

**DK findout!**

# Sharks



What do you want to **findout?**

Fun Facts, Amazing Pictures, Quizzes



 **findout!**

# Sharks



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First American Edition, 2017  
Published in the United States by DK Publishing  
345 Hudson Street, New York, New York 10014

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DK, a Division of Penguin Random House LLC  
17 18 19 20 21 10 9 8 7 6 5 4 3 2 1  
001-298644-Jan/2017

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A catalog record for this book is available from the  
Library of Congress.  
ISBN 978-1-4654-5751-6

DK books are available at special discounts when purchased in bulk for sales promotions, premiums, fund-raising, or educational use. For details, contact: DK Publishing Special Markets, 345 Hudson Street, New York, New York 10014 SpecialSales@dk.com

Printed and bound in China

A WORLD OF IDEAS:  
SEE ALL THERE IS TO KNOW

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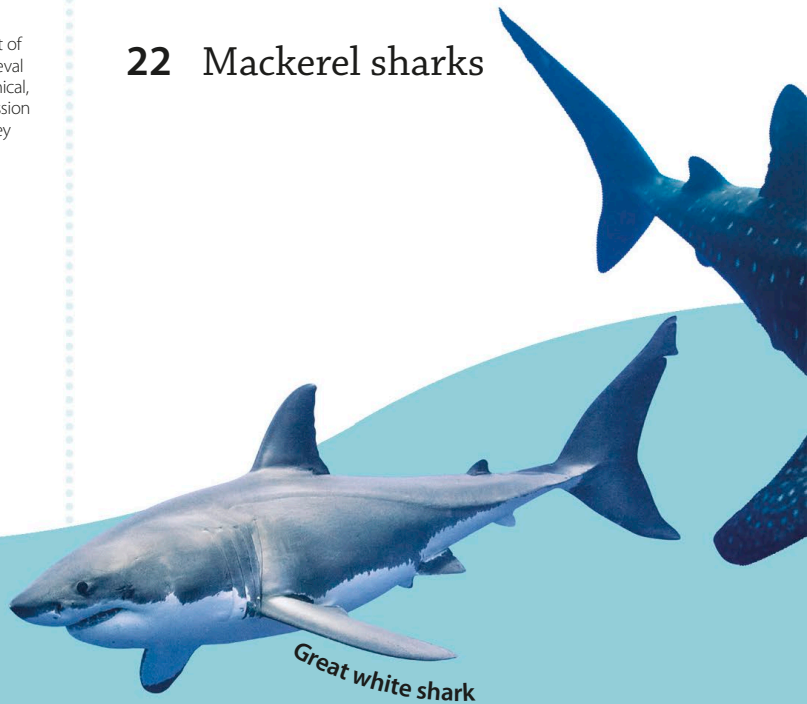
The scale boxes throughout the book show you how big a shark is compared to a diver who is 6 ft (1.8 m) tall from head to heel.

» Scale



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Great white shark



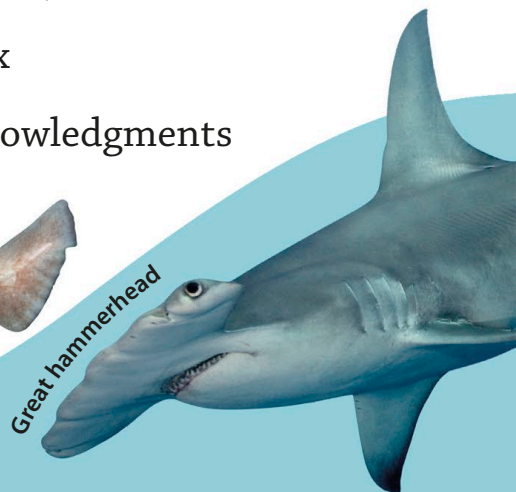
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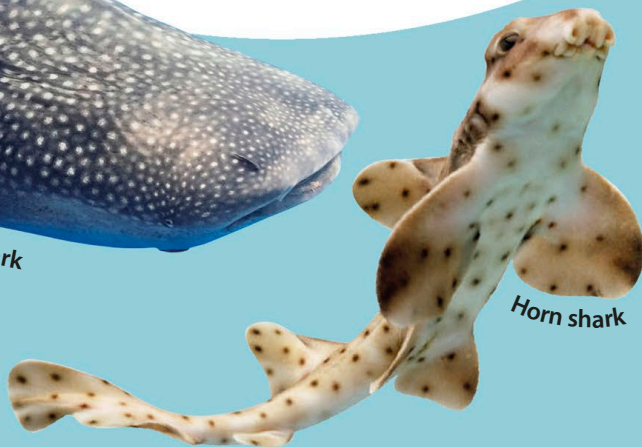
Whale shark



Prickly dogfish



Great hammerhead



Horn shark

Frilled shark



**! WOW!**

There are more than **500 different types** of shark.

### Tail

A shark's tail shape tells us how well it can swim. Crescent-shaped tails belong to the fastest sharks. Floppy, rounded tails make for slower, sluggish swimmers. Thresher sharks use their long tail to stun prey.

Pelagic thresher shark



### Eggs

All sharks produce eggs, but only 40 percent actually lay them! Most sharks keep their eggs inside their body and give birth to live young. This egg has curly tendrils that wind around seaweed or sea fans so it doesn't wash away.



