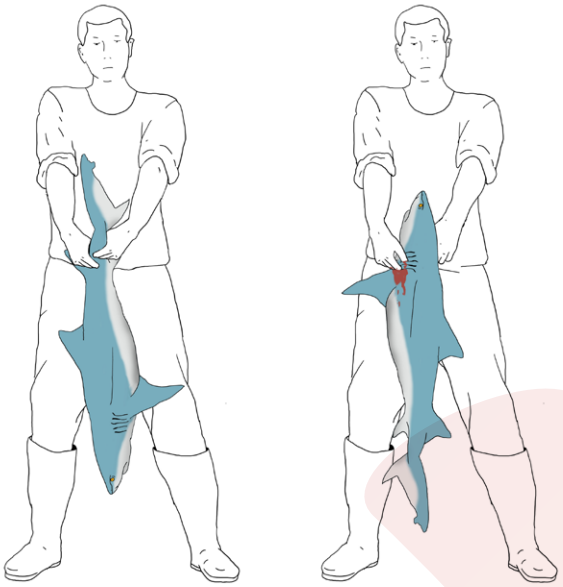
Sharks in poor condition should be attempted to be revived by placing it on the side of the boat, with the shark facing forward and the boat just in gear or moving forward slowly. This allows water to pass through the gills of the shark and re-oxygenates it. When doing so, do not use a gaff to hold the shark in position.

For vessels without stern ramps, the shark may need to be lifted. Lifting should be undertaken with a minimum of two wide slings to support the weight of the animal whist it is out of the water.

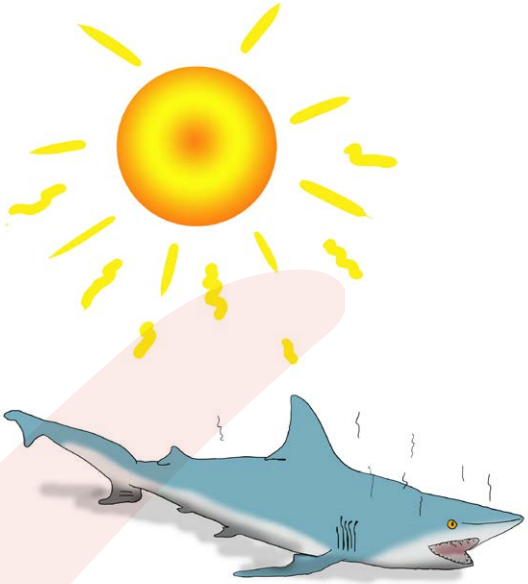


Correct handling practice: shark lifted with the use of wide slings

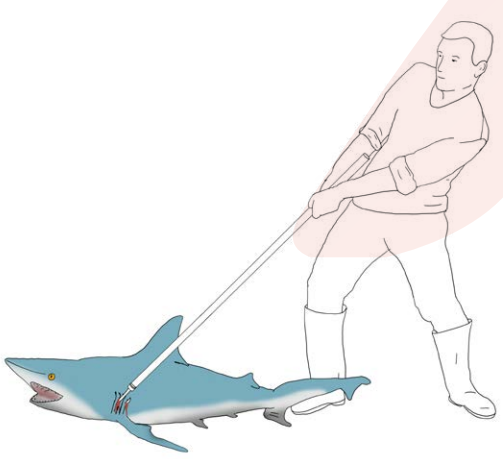
Incorrect Handling of Sharks



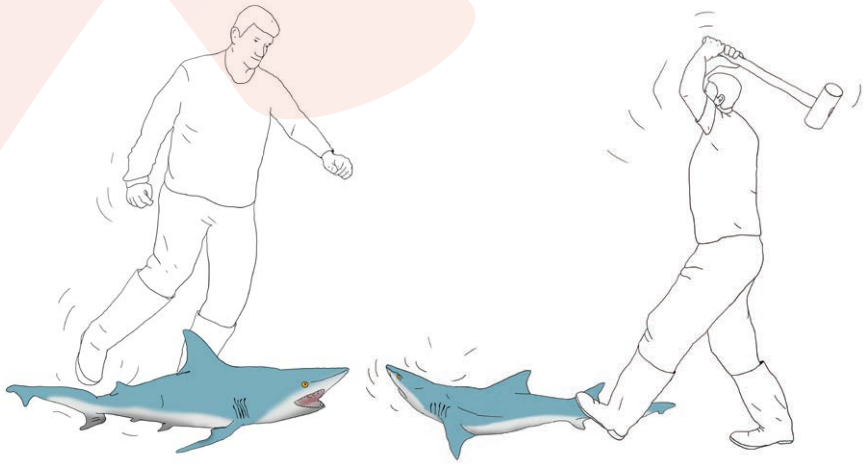
Do not pick the shark up by the tail, head or the gill slits



