



Chapter 3

*Bycatch Mitigation
& Handling*

Chapter 3: Bycatch Mitigation and Handling

Bycatch and discards in fisheries have become a serious issue in recent years, both because of their very real impact, particularly on sensitive species, and because of consumers' increasing awareness, which creates demand for sustainable seafood choices. In addition to this being a major issue for the tuna-buying public, RFMOs are increasingly concerned with taking an "ecosystem approach" to fisheries management, which includes reducing the mortality of nontarget species.

Chapter Objectives

1. Provide background on those bycatch species of most concern.
2. Summarize best practices for avoiding bycatch.
3. Detail techniques for the safe handling and release of bycatch.



Scientist studying fish behavior. ISSF bycatch research cruise in the western Pacific, June 2012.

Sharks and Rays

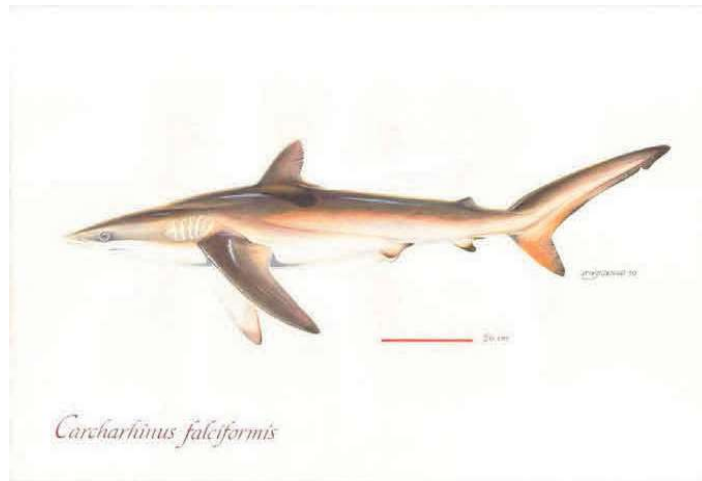
While not the most common bycatch in tuna purse seine fishing, sharks and rays are the most vulnerable to its effects. Several aspects of their biology make them highly susceptible to overfishing, including:

1. slow growth rates,
2. late maturation,
3. long pregnancies,
4. low fertility, and
5. long life spans.

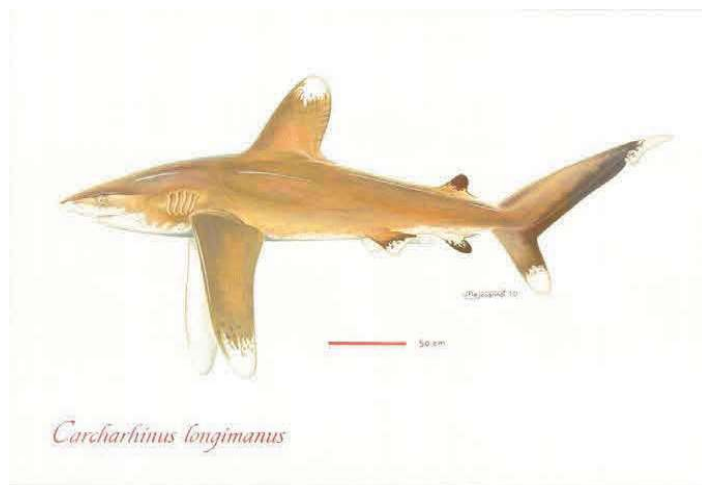
Contrary to the belief that sharks (and to a lesser extent rays) are hardy and that they can sustain rough handling or extensive exposure and still survive when returned to the sea, initial studies suggest a survivability rate of only 50 percent, even if they appear healthy upon release, most probably due to severe stress and/or injury sustained during the fishing and handling process.

This high mortality rate is surely influenced by a number of biological "weaknesses" in sharks and rays. Unlike other fish, these animals do not have a hard skeleton of bone to protect their internal organs. When out of water, the tissue that holds organs in place can tear and the weight of gravity can result in crushed or damaged organs. This same connective tissue holds the spinal cord and vertebrae in place, and for this reason, animals handled from the head or tail can suffer irreversible damage as a result. A shark's head also holds a number of sensitive and fragile organs used to detect prey, and if handling damages these, then the shark – once released—could be unable to locate prey and starve.

