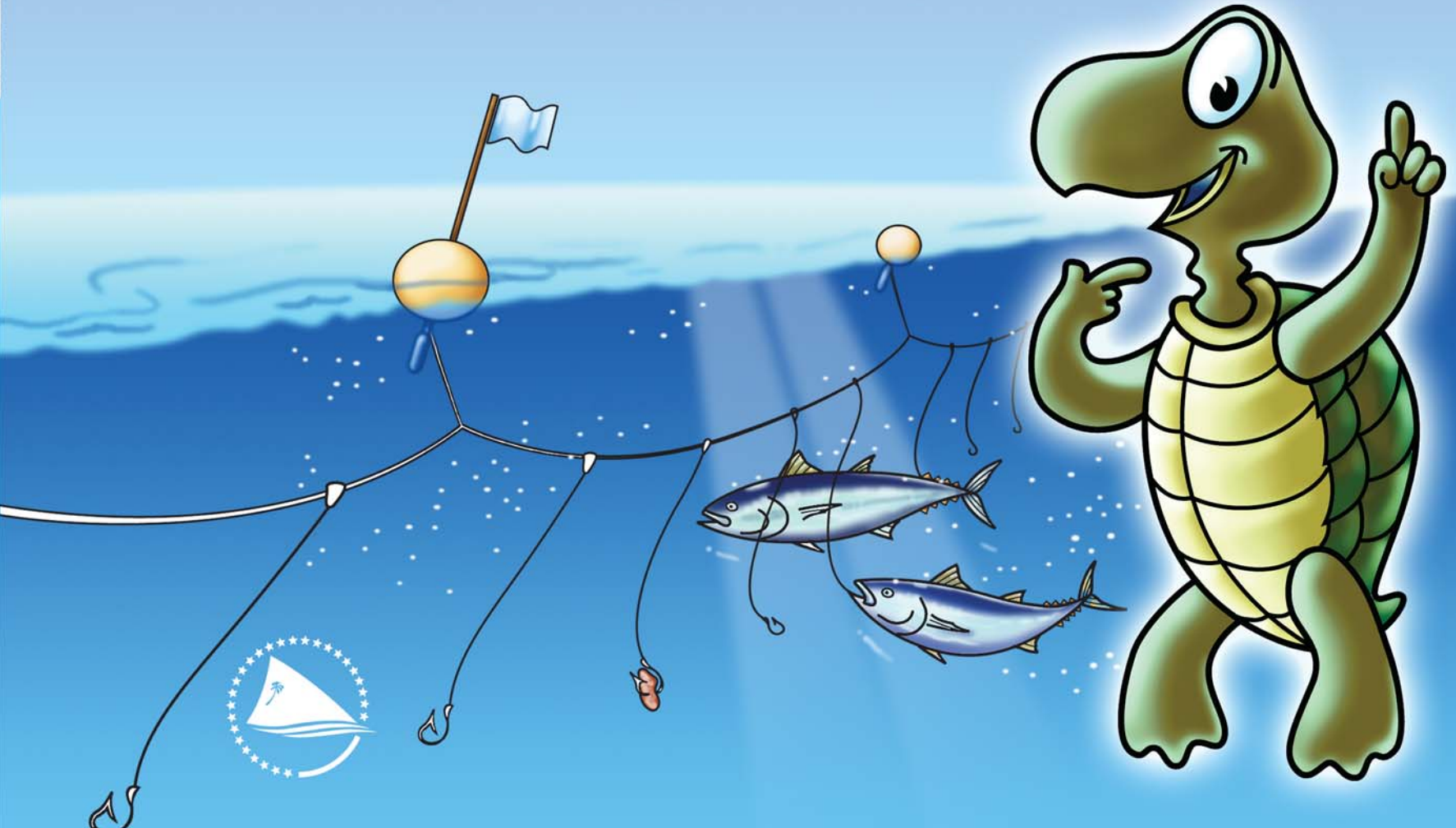


# Protected marine species

and the tuna longline fishery in the Pacific Islands





# **Protected marine species**

## and the tuna longline fishery in the Pacific Islands

by  
Mike King

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# **Protected marine species**

## **and the tuna longline fishery in the Pacific Islands**

This booklet has been produced by the Fisheries Training Section of the Secretariat of the Pacific Community to raise awareness of the tuna longline bycatch issue in Pacific Island countries. The booklet was prepared by Michael King and the project coordinated by Michel Blanc, SPC's Fisheries Training Adviser. Illustrations by the author are initialed and others are adapted from previous SPC and FAO publications.

The bycatch issue in the longline tuna fishery — the accidental catching on longlines of endangered and protected species, particularly turtles — is one that could eventually result in the loss of important markets for tuna from Pacific Island countries. The protection of threatened species and the Pacific Island longline fishery requires both awareness and cooperative action regarding bycatch.

This booklet provides information for fishermen, boat owners, processors and others in the longline fishing industry. It is designed for use by fisheries trainers and the final sections contain training aids and a list of additional reference materials.

It is hoped that this booklet will be used by trainers as the basis for incorporating sessions on the bycatch issue into existing and planned training courses for fishing industries across the Pacific.

Funding assistance from the government of New Zealand for the production of this booklet is gratefully acknowledged.

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# 1. Tuna longlining and the bycatch issue

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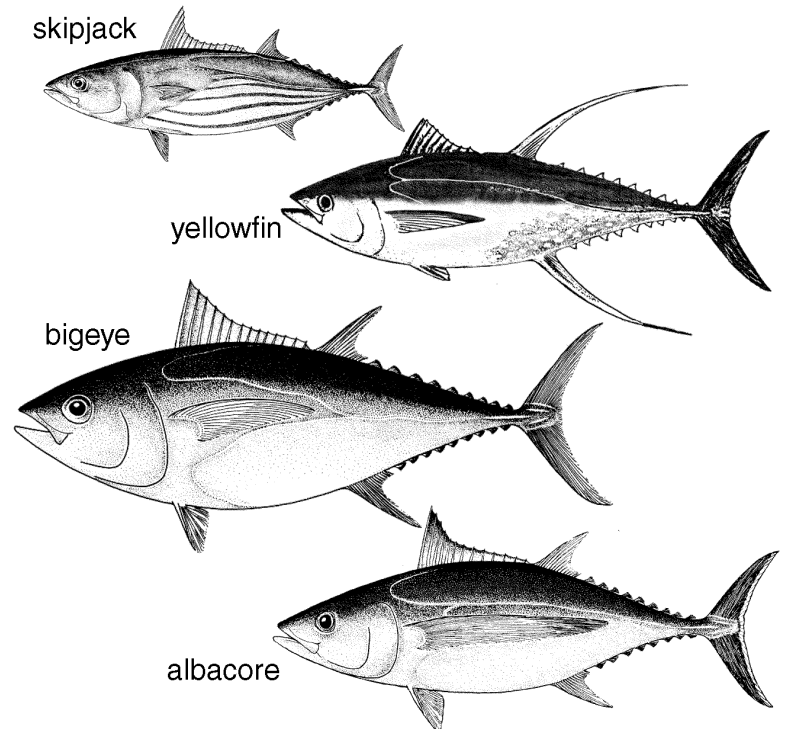
## 1.1 What is tuna longlining?

The involvement of Pacific Island nations in commercial tuna fishing has increased over the last 10 years, while that of foreign fishing vessels has decreased.

Local fishing vessels and processing facilities provide local employment and a substantial benefit to island economies. For many islands, tuna fishing is the only significant option for economic growth and food security.

In the western and central Pacific, several different types, or species, of tuna are commonly caught using different fishing methods (Figure 1.1). In order of increasing value these are skipjack (*Katsuwonus pelamis*), albacore (*Thunnus alalunga*), yellowfin (*Thunnus albacares*) and bigeye (*Thunnus obesus*).

**Figure 1.1:** Species of tuna caught in the western and central Pacific.



Of all the commercial tuna fishing methods, longlining has proved to be the cheapest and most effective for local fishermen in small Pacific Island nations.

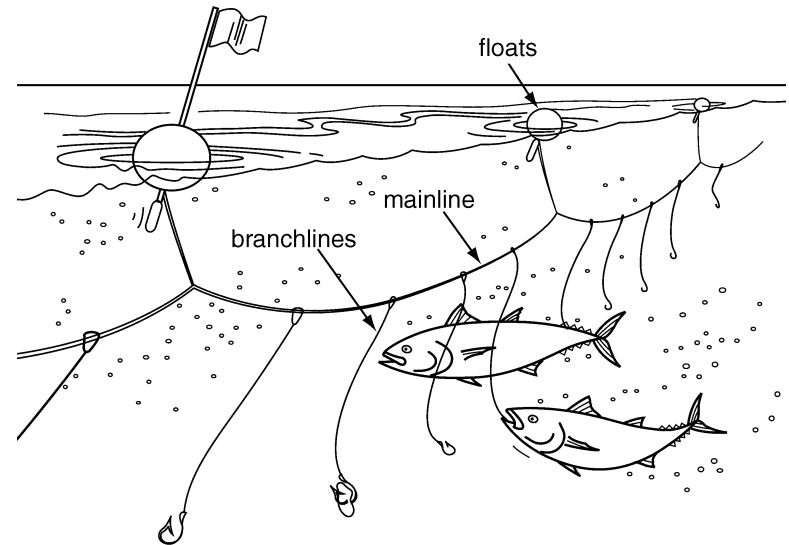
Longline fishing gear consists of baited hooks hanging from a long drifting line suspended from the surface of the sea by a number of floats (Figure 1.2).

The three major parts of longline gear are the:

- floats,
- mainline,
- branchlines.

From 300 to 3500 branchlines, each with a single baited hook, hang from the mainline, which is supported by floats. The mainline may be from 10 to 180 km in length.

Longlines with their baited hooks and floats are usually laid out (or set) and left in the sea for up to 8 hours before being pulled in (or hauled).