Do not expose the shark to the sun for extended periods



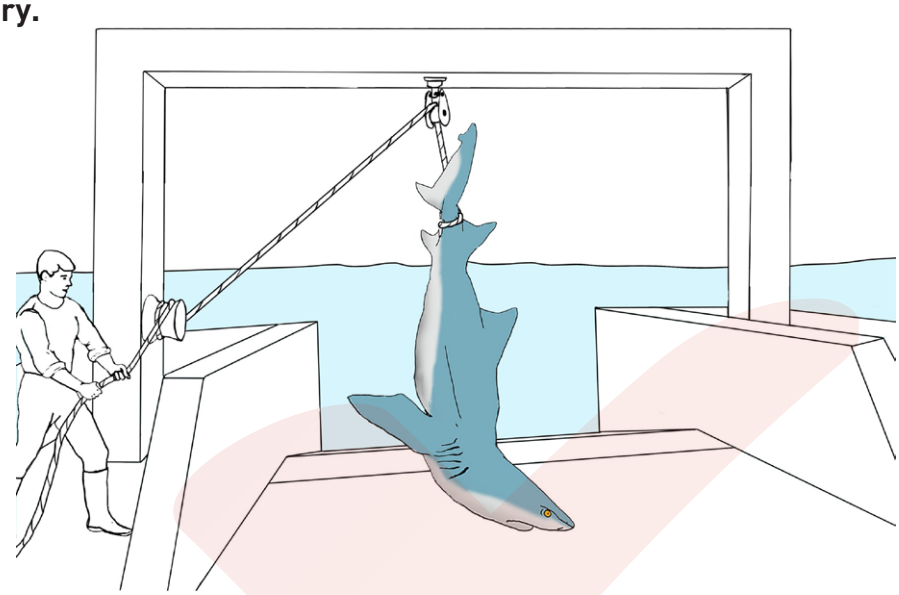
Do not gaff or cut shark (If you need to gaff a shark it is recommended to gaff on the underside of their jaw to minimise damage)



Do not kick, hit, throw or push the shark harshly, or expose it to other physical trauma.

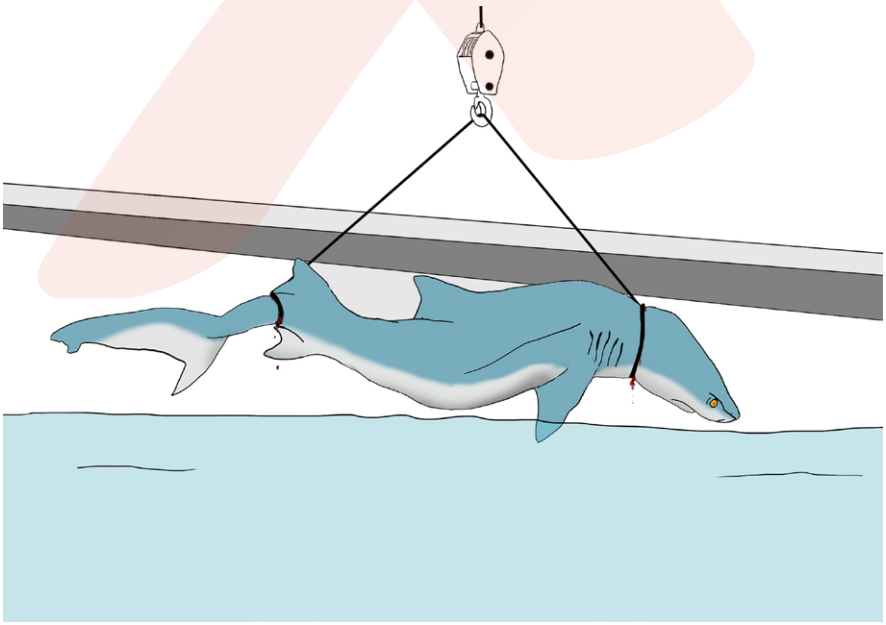
Incorrect Handling of Very Large Sharks

Do not attempt to lift or move large sharks by the tail alone as this can result in vertebrae injury.