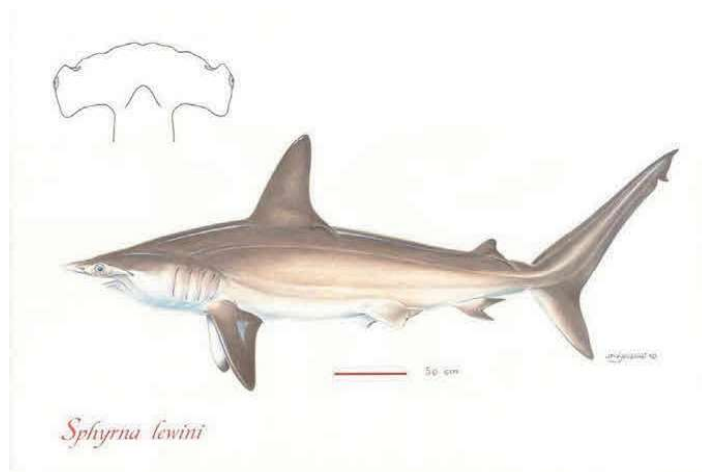
Gallery 3.1 Sharks Commonly Encountered



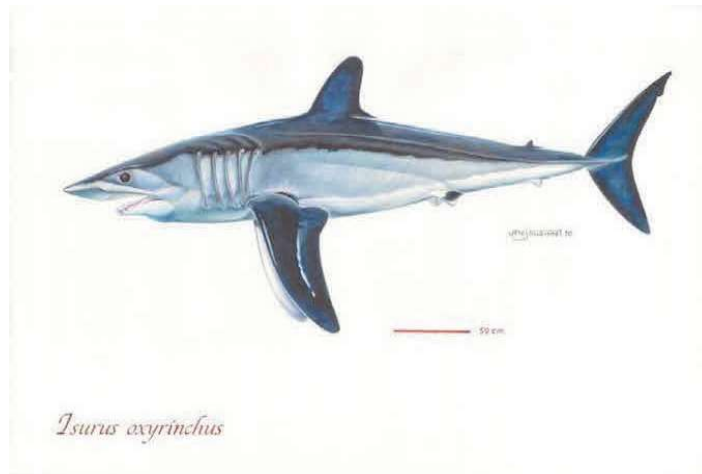
Silky Sharks (Photo: Poisson et al, 2012)



Oceanic Whitetip Sharks (Photo: Poisson et al, 2012)



Scalloped Hammerhead Sharks (Photo: Poisson et al, 2012)

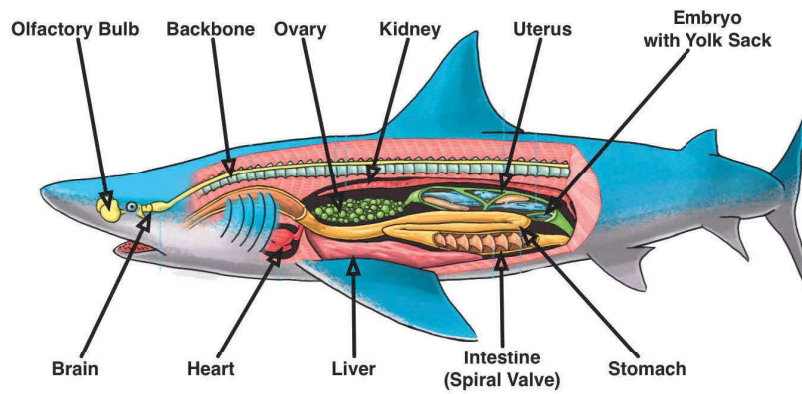


Shortfin Mako Sharks (Photo: Poisson et al, 2012)

Reducing Shark and Ray Bycatch

While there are several strategies currently being tested, there are still relatively few proven techniques for reducing the catch of sharks in purse seine fishing.

However, ISSF continues to sponsor bycatch research cruises to study the most promising strategies, including the use of escape windows in the net. Further developments in this field will be included in future versions of this guidebook.