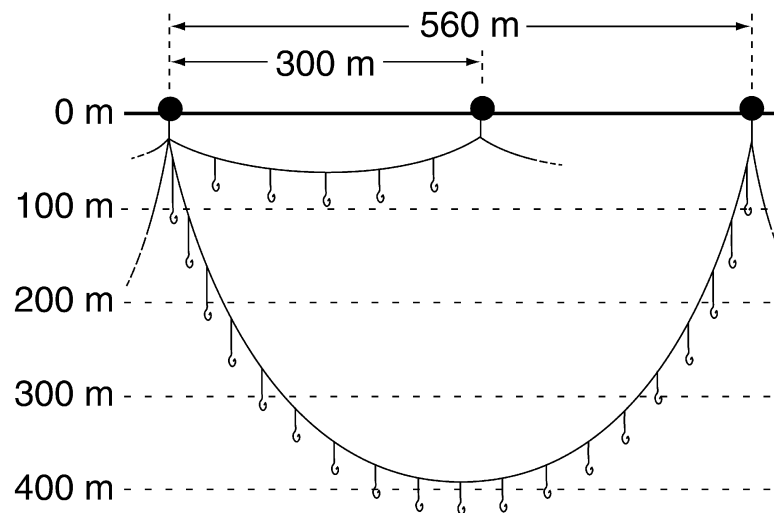
**Figure 1.2:** Catching tuna by longlining.



The shape of the set longline will vary depending on the species being targeted and the judgement of the skipper. By monitoring the number of hooks between the floats and the setting speed, the skipper can control the depth at which the hooks will be set (the fishing depth).

A shallow set (from 35 to 110 m deep), targeting swordfish for example, has from 4 to 6 branchlines between the floats.

A deep set (from 300 to 400 m deep), targeting species such as albacore and bigeye tuna, has between 15 and 30 branchlines between the floats, which results in a deeper sag of the mainline (Figure 1.3).



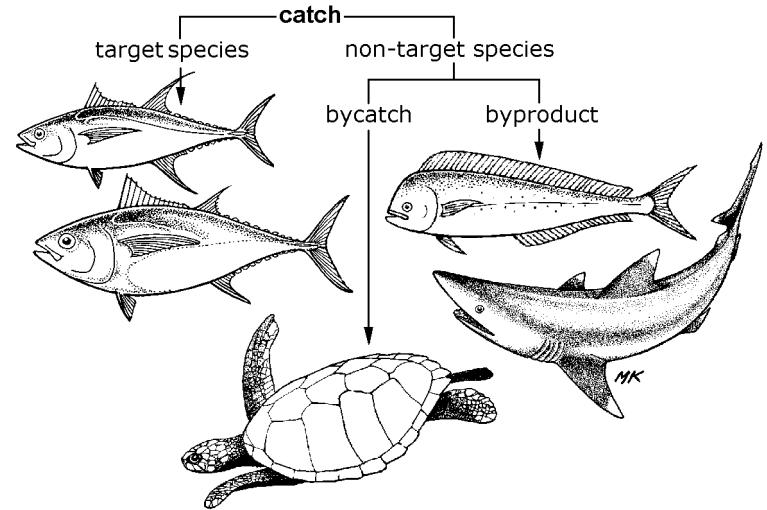
**Figure 1.3:** The longline can be set shallow or deep depending on the species the fisherman wishes to catch.

## 1.2 What is bycatch?

Longlines float offshore and, in the western and central Pacific, are generally set to catch various species of tuna. These species are referred to as the **target species**. In other areas, longline fishermen target billfish, such as swordfish.

In addition to the target species, longlines catch some other species, usually in small numbers, and these are collectively known as **non-target species**. Non-target species can be divided into those species that have some commercial value (referred to as **byproduct**) and those species that are unwanted (referred to as **bycatch**) because they have no commercial value or are protected by law. Species may be protected by law if their numbers are thought to be very low; these species are said to be threatened or endangered.

Byproduct species include some sharks and marlin, as well as sailfish, mahi mahi, wahoo and opah. Bycatch species include snake mackerel and pelagic rays (that have no commercial value) and species such as sea turtles (that are endangered and protected under various laws).



**Figure 1.4:** The longline catch is made up of target species (typically tuna) and non-target species. Non-target species can be divided into byproduct species (such as mahi mahi and sharks that are retained as they have some commercial value), and bycatch species (those such as turtles that have either no commercial value or are endangered).

### 1.3 The bycatch issue

From an environmental viewpoint, tuna longlining is one of the least damaging commercial fishing methods in the world. Unlike trawls, pelagic longlines do not come into contact with (and therefore damage) the sea floor. Longlines are set in the open sea and target oceanic fish well away from more sensitive environments such as coral reefs.

Unlike gill nets and seine nets, longlines are relatively selective in the species that they catch – that is, they catch only a small number of different types of fish. The large hooks catch adult fish that have had a chance to reproduce before capture. Also, longlines are not capable of “ghost fishing” (i.e. the continuous catching of fish by lost fishing gear). In the case of longlines, fishing stops when the bait has gone.

Longlines are low in impact as a large number of hooks are spread over a wide area of ocean to catch specific species, usually tuna. Catch rates of tuna are generally low: two or three fish (about 50 kg) per 100 hooks is regarded as economically viable.

However, besides tuna, longlines sometimes catch small numbers of other species, some of which may be endangered and protected under various laws. This issue, the accidental catching of small numbers of endangered species, is the bycatch issue.

The public, as well as the fishing industry, is justifiably concerned about any actions that further threaten endangered species. Fishermen and fishing authorities need to work together to minimize the additional threat to endangered species caused by longlining (see Section 3).

**The bycatch issue.** Longlining is one of the least damaging commercial fishing methods used in the world. However, fishermen and authorities need to work together to minimize one negative impact – the accidental catching of small numbers of endangered species. This is the bycatch issue.

## 2. Which bycatch species are encountered?

---

### 2.1 Sea turtles

Around the time of the last dinosaurs, about 60 million years ago, ancient terrestrial tortoises entered the seas and eventually evolved into the seven or so species of sea turtles that exist today.

With their limbs modified into flippers, turtles are excellent swimmers but must return to the surface to gulp air. Although turtles mate at sea, their eggs, like the eggs of all reptiles (crocodiles, snakes and lizards), can only develop on land. Turtles may travel thousands of kilometres across oceans, but females must leave the water to lay their eggs in pits that they dig on sandy beaches. Human predators, however, often wait and watch for the nesting turtles and, along with dogs and pigs, steal the eggs for food.

Small numbers of turtles are also incidentally caught on longlines, generally on shallow sets or on hooks near the floats.

**Threats to turtles.** Turtles and their eggs are hunted and collected for food. Nesting sites are sometimes interfered with by urbanisation projects. In addition, turtles can die after eating discarded plastic bags (which they mistake for jellyfish). Compared with these threats, the accidental capture of turtles on longlines accounts for only a small number of deaths. Nevertheless, the additional threat caused to such endangered species must be taken seriously and action must be taken by the fishing industry.

Of the six species of turtles found in the Pacific, five may be encountered by longline fishermen in the western and central Pacific. The number of costal scutes (or lateral plates) on the turtle's carapace, or shell, is important in distinguishing one species from another (Figure 2.1a). All six species are described on the following page and the five species of interest to longline fishermen are shown in Figure 2.1b.

**Flatback turtle, *Natator depressus***

The flatback turtle of northern Australia and Papua New Guinea eats crustaceans and other invertebrates. The species nests only in tropical Australia. It is also one of the few animals that eats sea cucumbers. This turtle is classified as "endangered" by the World Conservation Union (IUCN).

**Loggerhead turtle, *Caretta caretta***

The loggerhead turtle, which is found in subtropical and tropical seas, eats crabs, shrimps, molluscs, fish and sea urchins. Loggerheads nest sporadically throughout the Pacific with major nesting grounds in eastern Australia, New Caledonia and southern Japan. It is classified as "endangered" by the IUCN.

**Hawksbill turtle, *Eretmochelys imbricata***

The hawksbill turtle, which is found in all tropical oceans near rocky and coral reefs, is unfortunate enough to have a carapace, or shell, that is attractive. The species is hunted for its shell, which can be polished to give the red, brown and black patterned "tortoise-shell" used in ornaments. It feeds on soft corals, sponges, crustaceans and cephalopods (octopuses and squids). It is now classified as "critically endangered" by the IUCN.

**Leatherback turtle, *Dermochelys coriacea***

The leatherback is the largest of all the turtles and grows to a weight of over 500 kilograms. Instead of the usual horny plated carapace, this peculiar species has a leathery covering with distinct ridges. Although the species can be found in cooler waters, it returns to tropical beaches to lay its eggs. It feeds mainly on jellyfish and other soft-bodied invertebrates. It is classified as "critically endangered" by the IUCN.

**Olive ridley turtle, *Lepidochelys olivacea***

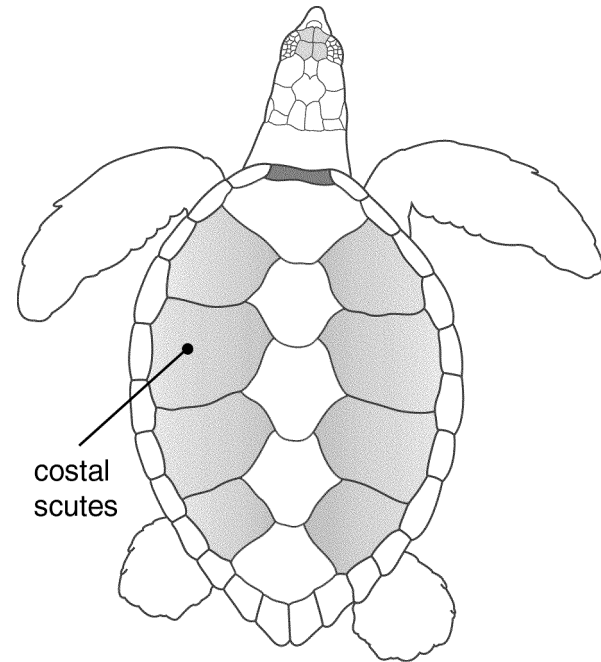
The olive ridley, the smallest of the sea turtles, is found in the warmer waters of all oceans including the western and eastern Pacific. Low density nesting occurs in the Pacific region. The species eats crustaceans, molluscs, jellyfish and, less frequently, plants. It is classified as "endangered" by the IUCN.