Do not lift by the tail.

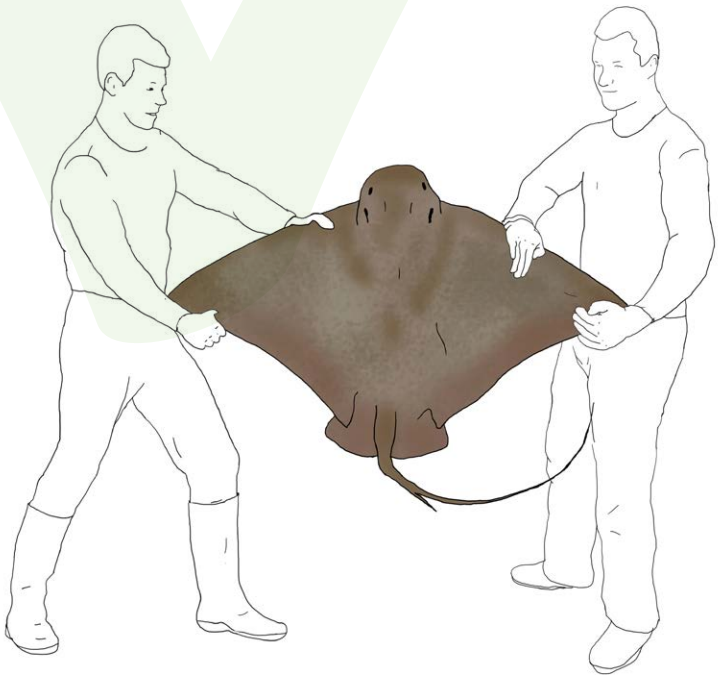
Do not use wire or thin cable type strops for lifting as these will cause injury.



Do not lift using thin wires or cables.

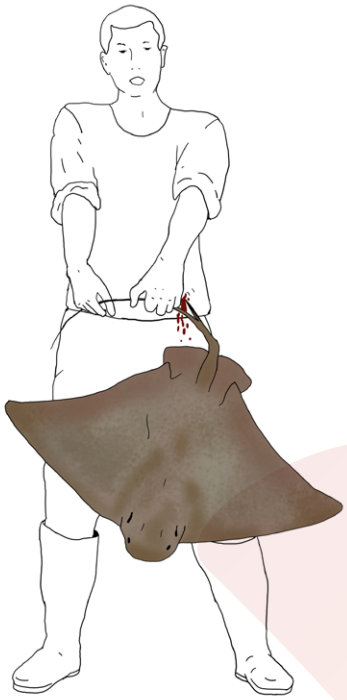
Handling of Rays

For small and medium size rays, isolate the tail and pick up by the snout or the spiracles (the openings behind the eyes). Make sure you keep your fingers away from the mouth and hold the ray away from your body to avoid lashes of the tail and barb.



For large rays use two people and carry by the wings

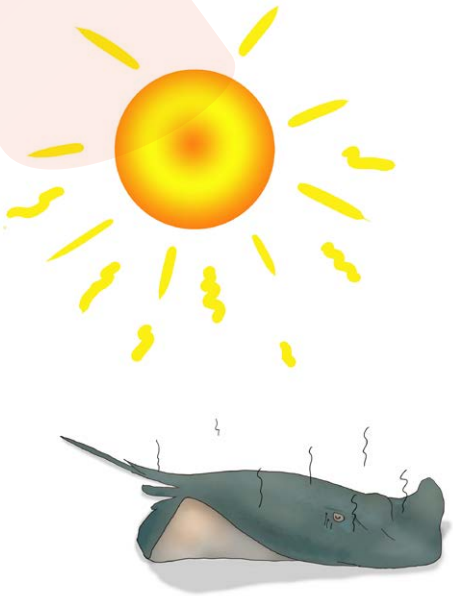
Incorrect Handling of Rays



Do not carry ray by the tail to avoid being stung

Do not carry or drag the ray by the gill slits

Do not use a gaff to lift the ray.