Shark Anatomy

Gallery 3.2: Whale Sharks and Rays



Whale Sharks



Reef and Giant Manta Rays

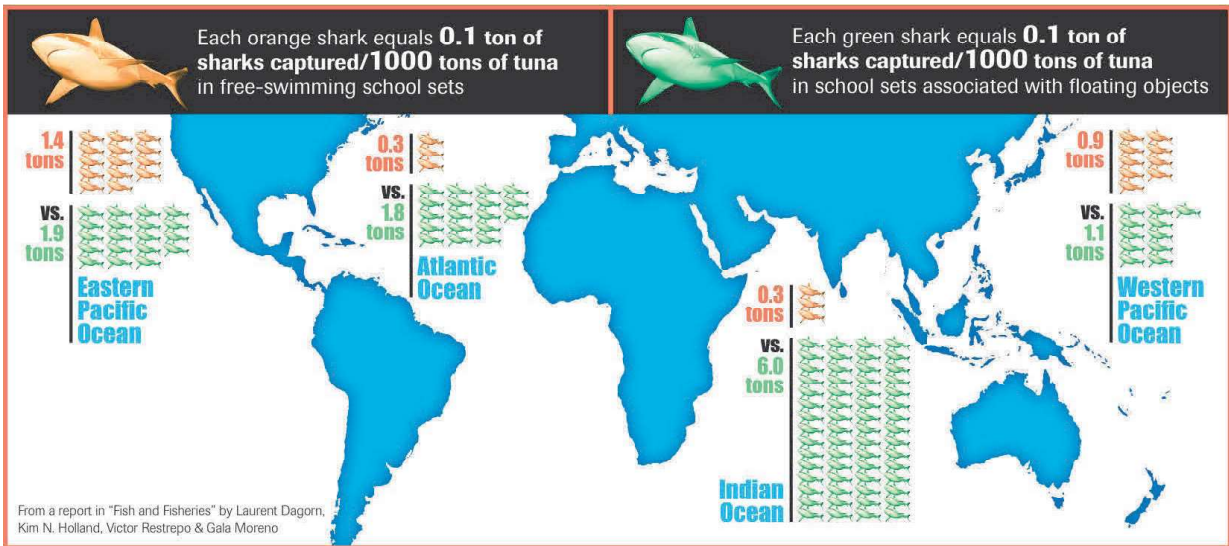


Devil Ray

Target Large Schools

Published science shows that fishers can reduce bycatch simply by targeting larger schools of tuna. In the Canadian Journal of Fisheries and Aquatic Sciences, Dagorn et al. found that the total amount of bycatch is more dependent on the number of sets than the total catch of tuna.

Fishers should target schools larger than 10 tons to reduce shark bycatch by 23 to 41 percent. Overall, using this method will cut the amount of bycatch by 23 to 43 percent, depending on the ocean region (see shark/tuna chart on the next page.)



Tons of sharks captured per tons of tuna.

Movie 3.1: ISSF Shark Research



A video about testing a chum lure. Available online at <http://youtu.be/ap8aYwDEcqA>

Safe Handling Techniques for Sharks and Rays

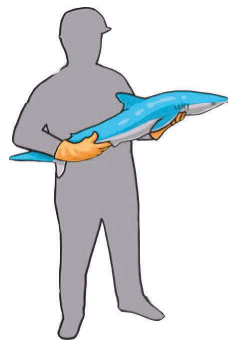
Have the crew prepared for safe handling PRIOR to net hauling – this includes instructing them on correct handling techniques and ensuring they have the right tools at hand, while putting personal safety always first.

The following galleries illustrate handling techniques as well as other dos and don'ts.

Gallery 3.3: Handling Small Sharks (1 Person)



One hand on the dorsal (top) fin and the other holding the body from below (Photo: Poisson et al, 2012)



Both hands holding the body (Photo: Poisson et al, 2012)

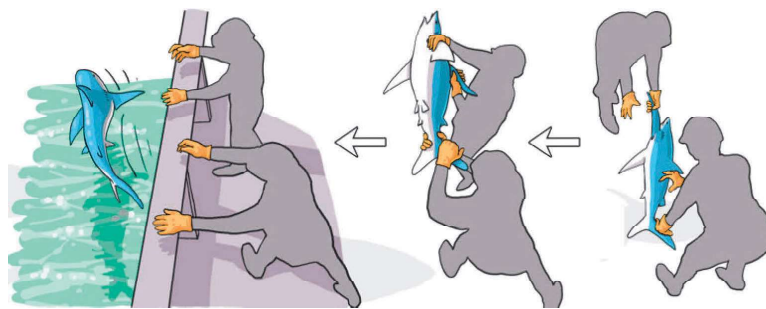


One hand on the pectoral (side) fin and the other holding the tail (Photo: Poisson et al, 2012)