**Green turtle, *Chelonia mydas***

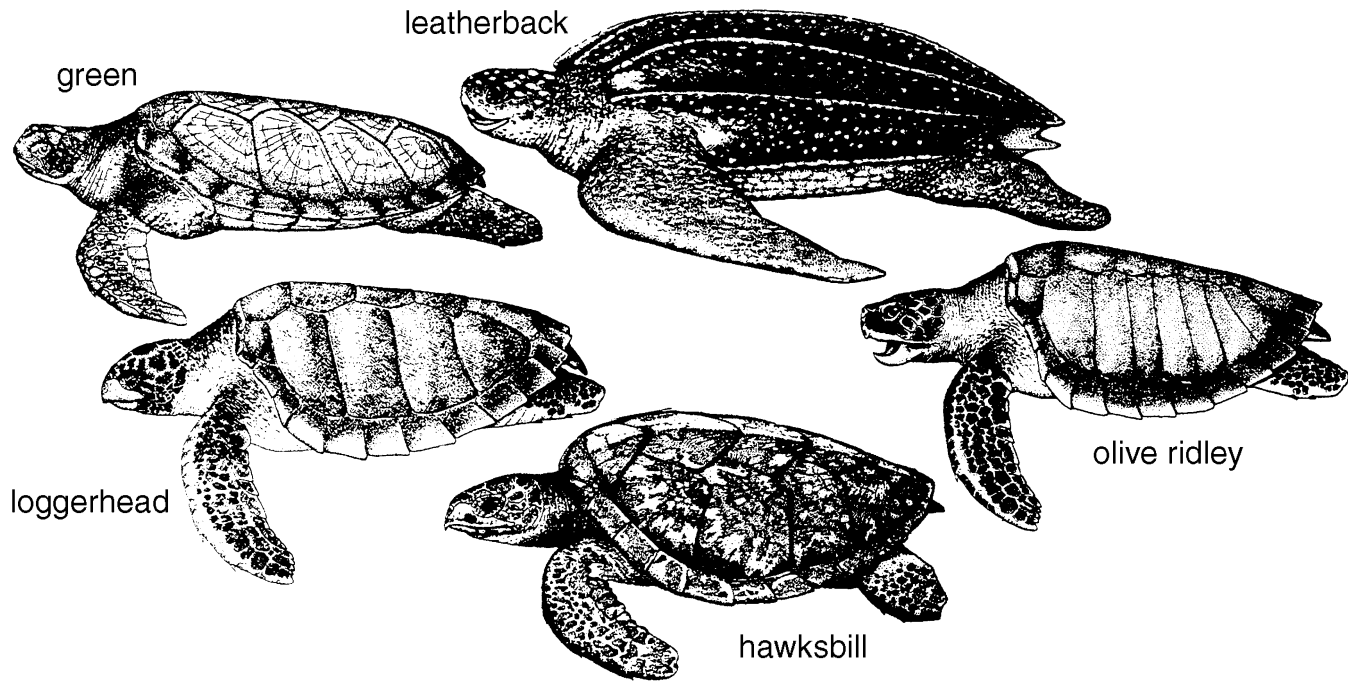
The green turtle, one of the few larger animals that feeds directly on seagrasses, is found in all tropical waters. There are limited nesting sites throughout the Pacific. This species is the one most commonly hunted in the Pacific Islands for its meat and is classified as "vulnerable" by the IUCN.

**Table 2.1:** Reference guide to turtles. Mean lengths refer to the average size of the carapace (or covering “shell”) in adults. The number of costal scutes (see Figure 2.1a) is an important distinguishing feature. SPC’s “marine turtle identification cards” (see Section 5) provide more complete information for distinguishing between the different species.

common name	mean length (cm)	carapace colour	pairs of costal scutes	distinguishing features
flatback	90	grey to olive green	4	low domed, grey carapace
loggerhead	100	reddish-brown to orange-brown	5-6	heart-shaped shell thick neck/shoulders
hawksbill	90	reddish-brown with dark markings	4	“tortoiseshell” markings pointed, hooked beak
leatherback	170	bluish-black with white spots	none	leathery covering with ridges
olive ridley	70	green to dark brownish-green	5-9	round shell
green	110	red to olive-green with black spots	4	serrated lower jaw



**Figure 2.1a:** Diagram showing the position of the costal scutes (shaded).



**Figure 2.1b:** Five species of turtles likely to be encountered by longline fishermen in the western and central Pacific. (turtle illustrations from Marquez 1990).

## 2.2 Sharks

Sharks existed in the sea many years before modern bony fish came into existence, about 500 million years ago. Sharks are different from bony fish (such as tuna) in that they have skeletons of firm but flexible cartilage rather than bone.

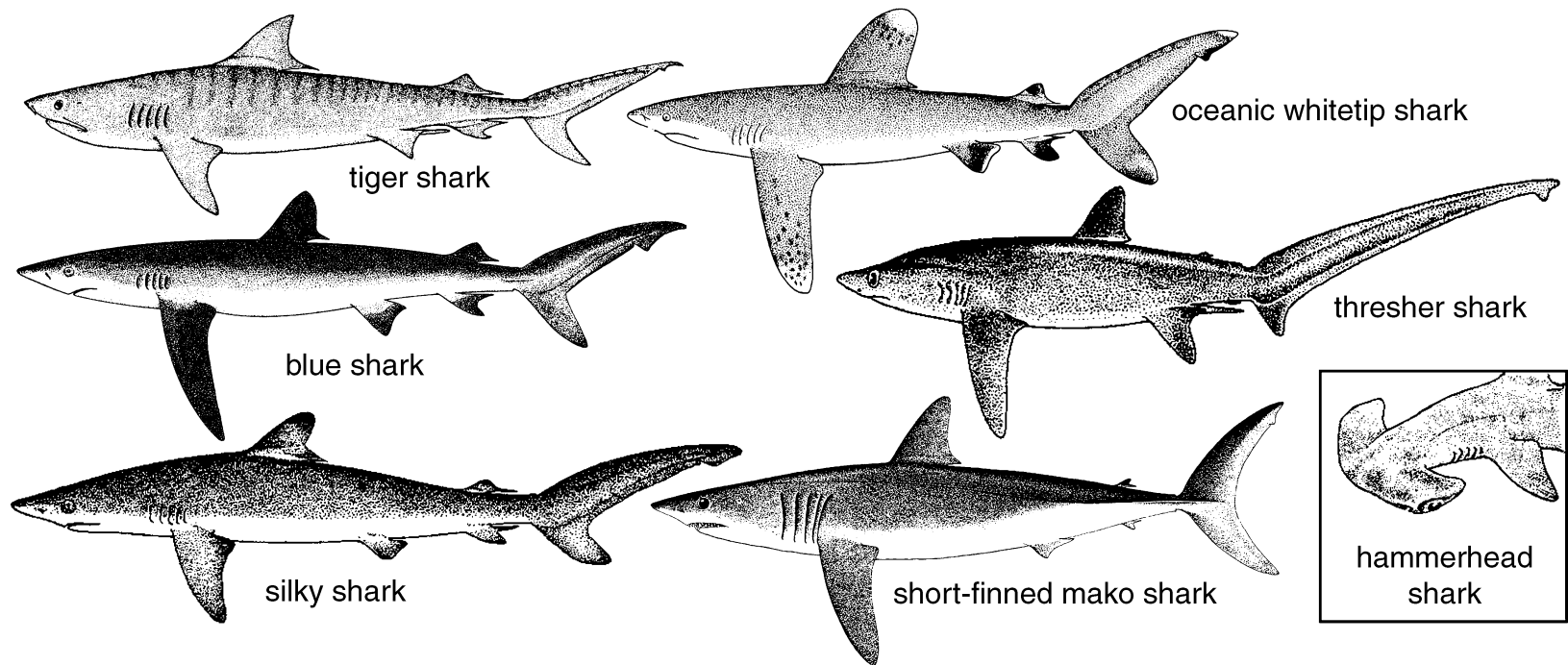
Sharks are especially susceptible to overfishing because, unlike most other fish, they grow slowly, mature late and produce a small number of young. Because of this susceptibility, there is worldwide concern over the longline catch of pelagic sharks. There is a belief that some species are being overfished, although current scientific evidence does not indicate that this is true in the western and central Pacific.

There are very few species of sharks in the open sea. Here, food is too sparsely distributed to support such large carnivorous animals, and most types of sharks hunt in shallower areas, particularly reefs, where food is more abundant. However, there are some species of sharks found far from land and these interact with longlines.

Sharks taken by longlining (Figure 2.2a) include the hammerhead shark (*Sphyrna*), tiger shark (*Galeocerdo cuvier*), blue shark (*Prionance glauca*), silky shark (*Carcharhinus falciformis*), thresher shark (*Alopias*), mako shark (*Isurus oxyrinchus*) and the oceanic whitetip shark (*Carcharhinus longimanus*). Sharks are usually caught on the shallower set hooks and particularly during the night. Sharks may also attack longline-hooked fish, leaving them in an unsaleable condition.

**Shark fins.** Shark fins are used to make a soup that is considered a delicacy in many parts of Asia. The fins are salted and dried before being treated with hot water to extract the gelatinous “needles” between the rays of the fins. Millions of sharks are killed each year by fishermen who, in many cases, just slice off the fins and dump the shark carcasses back in the sea. Fishing sharks on a sustainable basis for their flesh is acceptable but fishing them just for their fins is a waste of good protein. Some countries have banned the landing of shark fins without the accompanying carcass.



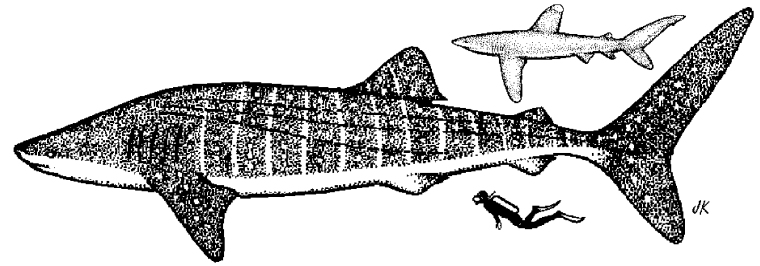


**Figure 2.2a:** Sharks likely to be encountered by longline fishermen in the western and central Pacific (Illustrations from Carpenter and Niem 1998). The inset shows the distinctive head of the hammerhead shark.