Do not expose rays to the sun for extended periods

Shark and Ray Research

The Chondrichthyan Bycatch Research Group at Monash University is led by Dr Richard Reina, in collaboration with the Australian Fisheries Management Authority, industry partners, Dr Charlie Huveneers of Flinders University and Dr Terry Walker, formerly of the Department of Environment and Primary Industries, Victoria. The group of researchers and students is working to understand how capture by fisheries impacts shark and ray biology and how to apply this information to management and conservation.

We want to understand how the response of animals to the stress of capture affects their survival, physiology, immune system, reproduction, behaviour, movement and ecology. By incorporating this information into fisheries management practices we aim to reduce the impact on bycatch species while increasing the efficiency of fisheries.

Our research is conducted in the laboratory and at sea. Capture of animals in laboratory tanks allow us to control the duration of capture, the conditions and the monitoring of the animal's recovery over several days after capture. Observations at sea allow us to work with a greater range of species and compare what happens in the wild to what happens in the laboratory.

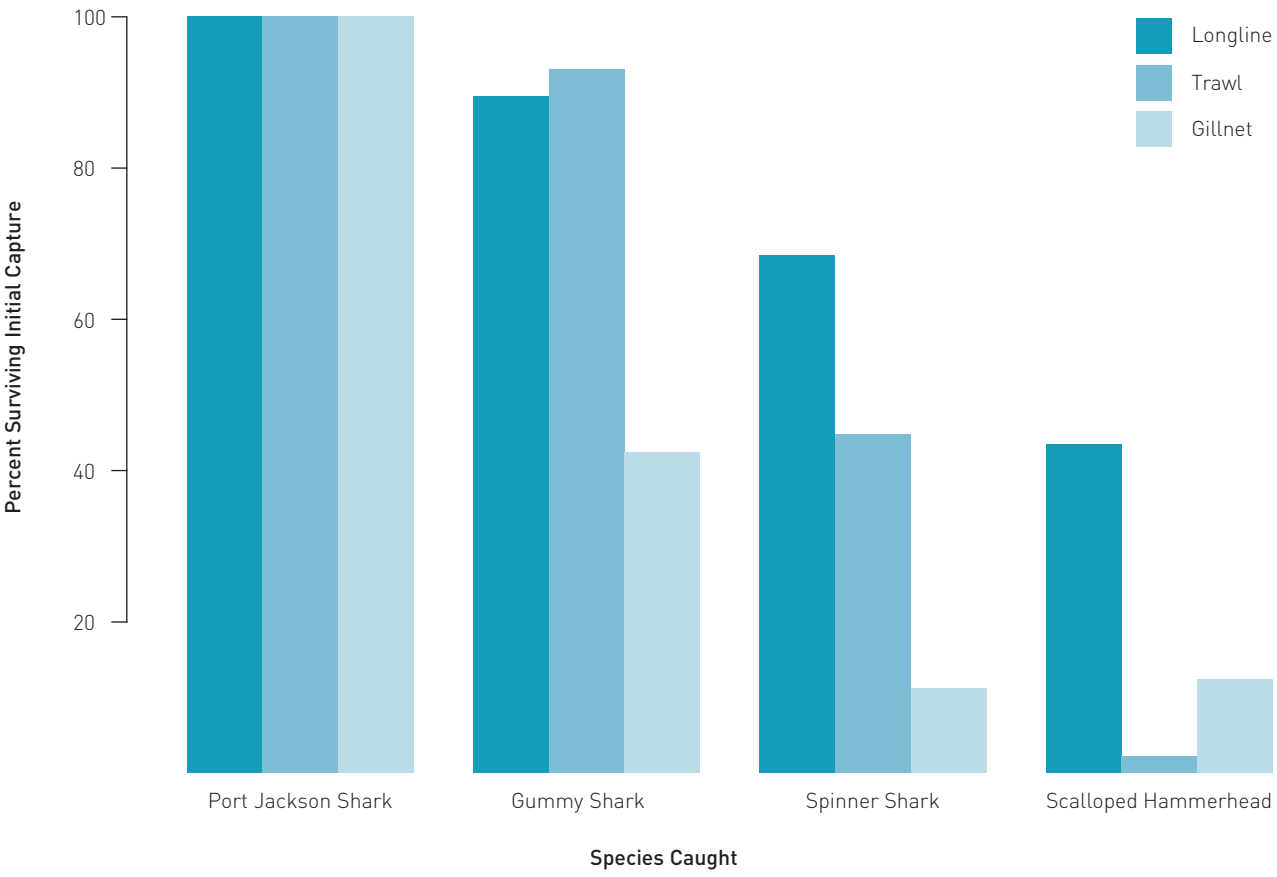
Both in the lab and at sea, we assess and monitor the animal's condition by blood and tissue sampling and by looking for specific visible signs of good and poor health. We also use ultrasound to determine if a captured female is pregnant and how capture stress may affect embryonic development.