Release the fish by pointing its head down toward the water and dropping it in (Poisson et al, 2012)

Handling Medium Sharks (2-3 People)



One or two people should hold the dorsal and pectoral fins, with the other person holding the tail. Release over the side by dropping, not throwing, the animal. (Photo: Poisson et al, 2012)

Handling Stingrays

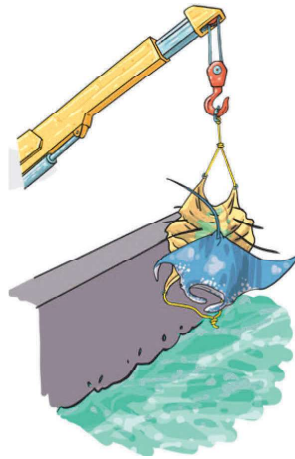


The ray's stinger is located at the base of its tail. The sting is not very harmful, though it is painful. It is best to avoid the rear of the ray and grasp it near the head. Hold the ray away from the body. (Photo: Poisson et al, 2012)

Gallery 3.4: Handling Large Sharks and Manta Rays (with vessel's crane)



If the animal can't be released directly from the brailer (e.g., by tipping one edge), then large sharks, rays, and other fish (e.g., moonfish) can be returned to the sea using a piece of net, plastic tarp, or canvas that can be lifted by the crane. The material should be ready on deck before brailing, and when a large animal is encountered, it can be placed on the material, which is then hooked up to the crane and lifted over board.

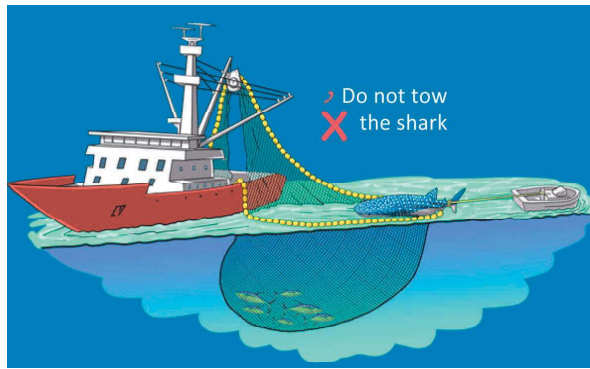


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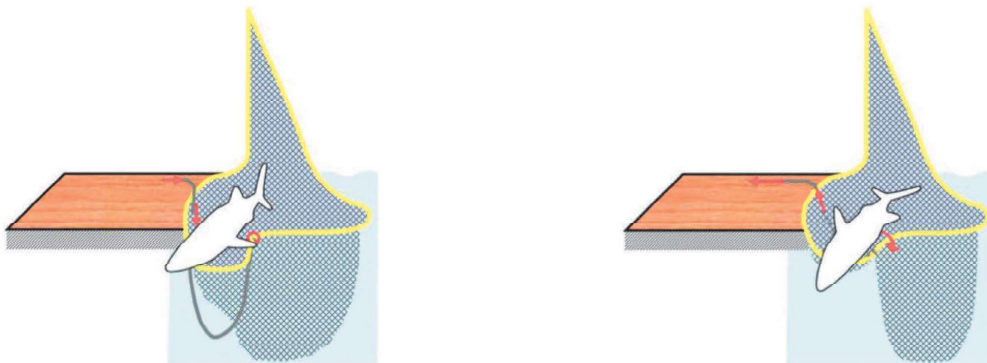
Gallery 3.5: Releasing Whale Sharks



Unlike the handling techniques for sharks and rays discussed above, whale sharks should always be dealt with in the water.



At no time should the whale shark be handled by its tail (e.g., lifted using the crane, or towed it with a speed boat). This can cause severe injury to the animal. (Photo: Poisson et al, 2012)

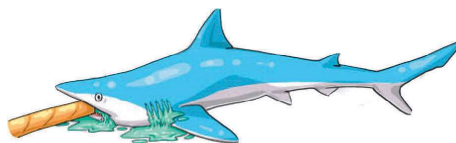


If a whale shark appears early during hauling and is at the surface while the tunas remain below, then the animal may tear the net on its own or a crew member can cut a few meters of net near the head of the animal to allow it to escape. Alternatively, the crew in charge of the net hauling operation can use the winch and the capstan to bring the animal close to the hull, to drain the animal, and then to roll it outside the bunt. A rope placed under the animal and tied on the cork line could help roll it outside the net (Photo: Poisson et al, 2012)