The sharks shown in Figure 2.2a are relatively large (usually up to 4 m) but these are dwarfed by another type of oceanic shark that is occasionally encountered by offshore fishermen in the Pacific.

This is the whale shark, the world's largest living fish (it is a shark, not a whale), which grows to a length of 18 metres and a weight of over 40 tonnes. This clownish and gentle giant is dark green with yellowish spots and has three longitudinal ridges on each of its sides (Figure 2.2b).

In spite of its large size, the whale shark filters its food of plankton and small fish from the surrounding water. Because of its reported gentle feeding habits, and lack of shyness, the whale shark is a favourite with divers, many of whom have been filmed hitching rides on the shark's massive dorsal fin.



**Figure 2.2b:** The whale shark, the world's largest fish, shown with an oceanic whitetip shark and a human diver for size comparisons (illustration by Jeremy King).

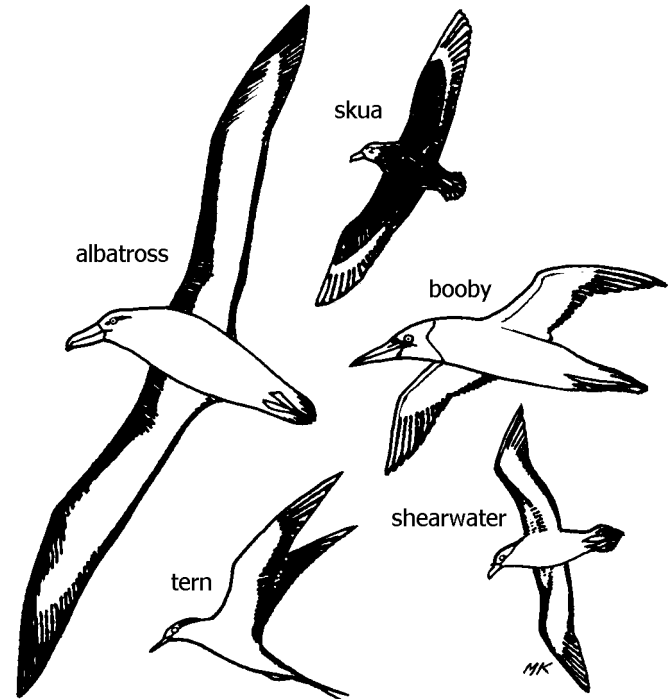
## 2.3 Seabirds

Although the incidental catch of seabirds by longline fishing vessels has been widely publicised, this mainly occurs in higher, colder latitudes where albatrosses are common. Two species breed in Hawaii, but elsewhere in the western and central Pacific region, albatrosses are rarely encountered.

Longline fishermen in the western and central Pacific may see several other groups of smaller seabirds. Indeed, the presence of seabirds often indicates the whereabouts of surface-feeding tuna. A "bird pile" of seabirds actively striking the water to feed on baitfish usually suggests that there is a school of skipjack or yellowfin tuna feeding from below. Because of the large hooks used on longlines, these smaller birds are rarely caught during fishing operations.

Seabirds likely to be encountered in the region are illustrated in Figure 2.3. Several species of petrels and shearwaters breed in the tropical Pacific and others migrate across the region. Gulls are found in New Caledonia and their smaller relatives, the terns, are common in the western tropical Pacific.

Several species of skua are regular migrants and some boobies and gannets are resident breeders in tropical Pacific Islands.



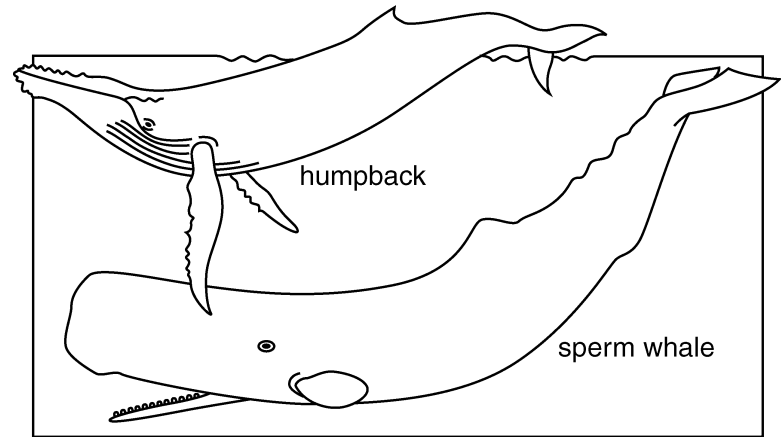
**Figure 2.3:** Other than in Hawaii, albatrosses are rarely found in the central Pacific. The smaller seabirds shown are common in the region but are rarely caught on longlines.

## 2.4 Marine mammals

Mammals first appeared on the earth during the time of the dinosaurs, more than 60 million years ago. Some of these ventured into the sea, perhaps in search of new food sources or safety from predators. Dolphins and whales were some of the first mammals that adapted to the sea. Whales have evolved the ability to mate and give birth at sea but they are still mammals; like dogs and humans, they are warm-blooded and bear live young that are nourished with milk.

Whereas large land mammals have had to develop strong skeletons to support their bodies, whales have no such requirement. With their buoyant bodies supported and cushioned by the sea, whales were free to evolve into huge sizes. The blue whale, up to 35 m in length and 150 tonnes in weight, is bigger than any of the dinosaurs that ever lived.

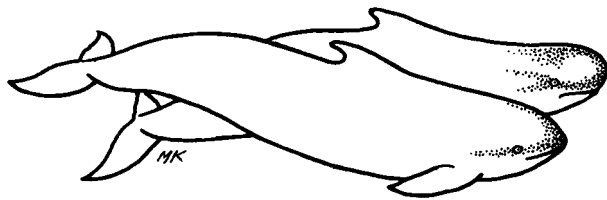
Whales are divided into toothed whales and baleen whales (Figure 2.4a). Although both types are found in the western and central Pacific, there are no known records of whales being caught by longline gear in the region.



**Figure 2.4a:** A humpback whale (a baleen whale) and a sperm whale (a toothed whale).

There are about 65 species of toothed whales, ranging in size from the smaller porpoises and dolphins, about the size of a human, to the deep-diving sperm whale (Figure 2.4a), which grows to a length of about 20 metres. Medium sized toothed whales include the killer whale (or orca) and the pilot whale.

**Depredation.** Some smaller toothed whales take tuna from longlines, leaving only the tuna's head dangling from the hook. This taking of hooked fish is termed "depredation" and may result in considerable catch losses. Preventing depredation is difficult although possible mitigation measures are given in Chapter 6 of SPC's manual on horizontal longline fishing (see Section 5 of this booklet). In order to develop effective mitigation measures of this booklet, it is important that fishermen record all whale sightings and, in the case of depredation, the number of fish heads left on the longline.



**Figure 2.4b:** The pilot whale (background) and the false killer whale (foreground) are implicated in depredation. These similar species often ride in the bow waves of boats. The pilot whale can be recognised by its bulging forehead and deeper body.

Baleen whales (Figure 2.4a) are so named because their upper jaws bear a set of bristly slats, baleen, which is used as a giant sieve. Major food includes small shrimp-like crustaceans called krill. Baleen whales do not take large fish.

Whales began to be hunted commercially in the eighteenth and nineteenth centuries, when sailing ships traveled across the Pacific to hunt the sperm whale for its oil-containing blubber. The 6 tonnes or more of oil rendered from a large sperm whale was used to make margarine, soap, cosmetics, pharmaceuticals, and glycerin for explosives. Under this hunting pressure the stocks of many whale species were greatly reduced and some were almost driven to extinction.

The banning of commercial whaling in 1986, even if not universally adhered to, has resulted in some whales being able to rebuild their populations. In the Pacific, populations of humpback whales are increasing, and whale-watchers are being thrilled by the humpback's arched-back dive and mesmerized by its long ethereal "songs". Whale watching in some areas in the Pacific, such as in the Vavau Islands of Tonga, has boosted income from tourism to local communities.

### 3. Why be concerned about bycatch?

---

Most fishermen recognise the need to manage and conserve the populations (or stocks) of species that they target. Stocks of tuna in the Pacific are monitored by SPC on behalf of island countries. Some individual countries regulate either the numbers of fishermen (under a fishing license system) or the amount of fish caught (under a catch quota system).

As long as there are sufficient fish left in the sea to produce young fish, these stocks will remain healthy and Pacific nations will continue to have valuable tuna fisheries; catch rates, profits, and overseas earnings will remain high.

However, stocks of some non-target species, including some sharks and turtles, appear to be alarmingly low. If stocks become too low to allow successful reproduction and the replacement of those dying or being killed, numbers will continue to fall. The eventual and catastrophic result of this may be the extinction, or total loss, of the species. In inshore areas, where marine species are more accessible, this is already happening. Some species of giant clam, for example, have already been driven to extinction in certain areas through people

catching too many (a situation referred to as overfishing).

Longline fisheries around the world have contributed to a reduction in the numbers of several species including oceanic birds such as albatrosses as well as turtles. Although seabirds and mammals generally do not form part of the bycatch in the western and central Pacific region, small numbers of turtles are occasionally caught.

Even though the threat to turtles by Pacific longline fisheries is a comparatively small one, those in the fishing industry need to take action to reduce this threat. Reasons to reduce the bycatch of turtles are given on the following page.

## **Protection of threatened species**

People have a moral obligation to care for other species on this earth. This is particularly so in cases where their actions could contribute to the species' detriment or eventual loss. Some species, such as turtles, are protected under international conventions. Trade in turtle products, including flesh and shells, is banned under the Convention on International Trade in Endangered Species (CITES).

## **Maintenance of biodiversity**

An ecosystem is a community of interacting plants and animals and their surrounding environment. The different kinds of life and ecosystems in a given area are referred to as its biodiversity. Biodiversity refers to all variability in life, from the minute genetic level (the basic building blocks of life) through to the large scale of ecosystems, such as those in the open sea. The air that we breathe, the food we eat, and the fuel we use are all directly related to biodiversity. Destroying one component of an ecosystem (say, by reducing the numbers of one marine species) may affect the entire system.