Collection of Southern Fiddler Rays in Victoria by hand using SCUBA (left). Blood sampling of a Southern Fiddler Ray and Smooth Hammerhead (middle and right).

The release of captive-born Southern Fiddler Ray offspring to the wild in Victoria Photo: Leonardo Guida

Among our findings so far we have shown that some common bycatch species such as the Port Jackson and swell sharks are largely tolerant of longline and gillnet capture, while key commercial species like the gummy shark are less tolerant. Bronze whalers are moderately sensitive to longline capture, while smooth hammerhead and elephant sharks are even more so. We have shown that reproduction of some species can also be affected, with reduced size and weight of pups born from mothers that have experience trawl capture during pregnancy.

Our overall goal is to directly apply our research to assist not only in improving and conserving shark and ray populations, but also to ensure the sustainability of commercial and recreational fisheries. This can be achieved by working closely with fisheries, using our understanding of biology to continually evaluate strategies that minimise their impact on the sustainability of shark and ray populations.



Comparisons of the survival rates of four different species caught in trawl, longline and gillnet fisheries. Scalloped hammerhead and spinner sharks are less likely to survive from initial capture until landing than gummy or Port Jackson sharks. Sharks and rays caught by longline are more likely to be alive when landed than sharks caught by trawl or gillnet fisheries.

Figure: Derek Dapp

Species commonly encountered during fishing

Southern Fiddler Ray

Scientific name: *Trygonorrhina dumerilii*

Other common names: Banjo shark, Dumeril's shovelnose-ray, Fiddler ray, Green skate, Southern fiddler, Parrit

Distinguishing Features: Similar in appearance to the Eastern Fiddler Ray. The southern fiddler ray has three parallel stripes behind the eyes. The eastern fiddler ray has a triangle pattern behind the eyes.

Maximum Size: 146 cm

Size at Birth: 21-25 cm

Depth and Habitat: 0-205 m, Bottom-Dwelling

Commonly Captured In: Trawl, Longline, Recreational

Fishing Mortality Risk: LOW

Remarks: A resilient species which is capable of surviving prolonged trawl tows (up to 8 hours) and aerial exposure (30 minutes). It has no barb or spines and is generally safe to handle, but avoid contact with the mouth.

