Teachers' Resource Sheet on

Oceanic species

Imagine living out on the surface of the open sea – being hunted by birds from above and by larger fish from below – and with no place to hide!

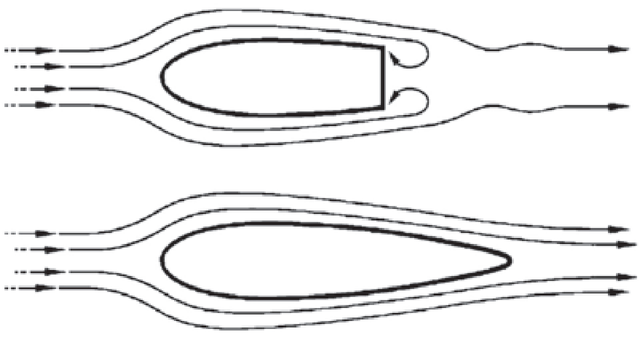
But a few species* have managed to adapt to this difficult pelagic* environment.* The best known of these are the species of tuna, which are distributed over large areas of the Pacific Ocean where they hunt smaller fish. Other oceanic species include billfish*, mahi mahi and wahoo.

Tuna are caught by local fishers often by towing (or trolling) lures behind small boats. Commercial fishing* vessels use longlines and purse seines – these fishing methods are described in Teachers' Resource Sheet 15: Modern large-scale fishing techniques. Here, we are more concerned with the amazing adaptations of fish that live in the open sea.

Pelagic fish rely on speed to catch their prey and to avoid predators*. And, as water is 'thicker' than air (in fact, 800 times more dense* than air), any part of the body that creates friction or turbulence causes a large amount of drag. Compared with travelling through the air, travelling through water is like moving through honey!

In many fast fish, the pectoral or side fins are used as brakes and rudders and fit into depressions in the body when the fish is swimming at speed. The caudal or tail fin, which provides the propulsion, may be shaped like a scythe, with both a long leading edge and a small surface area (a high aspect ratio).

But the shape of the body is most important. The best shape is one of a spindle or tear-drop, called a fusiform shape, as this offers the least resistance or drag when moving through the water. Independently, this fusiform shape has evolved in aquatic mammals such as dolphins and whales. Not so independently perhaps, marine architects have used the shape in designing boats.



Laminar flow* of water past a blunt-ended shape (top), which creates turbulence and drag and flow past a fusiform shape (bottom) which minimises drag.
From: King M. 2007. Fisheries biology, assessment and management. UK: Wiley Blackwell. 400 p.

Life in the fast lane

In addition to their shape, tunas have other adaptations that assist with their fast life. Unlike most other fish, tunas are warm-blooded and keep their bodies at higher temperatures than the surrounding water. A higher body temperature allows increases in muscle power and may account for a tuna's ability to swim at speeds of over 50 kilometres per hour to catch smaller fish. But another oceanic species is much faster.

Which is the fastest animal on the planet?

This is undoubtedly the peregrine falcon, a bird of prey, which can dive at over 300 kilometres per hour. The fastest land animal is the cheetah which can run to catch its prey at over 100 kilometres per hour. But in the sea, the fastest fish is the sailfish.

Did you know?

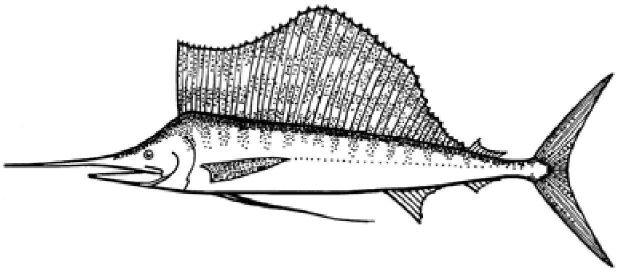
The fusiform shape of fish has helped architects design more fuel efficient boats. The bulbous bow – the rounded bulb or bulge sticking out at the bow, or front, of a ship – makes the ship's underwater shape more fusiform, and allows water to flow around the hull more easily. Large ships with bulbous bows are 12–15% more fuel efficient that similar boats without them.

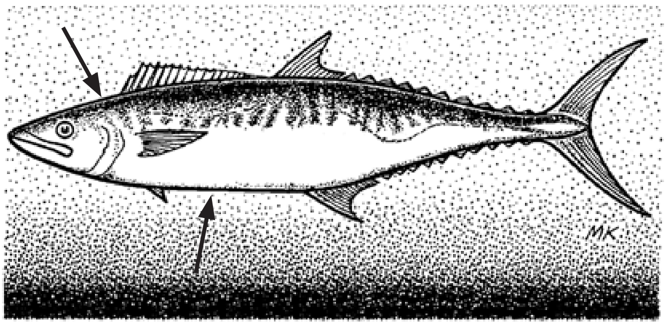
This resource sheet is one of a series produced by the Pacific Community (SPC) to assist teachers in introducing fisheries topics into school curricula.

Each sheet should be used in conjunction with the Guide to Teachers' Resource Sheets, which contains suggestions for student activities and exercises. All words marked with an asterisk (*) are defined in a glossary in this guide.

Pacific Community
Communauté du Pacifique

NEW ZEALAND
FOREIGN AFFAIRS & TRADE
Aid Programme





Counter-shading in a pelagic fish.
From: King M. 2007. Fisheries biology, assessment and management. UK: Wiley Blackwell. 400 p.

Sailfish, which can grow to reach 100 kilograms, have large, sail-like dorsal fins more than twice as high as the body is deep. They appear to hunt in groups and their tall blue dorsal fins, cutting through the surface of the sea, are used to herd prey species into a tight ball. The sailfish then move through the ball, slashing from side to side with their long bills to kill or maim the smaller fish. With a timed short-burst swimming speed of 110 kilometres per hour, the sailfish may be the fastest non-flying animal on the planet.

In the open sea, you can swim but cannot hide – or can you?

Most pelagic fish have a very subtle form of camouflage* called counter-shading to avoid predators. Fish that habitually swim near the surface often have dark backs that shade to lighter underparts. To a predator swimming below such a fish, the lighter underparts appear the same shade as the sky and the bright surface of the sea. But to a predator such as a sea bird flying above, the dark back of the fish merges in with the deep blue shades of the sea.

Marc Taquet © FADIO/IRD-Ifremer