In addition, because ecosystems are connected through food webs and migration, human activities that badly affect one ecosystem may affect other types of ecosystems, even those some distance away.

## **Cultural value**

Turtles feature in many Pacific Island traditions and legends. Because of this, Pacific Islanders have a cultural interest in the well-being and continuation of healthy turtle stocks. The disappearance of turtles would be felt more severely by people in the Pacific than by people of other nations.

Accordingly, many Pacific countries have taken actions to restrict the catch of turtles by inshore fishermen. Actions have included restrictions on net mesh size and the imposition of closed seasons during which no turtle fishing is allowed.

Some communities also have traditional laws that ban the taking of turtle eggs from beaches. It is up to those in the offshore longline fishery to complement these actions by reducing the bycatch of turtles.

***The following points are of more direct relevance to those involved in tuna longline fishing.***

### **Reduction of available hooks**

If a bait is taken by a non-target species, the hook is no longer available to be taken by a tuna. This is the case whether or not the non-target species is actually caught. If 10 per cent of the baits on a longline are taken by non-target species this has the potential to reduce the total catch of target species by the same amount; that is, 100 kg of fish could be lost from each potential catch of 1t.

### **Protection of markets**

Public reaction to the catching of endangered species is strong. Individuals and conservation groups are justifiably concerned about anything that reduces endangered species' chances of survival.

Actions taken by the public and courts have affected tuna fisheries in which dolphins, seabirds and turtles are incidentally caught as part of fishing operations.

In the eastern tropical Pacific, schools of tuna are accompanied by dolphins, some of which were accidentally caught in the large purse-seine nets once used to catch the tuna in the area. A public campaign persuaded canneries to buy only "dolphin-safe" tuna and this resulted in drastic changes in the fishery.

A longline fishery in Hawaii was closed by a court order because small numbers of leatherback turtles were accidentally caught (see box below).

### **The closure of the Hawaiian longline fishery.**

In the 1990s there was growing public concern about accidental catches of leatherback turtles in the longline fishery for swordfish in Hawaii. In 1999, conservation groups initiated legal proceedings against fishing interests and the US National Marine Fisheries Service. Subsequently, a court judge ordered the closure of the fishery and about 500 people working in positions associated with the industry became unemployed. The fishery is now operating under new requirements and regulations.



Much of the tuna caught by fishermen in Pacific Island countries is sold to large developed countries, such as the USA, and there is a strong dependence on these markets. Local Pacific fisheries could be badly affected by legal action that prevents the import of tuna, or simply by a public unwilling to buy tuna from fisheries in which turtles are caught.

Public action to boycott (a refusal to handle or buy) tuna from Pacific Island countries could cause the collapse of local fisheries in the Pacific just as surely as any legal action. Legal or public boycott actions taken in importing countries could result in Pacific nations losing markets for their tuna unless local fishing industries are seen to be taking some steps to avoid the incidental catching of turtles.

Fishing industries that are taking active steps to reduce bycatch have a good image in the eyes of consumers. There are several methods that can be used to reduce the bycatch of turtles and these are discussed in the following section.



**Figure 3.1:** Copies of this cartoon, reproduced as stickers, are available from SPC. The stickers are meant to be placed on fishing vessels as a reminder to avoid the catching and killing of turtles.

## 4. What can be done?

---

The bycatch issue can best be addressed by the fishing industry working with scientists, governments and non-governmental agencies. The following practical solutions have been developed for, and often by, fishermen to reduce the bycatch of threatened species.

**Set the longline deeper:** Deep-set lines (below 100 m) will not only reduce the accidental catch of species such as turtles but will catch more albacore and bigeye tuna.

**Set the longline at least 12 nautical miles from reefs:** Setting longlines far from reefs, and where they will not drift inshore, will reduce catches of reef sharks and species of turtles that do not venture far from the reef.

**Do not use squid as bait in shallow sets:** Squid is a favourite food of turtles and should not be used in shallow sets, or on hooks close to the longline floats in deeper sets. Species of mackerel are now being used with success as an alternative bait. Baits may also be dyed blue to reduce bycatches of seabirds

**Use large circle hooks:** The use of large circle hooks instead of J-shaped hooks (mainly used for swordfish) reduces the catch of turtles; also, if a turtle is caught, a circle hook tends to lodge in the jaw rather than deeper inside the turtle.

**Use monofilament leaders rather than wire:** Attaching hooks using monofilament nylon will allow sharks to bite through the leader and escape.

**Use an “underwater bait setting chute” to set the longline:** Set baited hooks through a chute or a funnel, which feeds the longline beneath the surface of the sea during shooting, quickly places bait beyond the reach of seabirds.

**Use side-setting longline gear:** Gear set and retrieved from the side of the fishing boat (instead of from the stern) greatly reduces the risk of interactions with seabirds.

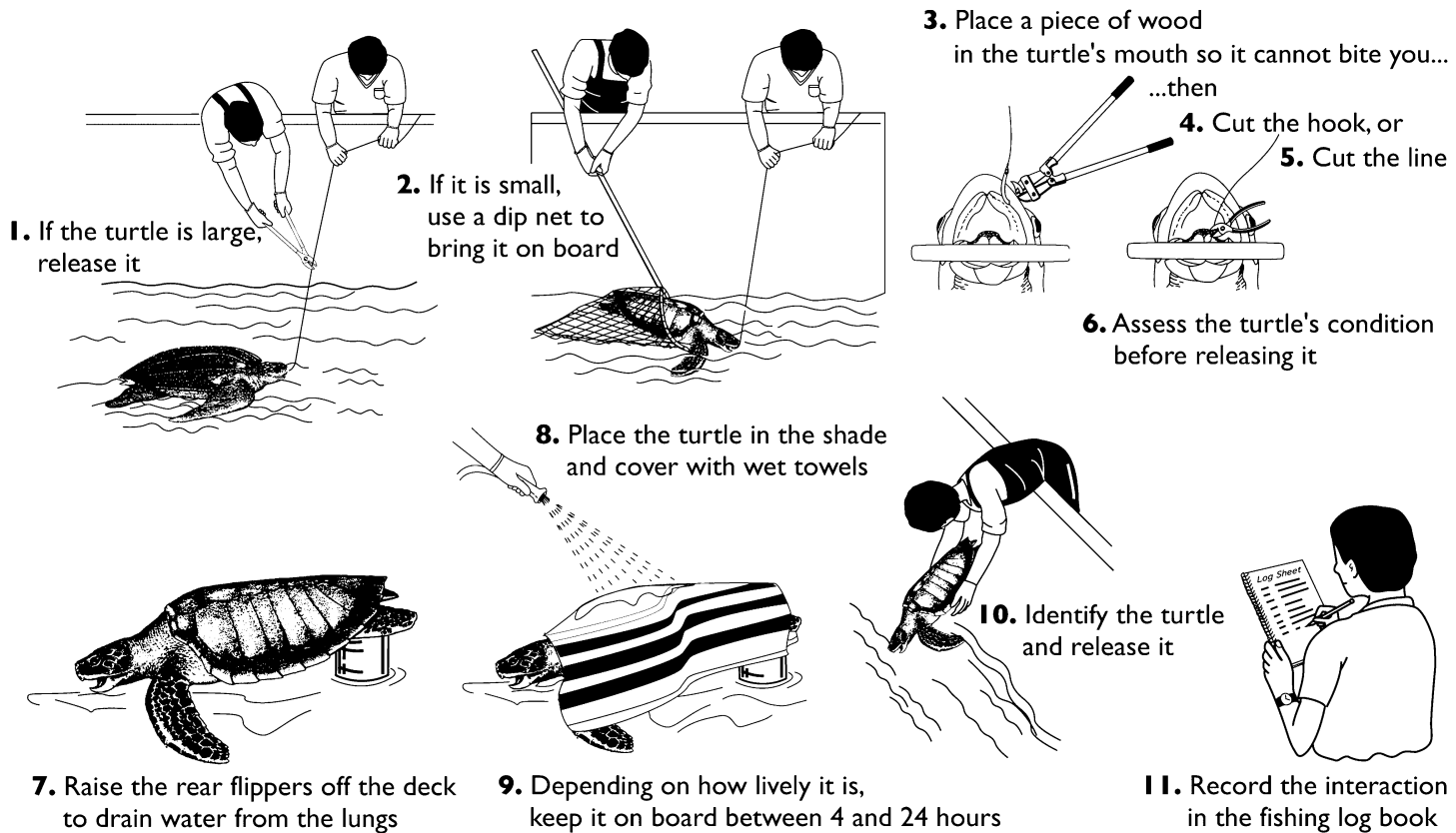
**Carry equipment required to release a turtle:** A long-handled dip net and a wire-cutter are needed (see Figure 4.1). In Hawaii, all longliners are required to carry this equipment.

### **Keep records of byproduct and bycatch species**

**caught:** Fisheries managers need accurate data to better understand the interactions between longlines and non-target species (especially turtles and sharks). Record catches of non-target species in the fishing logbook for local fisheries authorities. SPC can provide identification cards for turtles - see Section 5).

**Collaborate with fisheries managers:** Work with fisheries agencies to develop practical methods of reducing bycatch. If a turtle is caught, the following steps should be taken to give it the best possible chance of survival (Figure 4.1).

1. If the turtle is too large to bring onboard, bring it as close to the boat as possible without putting too much strain on the line. Then cut the line as close to the turtle as possible.
2. If the turtle is small, use a dip net to lift it onboard the boat. Do NOT use a gaff or pull on the line. Do NOT grasp the eye sockets to bring the turtle onboard.
3. Place a piece of round wood (a broom handle) in the turtle's mouth so that it cannot bite you.
4. If the hook's barb is visible, use bolt cutters to cut off the point. Then remove the two parts of the hook separately.
5. If the hook is not visible, remove as much line as possible without pulling too hard. Then cut the line close to the turtle. Tools have been developed for removing deeply-set hooks from turtles.
6. Assess the condition of the turtle before releasing it.
7. If the turtle is not active, it may have water in its lungs. If so, raise the rear flippers by 20 cm while it is recovering.
8. Place the turtle in a shaded location on the boat. Cover the turtle's body (NOT the nostrils) with wet towels. Spray the towels with water (but do NOT spray the turtle in the face).
9. Keep the turtle onboard a minimum of 4 hours and up to 24 hours, depending on how lively it is.
10. Carefully return the turtle to the water headfirst while the boat is stopped and the engine is out of gear. Ensure the turtle is clear of the boat before motoring off.
11. Record the interaction in your logbook, identifying the turtle species if possible. If the turtle has any tags on its flippers, record the tag numbers.