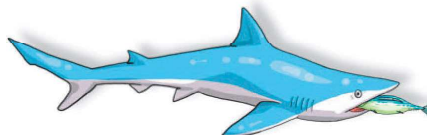
Gallery 3.6: Shark Handling and Release Dos



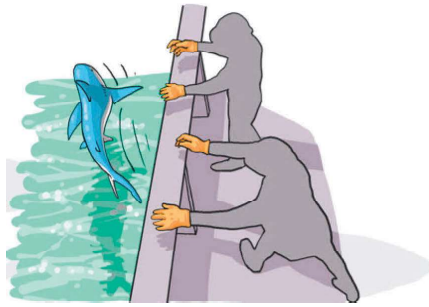
A cool, wet cloth lightly draped over its head can calm an energetic shark. (Poisson et al, 2012)



Inserting a seawater hose in its mouth might improve an animal's chance of survival if, for an unavoidable reason, the shark cannot be released right way. (Poisson et al, 2012)



For crew safety, avoid the animal's jaws (some suggest placing a fish in its mouth to prevent bites), and regardless of the animal's state (live or moribund) be cautious at all times. (Poisson et al, 2012)

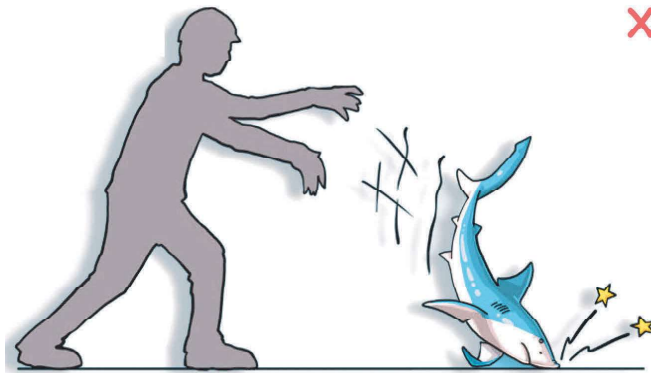


Most importantly, attempt to release the animal AS SOON AS POSSIBLE. (Poisson et al, 2012)

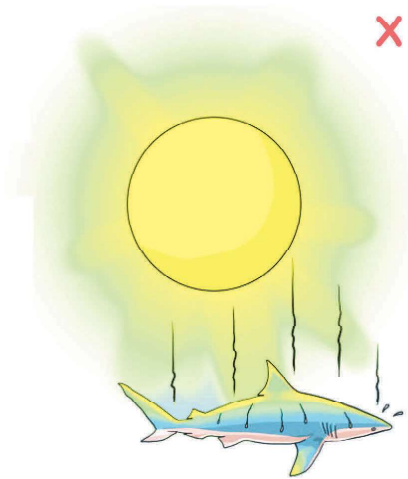
Gallery 3.7: Shark Handling and Release Don'ts



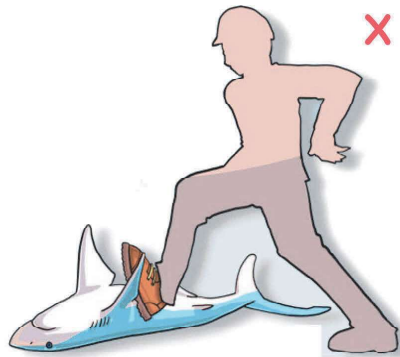
DO NOT lift the animal by its head or tail, as this can severely damage the spinal cord (Poisson et al, 2012)



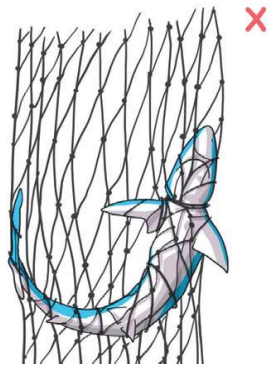
DO NOT throw, hit, or squeeze the animal. Prevent the animal from battering itself against the deck or other hard objects. (Poisson et al, 2012)