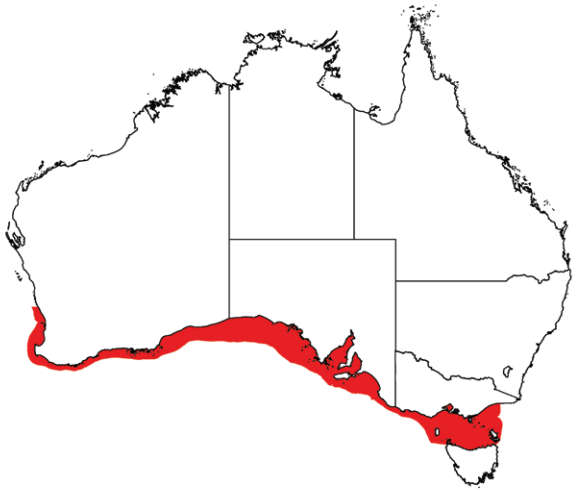
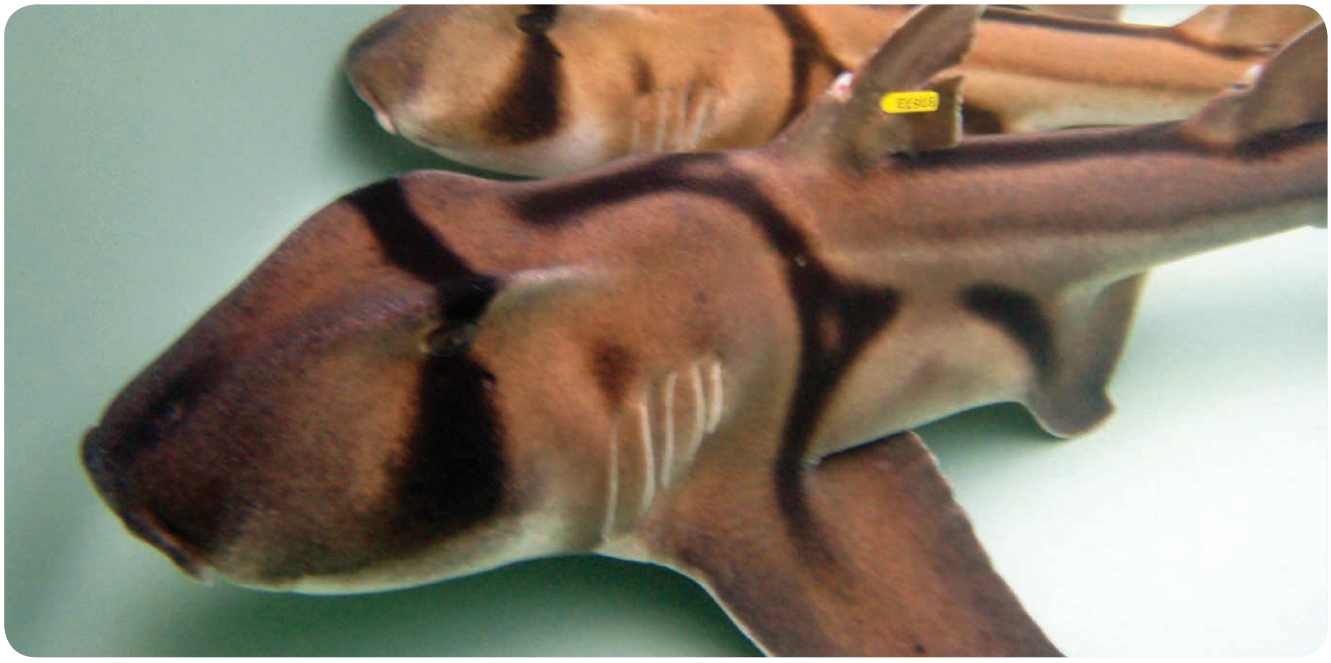


Photo: Leonardo Guida
Distribution map: Derek Dapp

Port Jackson Shark



Scientific name: *Heterodontus portusjacksoni*

Other common names: Bullhead, Oyster crusher, Tabbigaw

Distinguishing Features: Easily distinguished from other sharks by its blunt head and pattern of dark stripes.

Maximum Size: 165 cm

Size at Birth: 23 cm

Depth and Habitat: 0-275 m, Bottom-Dwelling

Commonly Captured In: Gillnet, Longline, Recreational, Trawl

Fishing Mortality Risk: LOW

Remarks: A resilient species which is capable of surviving prolonged gillnet, longline, and trawl capture. It has hard venomous spines on both dorsal fins, which become increasing dull with age. Avoid contact with the mouth and spines.