**Figure 4.1:** Steps that should be taken to give an accidentally caught turtle the best possible chance of survival.

## 5. What other information is available?

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In addition to this manual, there is a wide variety of information available from the Coastal Fisheries Programme of the Secretariat of the Pacific Community.

These include:

**Information sheet.** Waterproof sheet with practical hints on "Releasing hooked turtles" (similar to Figure 4.1 in this booklet).

**Marine turtle identification cards.** Pocket-size, water-resistant cards designed to assist fishermen identify different species of turtles.

**Horizontal longline fishing.** A manual on longlining methods and techniques for fishermen

**Tuna longlining: the bycatch issue.** A brochure providing basic information on the bycatch issue.

*The material listed in the left-hand column can be obtained by contacting:*

**The Fisheries Training Section  
Secretariat of the Pacific Community  
BP D5, 98848 Noumea Cedex,  
New Caledonia.**

phone: +687 26 20 00

fax: +687 26 38 18

email: [cfpinfo@spc.int](mailto:cfpinfo@spc.int)

website: <http://www.spc.int/coastfish>

In addition to the above materials, there are several relevant technical publications available. Although these may not be required by trainers, they are included here as source documents for some of the information in this booklet.

Adams, T. 2003. Turtles and fisheries in the Pacific Community area. The Secretariat of the Pacific Community. New Caledonia.

Website <http://www.spc.int/coastfish/Reports/Misc/turt-adams.pdf>

Carpenter, K.E. and Niem, V.H. (eds) 1998. FAO species identification guide for fisheries purposes. The living marine resources of the Western Central Pacific. Volume 2. Cephalopods, crustaceans, holothurians and sharks. FAO, Rome.

Marquez, M.R. 1990. Sea turtles of the world. An annotated and illustrated catalogue of sea turtle species known to date. FAO Fisheries Synopsis 125, volume 11.

SPREP. 2001. A review of turtle bycatch in the western and central Pacific Ocean tuna fisheries. Prepared by the Oceanic Fisheries Programme, SPC.

Website <http://www.spc.int/coastfish/Reports/Misc/turt-ofp-sprep.pdf>

Watling, D. 2003. Interactions between seabirds and Pacific island fisheries. Information Paper 10. Third Heads of Fisheries Meeting, SPC, New Caledonia.

Website <http://www.spc.int/coastfish/Reports/HOF3/E-IP10.htm>

## 6. Resource material for trainers

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This section contains 18 single sheets (listed on the right) that can be used by trainers in one or more of the following ways.

The sheets can be either

- photocopied as handouts for distribution to fishermen and course participants,
- photocopied on transparent film for the trainer to use on an overhead projector, or
- scanned by the trainer for use as a PowerPoint\* presentation; alternatively, a CD containing all 18 sheets as well as turtle identification aids is available from SPC.

*\* PowerPoint is a registered trade name and its use does not necessarily imply endorsement by the producers of this booklet.*

- Sheet 1. Protected marine species
- Sheet 2. Tuna fisheries in the Pacific
- Sheet 3. Longline fishing gear
- Sheet 4. The shape of the set longline
- Sheet 5. Types (or species) of tuna
- Sheet 6. What is bycatch?
- Sheet 7. The bycatch issue
- Sheet 8. Which non-target species are encountered?
- Sheet 9. Turtles
- Sheet 10. Sharks
- Sheet 11. Seabirds
- Sheet 12. Marine mammals
- Sheet 13. Depredation
- Sheet 14. Why be concerned about bycatch?
- Sheet 15. Why should fishermen be concerned?
- Sheet 16. What can fishermen do?
- Sheet 17. Take actions to release turtles safely
- Sheet 18. Take actions to protect turtles and your fishery

## Courses for fishing trainees and fishermen

This booklet, the 18 sheets and the additional resource materials available from SPC may be used by trainers as the basis of courses and workshops for fishing trainees and fishermen.

- For fishing trainees, a full day session on both tuna longlining and the bycatch issue (using sheets 1 to 18) may be appropriate. The session could include a tour of a local longliner (when in port) and a local fish processing facility. For fishing trainees at maritime colleges and fisheries training centres, it is preferable that the bycatch issue is written into the student training syllabus.
- For fishermen already involved in commercial longlining, a 2-3 hour session on the bycatch issue (using sheets 6-8) may be all that is required. For working fishermen, it is less disruptive to add this session onto other training that they are required to complete (e.g. on sea-safety or seafood handling).

Whether for fishing trainees or for professional fishermen, the headings of the appropriate sheets listed on the previous page may be used as an outline of the training session.

In the following suggested course outline, fishing trainees would cover a to g (about 7 hours) and professional fishermen would cover d to g (about 2 hours).

- a) Tuna fisheries in the Pacific; trolling, purse seining, and longlining. (one hour)
- b) Longline fishing gear; visit to local longliner in port. (two hours)
- c) Types, or species, of tuna; visit to seafood processor. (two hours)
- d) Bycatch and the bycatch issue. (half hour)
- e) Non-target species; turtles, sharks, seabirds and marine mammals; depredation. (half hour)
- f) Why be concerned about bycatch? (half hour)
- g) What can fishermen do? (half hour)



# 1. Protected marine species and the tuna longline fishery in the Pacific Islands



Produced by the Fisheries Training Section  
of the Secretariat of the Pacific Community  
to raise awareness of the bycatch issue  
in tuna longline fisheries in Pacific countries

Produced with assistance from NZAID

## 2. Tuna fisheries in the Pacific

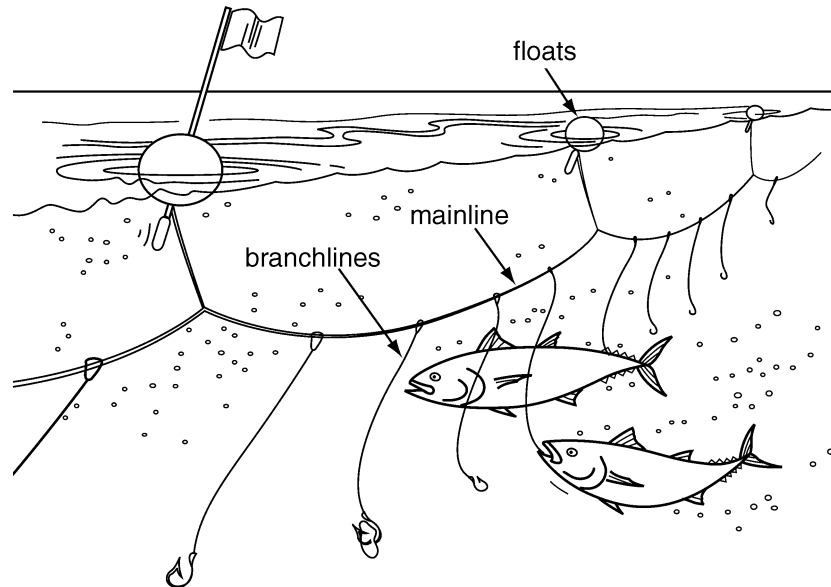
The number of foreign tuna fishing vessels is decreasing.  
The number of Pacific Island tuna fishing vessels is increasing.

*This is providing local employment  
and a substantial benefit to island economies.*

Many Pacific nations are developing local tuna fisheries  
based on the use of longline fishing gear.

### 3. Longline fishing gear

- **floats** – to support the mainline
- **mainline** – from 10 to 180 km in length
- **branchlines** – from 300 to 3500, each with a baited hook



The gear is set and left in the sea for up to 8 hours before being hauled in.

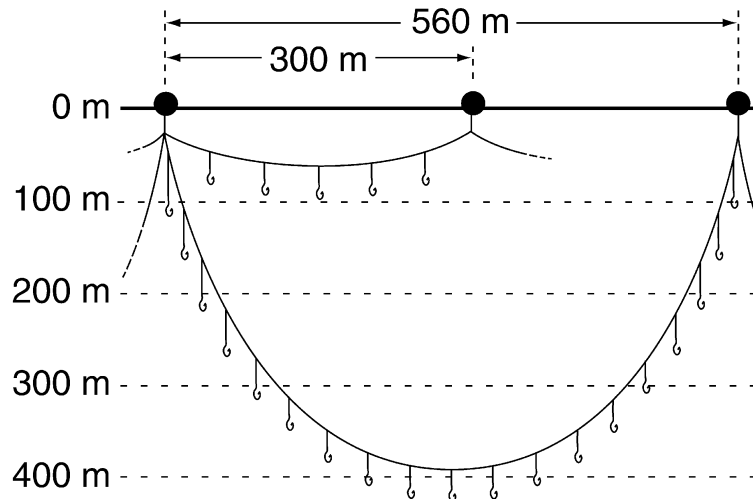
## 4. The shape of the set longline

**A shallow set**, say targeting swordfish, has:

- 4 to 6 branchlines and hooks between the floats
- A mainline sag of 35 to 110 m in depth between floats.

**A deep set**, say targeting bigeye tuna, has:

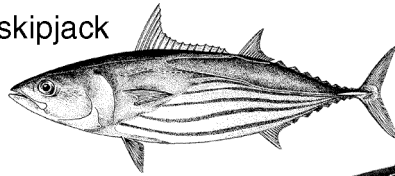
- 15 to 30 branchlines and hooks between the floats
- A mainline sag of 300 to 400 m in depth between floats.