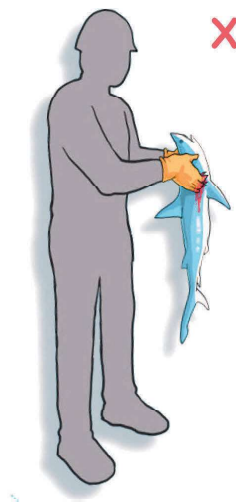
DO NOT leave the animal in the sun. If possible, handle the animal in the shade or otherwise reduce its exposure to the sun. (Poisson et al, 2012)



DO NOT yank or push the animal sharply. (Poisson et al, 2012)



DO NOT tug or yank the net around an entangled animal. Instead use clippers, if necessary. For animals entangled in the net, reduce the speed of the net reel. Once the tension is reduced, carefully remove the animal. (Photo: Poisson et al, 2012)



DO NOT insert hands or objects into the gill openings. (Poisson et al, 2012)



DO NOT insert a gaff, hook, or other pointed object to drag or lift the animal. (Poisson et al, 2012)

End Wasteful Shark Finning

Shark finning is the practice of retaining shark fins and discarding the remaining carcass while at sea. The practice is against the FAO Code of Conduct for Responsible Fisheries and its International Plan of Action for the Conservation and Management of Sharks, as well as the resolutions of a number of other international marine bodies, all of which call for minimizing waste and discards.

There are major uncertainties about the total quantity and species of sharks caught, and shark finning has added to this problem.

ISSF has called on industry to adopt policies against finning. All tuna fishery operators should prohibit shark finning, and should retain, land, and report all sharks caught, except for species that are prohibited by national law or RFMO regulations, or those individuals that are released alive.

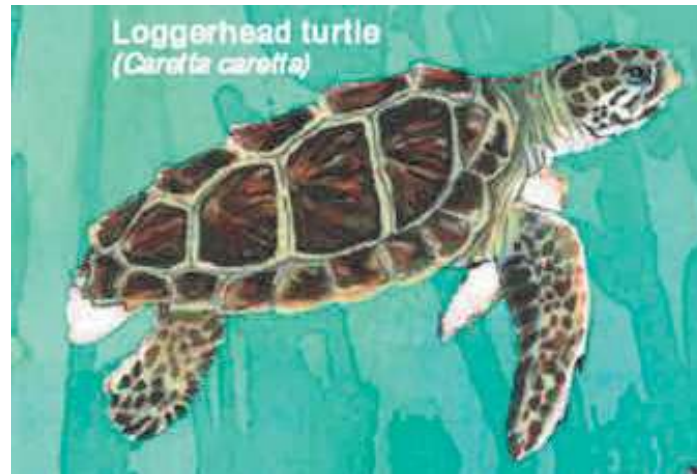
Sea Turtles

Sea turtles can be found entangled in the nets of FADs or associated with the tuna school in the bunt. Regarding sea turtles and FAD fishing, the most effective bycatch mitigation focuses on the structure and/or configuration of the FAD itself, which was reviewed in the previous chapter.

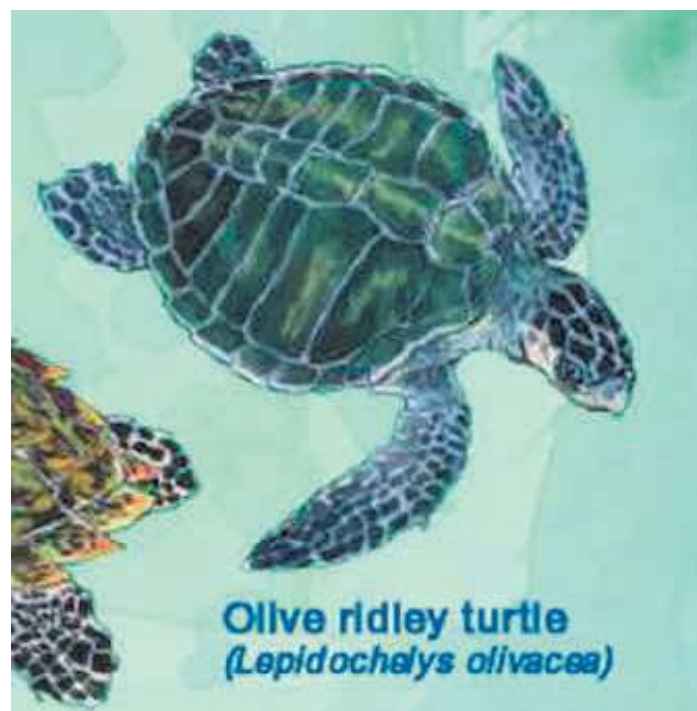
All sea turtles are protected internationally, as these long-lived animals face a number of environmental challenges (breeding ground destruction, boat collisions, ingestion of marine debris, disease linked to ocean pollution), including interactions with fishers. There are seven species of sea turtle, with five commonly encountered during tuna fishing.