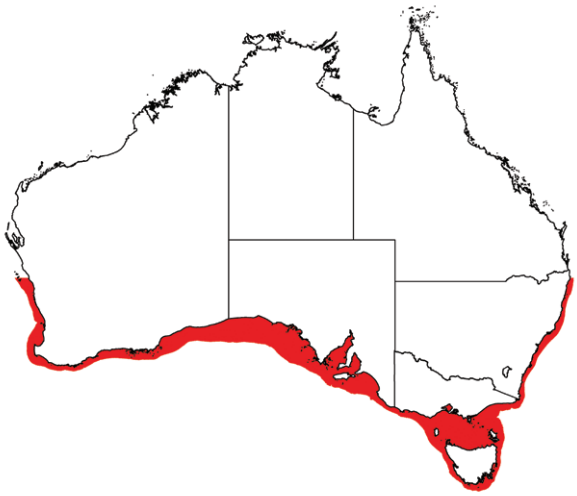


Photo: Jason van Rijn
Distribution map: Derek Dapp

Species commonly encountered during fishing

Draughtboard Shark

Scientific name: *Cephaloscyllium laticeps*

Other common names: Australian swellshark, Rock shark, Whitefinned swellshark, Sleepy Joe, Nutcracker shark

Distinguishing Features: Robust body with a short head and inflatable stomach. Has a dark, blotched colour pattern, with a dark stripe across the stomach. Responds to stress by inflating the body with water or air.

Maximum Size: 150 cm

Size at Birth: 16-18 cm

Depth and Habitat: 0-60 m, Bottom-Dwelling

Commonly Captured In: Gillnet, Longline, Recreational, Trawl

Fishing Mortality Risk: LOW

Remarks: A resilient species which is capable of surviving prolonged gillnet, longline, and trawl capture. It has no barb or spines and is generally safe to handle. Avoid contact with the mouth.

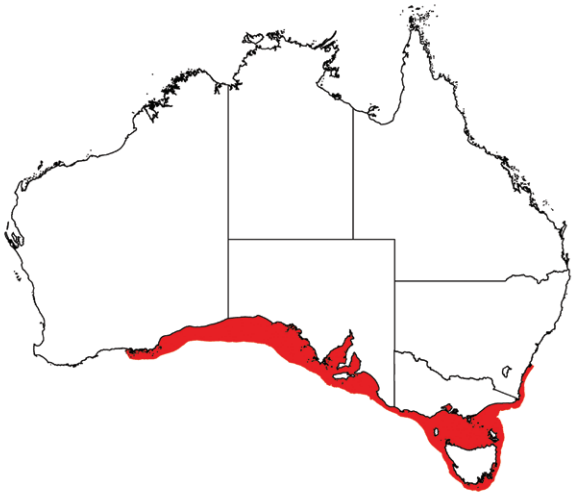


Photo: Mark Norman / Museum Victoria, Rights/Licence: CC BY (Attribution)
Distribution map: Derek Dapp

Bronze Whaler

Scientific name: *Carcharhinus brachyurus*

Other common names: Copper shark, Cocktail shark, Narrowtooth shark, New Zealand whaler

Distinguishing Features: A large whaler shark which can be distinguished from the dusky whaler by its lack of a ridge on its back. The back is grey to copper in coloration.

Maximum Size: 295 cm

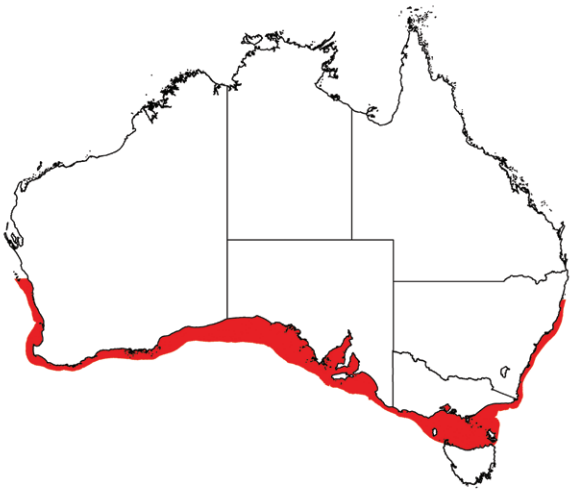
Size at Birth: 60-70cm

Depth and Habitat: 0-100 m, Mid-water

Commonly Captured In: Gillnet, Longline, Recreational, Trawl

Fishing Mortality Risk: MEDIUM

Remarks: This species has intermediate resilience to fisheries capture and is likely to die after prolonged gillnet, longline, and trawl capture. It has no barb or spines and is generally safe to handle, but has an escape response characterised by violent thrashing and can attain large sizes. Avoid contact with the mouth.