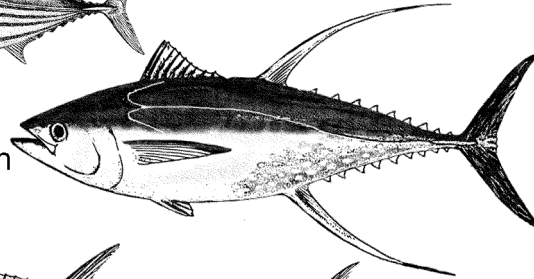
# 5. Types (or species) of tuna

The types (or species) of tuna commonly caught in the Pacific.

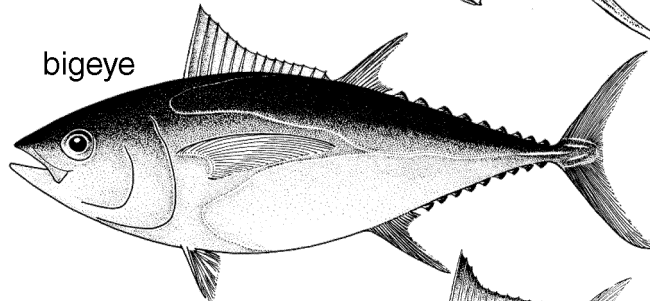
skipjack



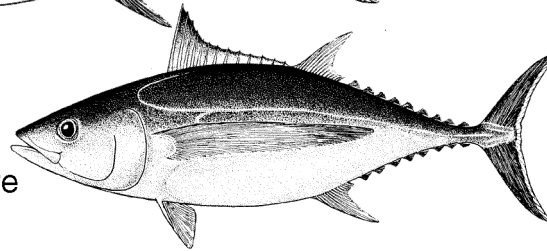
yellowfin



bigeye



albacore



## 6. What is bycatch?

### Target species

those that the fisherman  
is trying to catch

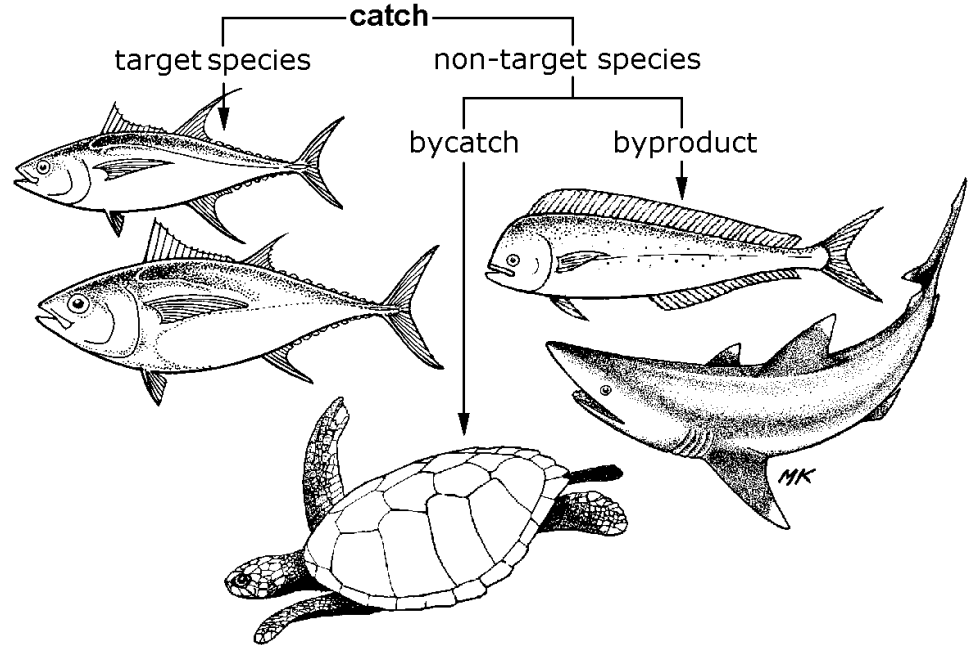
### Non-target species

those caught unintentionally

*Non-target species are  
divided into...*

**Byproduct** – wanted  
(some commercial value)

**Bycatch** – unwanted  
(no commercial value or  
endangered)



## 7. The bycatch issue

Longlining is one of the least environmentally damaging commercial fishing methods in the world.

Besides target species such as tuna, longlines catch small numbers of bycatch species, some of which may be endangered and protected under various laws.

There is wide concern about any actions that further threaten endangered species.

**Fishermen and fishing authorities need to work together to minimise the additional threat to endangered species caused by longlining.**

## 8. Which non-target species are encountered?

Longline fishermen encounter:

- turtles
- sharks
- seabirds
- marine mammals (dolphins and whales)

Longline fisheries around the world have contributed to the reduction in numbers of several species (seabirds such as albatrosses as well as turtles).

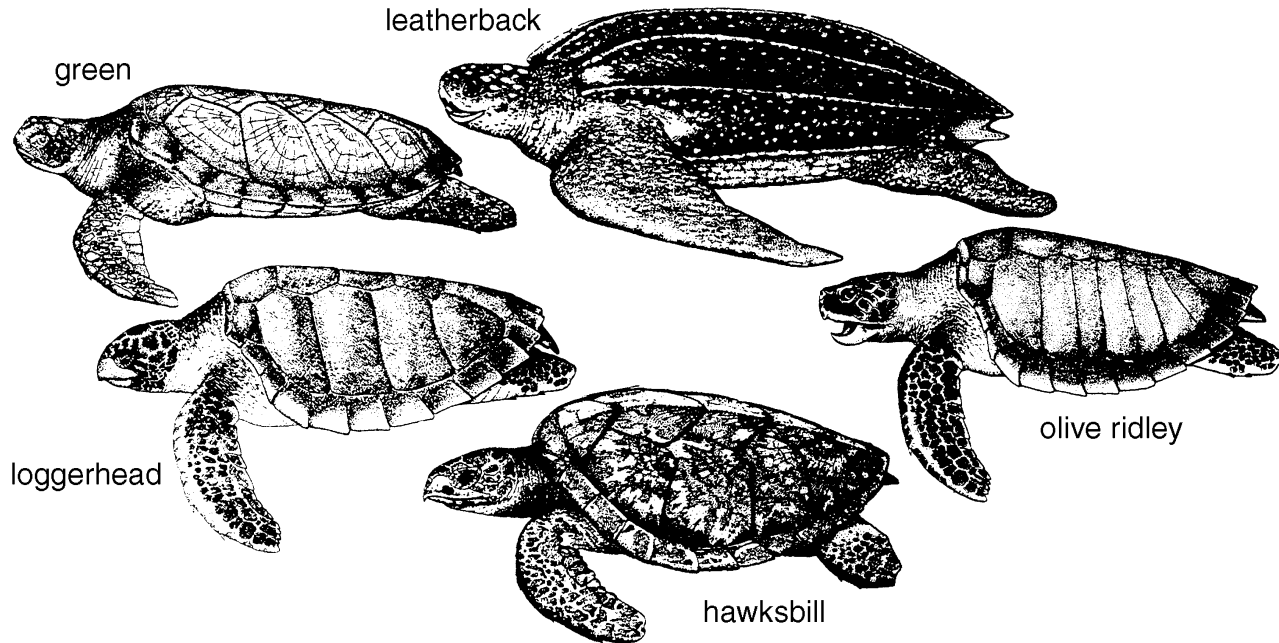
Seabirds and mammals are generally not part of the bycatch in the western and central Pacific region, however, small numbers of turtles are occasionally caught.



# 9. Turtles

Turtles are threatened by:

- the collection of turtle eggs from beaches
- the hunting of turtles for food
- the accidental catching of turtles in nets and on longlines



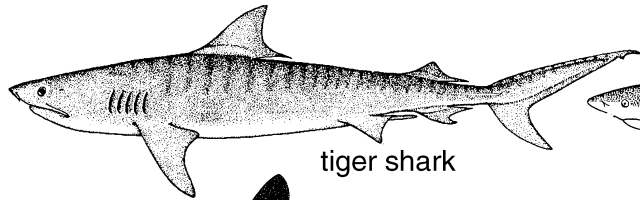
# 10. Sharks

Sharks grow slowly, mature late, and produce a small number of young.

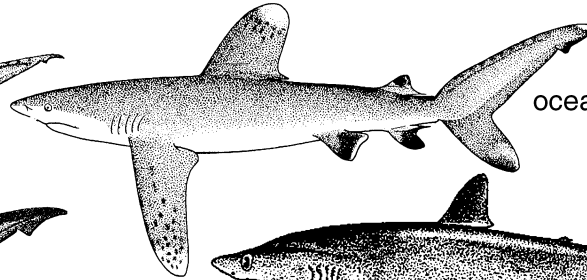
Some species may be overfished

*(although there is no evidence of this in the western and central Pacific).*

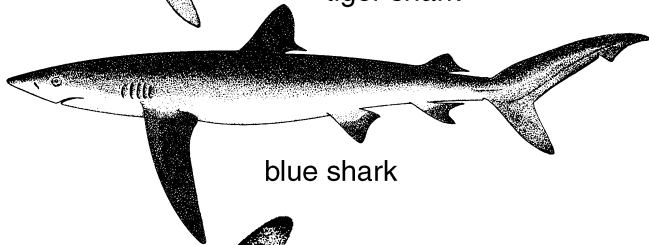
There is also concern over shark-finning