The current, and best, practice to avoid turtle mortality once the animal is entangled is the use of speedboats to release the turtles unharmed from the net before passing through the power block. The best time for this action is when the entangled turtle and net leaves the water on the way to the power block (at this point the hauling should be paused). If necessary, use clippers to cut the net. Disentanglement at the earliest possible stage maximizes survival. Speedboats can also be used to remove any free-swimming encircled turtles. When handling, do not lift the turtle by its flippers or use sharp objects (e.g., gaffs) to retrieve them. Hold the turtle by the sides of its shell and ease it into the water head-first as soon as possible. If the turtle appears unconscious (possibly due to entanglement underwater), place the turtle on a tilted surface so that its hindquarters are approximately 15 cm (6 in) higher than its head. This allows water to drain out of its lungs. Keep the animal moist (cover the body—but not the nose and mouth—with a wet towel or spray it periodically with water) and at a temperature above 15° C (60° F). Check the turtle's reflexes by touching its tail or eyelid every three hours. An unconscious, but live, turtle may not react. If, after 24 hours, the turtle shows no recovery, it is likely dead. However if it does recover, release it gently into the water.

Gallery 3.8: Sea Turtle Species



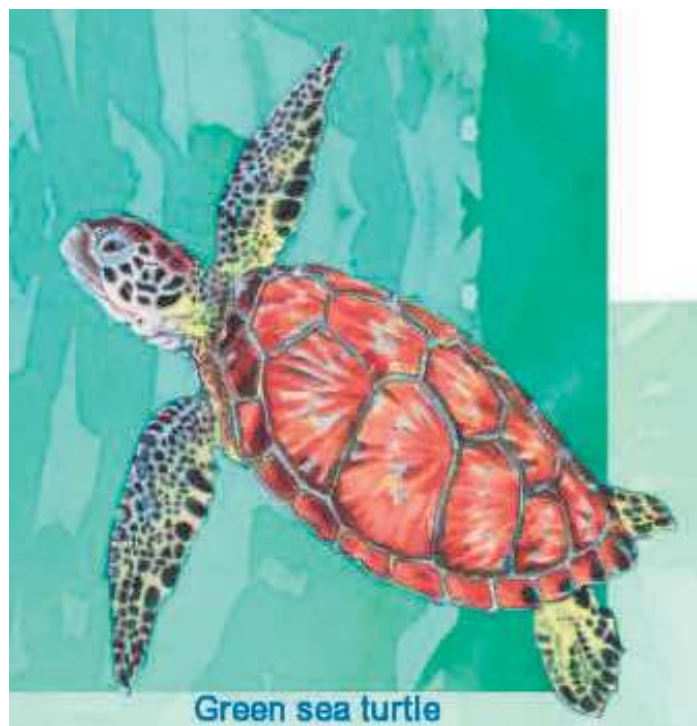
Loggerhead (Photo: FAO, 2009)



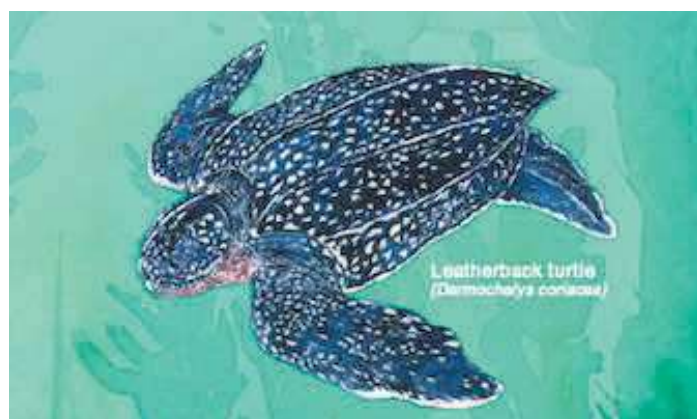
Olive Ridley (Photo: FAO, 2009)



Hawksbill (Photo: FAO, 2009)



Green (Photo: FAO, 2009)



Leatherback (Photo: FAO, 2009)