Picture: Leonardo Guida
Distribution map: Derek Dapp

Species commonly encountered during fishing

Smooth Hammerhead

Scientific name: *Sphyrna zygaena*

Other common names: Common Hammerhead

Distinguishing Features: Similar in appearance to scalloped hammerheads and great hammerheads, but the smooth hammerhead can be distinguished by the lack of an indentation in the centre region of the head.

Maximum Size: 350 cm

Size at Birth: 50-60 cm

Depth and Habitat: 0-60 m, Mid-water

Commonly Captured In: Gillnet, Longline, Recreational, Trawl

Fishing Mortality Risk: HIGH

Remarks: This species has a poor resilience to fisheries capture and is known to die in as little as 30 minutes of longline capture. It has no barb or spines, but has an escape response characterised by violent thrashing and can attain large sizes. Avoid contact with the mouth, handle with caution.

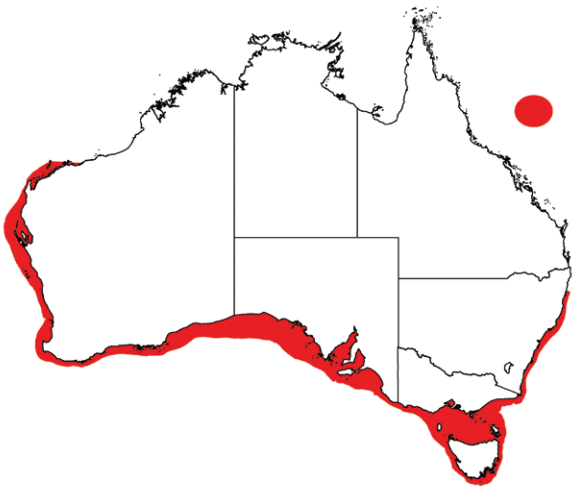


Photo: Jason van Rijn
Distribution map: Derek Dapp

Reporting

In Australia, most sharks can be caught by commercial and recreational fishers legally. However, due to declines in numbers, some species are now listed as 'threatened' under the Environmental Protection and Biodiversity Conservation Act 1999.

As long as operators are fishing in accordance with their fishery's accredited management arrangements, it is not an offence to interact with a protected species even if the animal dies. However, it is an offence to not report these interactions to AFMA or the Department of the Environment.

All operators need to do is fill out the **Listed Marine and Threatened Species form** in their logbook and then submit it to AFMA. Under agreed reporting arrangements, AFMA will report interactions to the Department of the Environment on the operator's behalf through quarterly summary reports of interactions.

Listed shark species in Australia

SPECIES	STATUS
Grey Nurse Shark *(Carcharias taurus)* - East coast population	Critically endangered species
Speartooth Shark *(Glyphis glyphis)*	Critically endangered species
Northern River Shark *(Glyphis garricki)*	Endangered species
Grey Nurse Shark *(Carcharias taurus)* - West coast population	Vulnerable
Whale Shark *(Rhincodon typhus)*	Vulnerable
White Shark *(Carcharodon carcharias)*	Vulnerable
Dwarf Sawfish, Queensland Sawfish *(Pristis clavata)*	Vulnerable
Freshwater Sawfish *(Pristis microdon)*	Vulnerable
Green Sawfish, Dindagubba, Narrowsnout Sawfish *(Pristis zijsron)*	Vulnerable
Porbeagle *(Lamna nasus)*	Migratory species
Longfin Mako *(Isurus paucus)*	Migratory species
Shortfin Mako *(Isurus oxyrinchus)*	Migratory species
Basking Shark *(Cetorhinus maximus)*	Sharks MoU*

*Six out of the seven species covered by the Memorandum of Understanding on the Conservation of Migratory Sharks occur in Australian waters - the white shark, whale shark, basking shark, porbeagle, shortfin mako and longfin mako. More information can be found on the Department of the Environment website http://www.environment.gov.au/topics/marine/marine-species/sharks.

References

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Photo: Mike Gerner

Notes

Notes

Australian Government
Australian Fisheries Management Authority

www.afma.gov.au