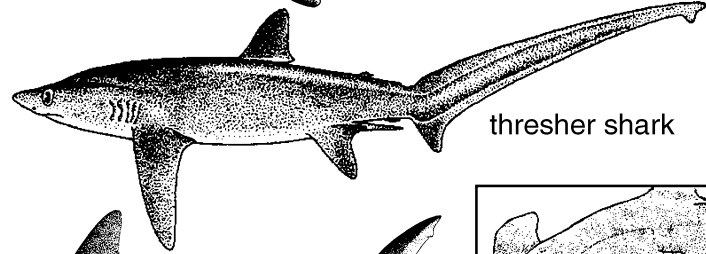
tiger shark



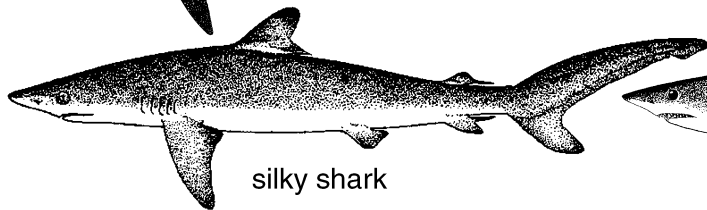
oceanic whitetip shark



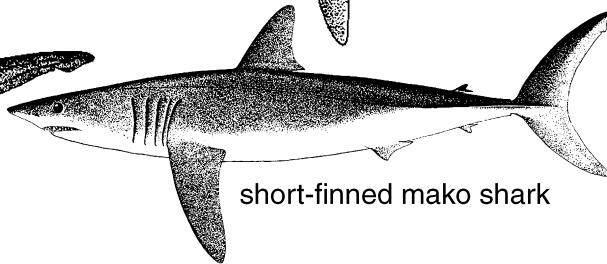
blue shark



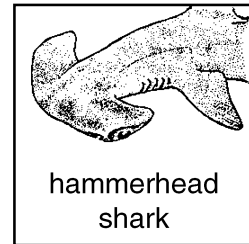
thresher shark



silky shark



short-finned mako shark

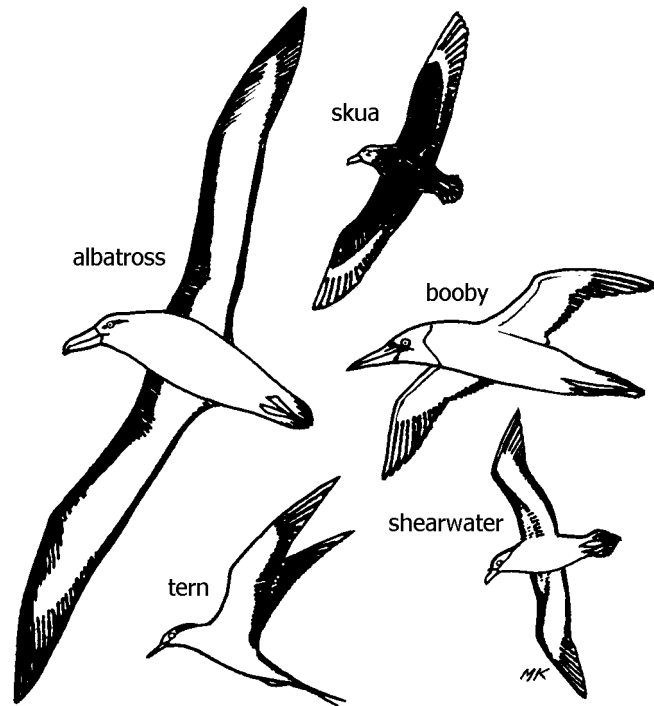


hammerhead shark

# 11. Seabirds

**Albatrosses** – accidentally caught on longlines in colder waters

**Smaller seabirds** in tropics – not caught on large circle hooks used on longlines  
*(a “bird pile” often indicates the presence of tuna)*

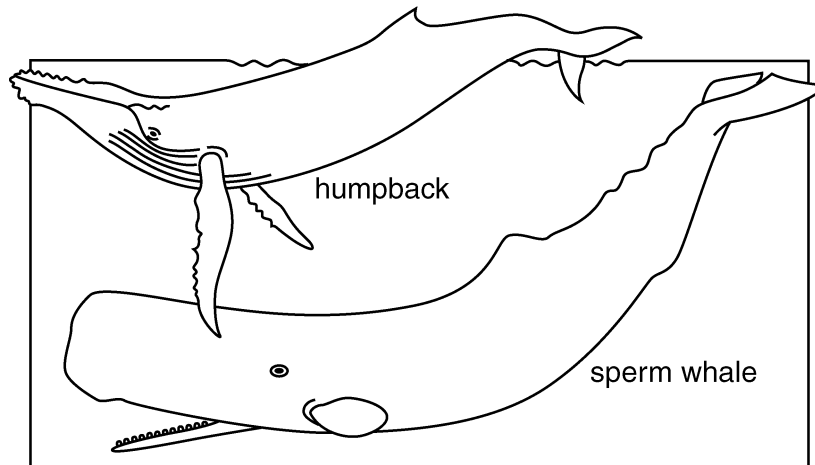


## 12. Marine mammals

**Baleen whales** – such as the humpback whale (filter small food from the sea)

**Toothed whales** – such as dolphins and the sperm whale (eat fish and squid)

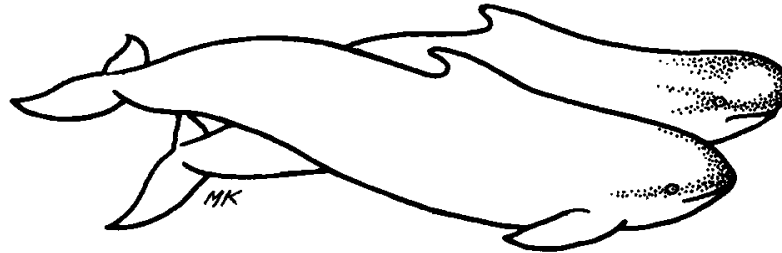
*There are no known records of whales being caught by longline gear in the region. Some smaller toothed whales (e.g. pilot whales) take fish from longlines (depredation).*



## 13. Depredation

The taking of hooked fish by species such as toothed whales and sharks is termed “depredation”.

*In some fishing areas depredation results in considerable catch losses.*



The pilot whale (background) and the false killer whale (foreground) are believed to take fish from longlines.

*There are no records of whales being caught by longline gear in the region.*

# 14. Why be concerned about bycatch?

## **Protection of threatened species**

The numbers of some bycatch species are decreasing.

## **Maintenance of biodiversity**

The survival of our planet depends on linkages between all kinds of plant and animal life.

## **Cultural value**

Many Pacific Island people have a cultural interest in the well-being of turtle stocks.

# 15. Why should fishermen be concerned?

## **Reduction of available hooks**

If a bait is taken by a non-target species, the hook is no longer available to be taken by a tuna.

## **Protection of markets**

Some fisheries have been closed because of public concern for threatened species

- **Purse-seine fishery in eastern Pacific** - closed due to bycatch of dolphins
- **Longline fishery in Hawaii** - closed due to bycatch of leatherback turtles

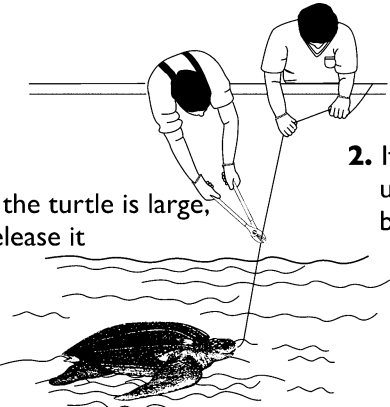
**Pacific nations could lose markets for tuna unless steps are taken to avoid killing turtles.**

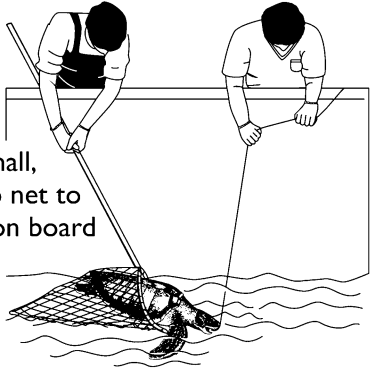
## 16. What can fishermen do?

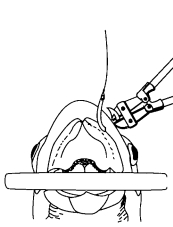
- Set the longline deep
- Set the longline at least 12 nautical miles from reefs
- Avoid using squid as bait in shallow sets
- Use large circle hooks
- Keep records of byproduct and bycatch species caught
- Cooperate with fisheries agencies to reduce bycatch
- Carry the basic equipment required to release a turtle

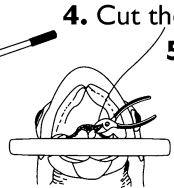


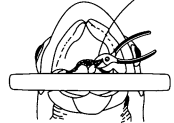
# 17. Take actions to release turtles safely

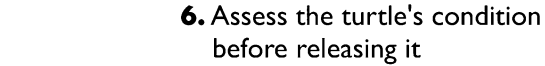
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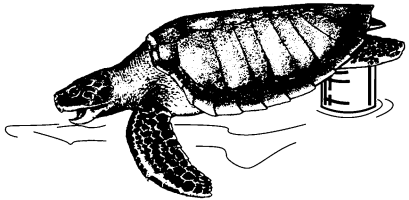
**1.** If the turtle is large, release it
- 

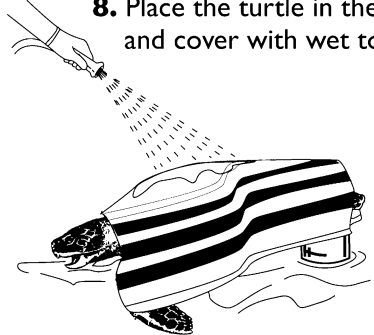
**2.** If it is small, use a dip net to bring it on board
- 

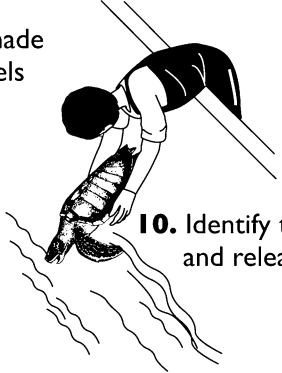
**3.** Place a piece of wood in the turtle's mouth so it cannot bite you...  
...then
- 

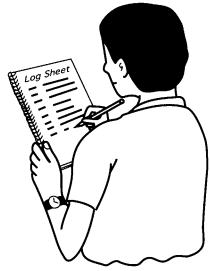
**4.** Cut the hook, or
- 

**5.** Cut the line
- 

**6.** Assess the turtle's condition before releasing it
- 

**7.** Raise the rear flippers off the deck to drain water from the lungs
- 

**8.** Place the turtle in the shade and cover with wet towels
- 

**10.** Identify the turtle and release it
- 

**11.** Record the interaction in the fishing log book

# 18. Take actions to protect turtles and your fishery







## Secretariat of the Pacific Community

Marine Resources Division

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