Smallspotted catshark egg

# What is a shark?

Sharks are fish, but unlike most other kinds of fish they have a flexible skeleton made of a material called cartilage instead of bone. They have gills behind their head to breathe and their strong tail powers them forward. Two pectoral fins keep them stable in the water as they swim around searching for food to eat. All sharks are meat-eaters!

Tiger shark



### Body

A shark's muscles are attached to the inside of its skin. Outside, the skin is armored with tiny plates, called denticles, that streamline the body. Many sharks have patterned or colorful skin, such as the tiger shark.

Blacktip reef shark



## Dorsal fin

Most sharks have two dorsal fins on their back. These fins help to stabilize a shark when it swims. Their shape and color can be used to identify the type of shark—it's easy to spot a blacktip reef shark!

Scalloped hammerhead



## Head

Many of a shark's sense organs are on its head. As well as the eyes, ears, and nose, it has special organs that detect electricity. Hammerheads have more of these organs than any other shark.



Australian angelshark



## Pectoral fins

Like flaps on an airplane wing, the pectoral fins on a shark's sides help to steer it and prevent it from rolling over! Sharks that live on the seabed, such as angelsharks, also use their strong pectorals for swimming or walking.



# How big?

Not many people realize, but big sharks are fairly unusual. Most shark species are less than 3 ft (1 m) long, and the tiniest of all are under 12 in (30 cm). Large sharks hunt big prey, but the most enormous sharks of all are filter feeders. They eat tiny sea creatures called plankton. Plankton may be small, but filter feeders eat a lot of it!

## Basking shark

The world's second-biggest fish can grow up to 33 ft (10 m) long. The basking shark often swims near the surface, which is where it gets its name. However, it isn't warming itself in the sun, but feeding on plankton there.

## Tiny sharks

Some adult sharks are so small they could fit into your hand! The biggest pygmy shark ever seen was 11 in (27 cm) long. Their young are really tiny, only 2–4 in (6–10 cm) long. Each mom has eight baby sharks.



**! WOW!**

Many adult sharks grow less than **0.4 in (1 cm)** a year, taking **decades** to reach full size!

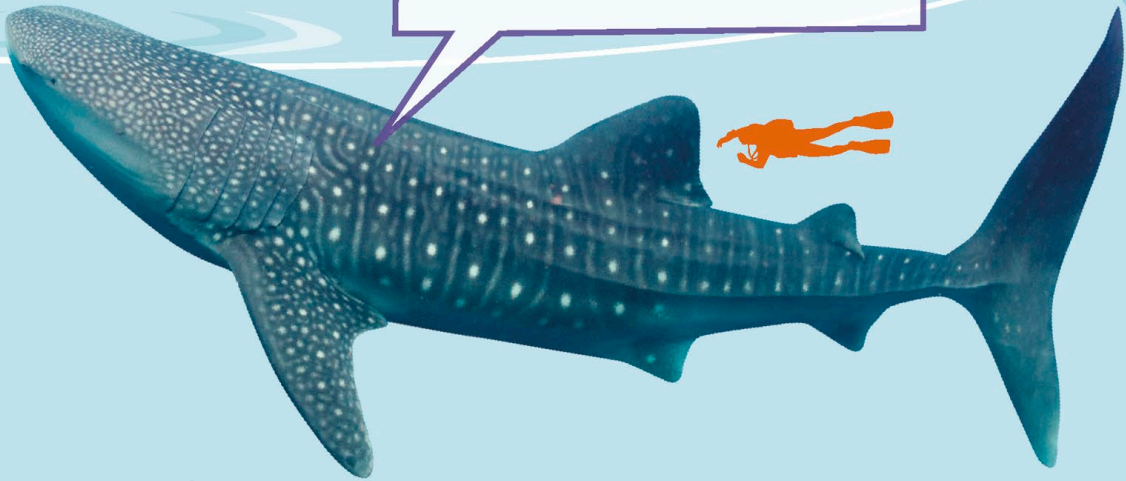
These sharks are compared in size to an adult human measuring 6 ft (1.8 m) tall.





## Whale shark

The whale shark can grow to at least 41 ft (12.6 m) long, and perhaps to 59 ft (18 m). This makes it the largest fish in the world. It lives in warm waters, feeding on plankton and small fish.



## Great white shark

The great white shark is a fierce predator. At 20 ft (6 m) long, it is big and fast enough to hunt marine mammals, such as seals and dolphins. However, its young eat fish until they grow up.



## Great hammerhead

The great hammerhead is the biggest hammerhead shark of all. It can grow up to 20 ft (6 m) long. It is quite a rare shark and usually lives alone. Its babies are about 24 in (60 cm) long.





# Prehistoric sharks

The oldest whole-shark fossil is about 409 million years old—that's almost 200 million years older than the first dinosaurs! A shark's soft skeleton doesn't fossilize easily, but their teeth, fin spines, and scales are almost indestructible. These provide many clues about the peculiar, prehistoric sharks below.

## Cladoselache

(clay-doe-SAY-lak-ee)

There are many complete fossils of this medium-sized shark. Some of them even include the shark's last meal! Cladoselache lived in the oceans about 370 million years ago.



## Helicoprion

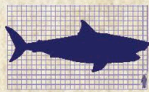
(he-LICK-oh-pry-on)

Modern sharks' teeth drop out all the time, but Helicoprion grew bigger teeth on top of its old ones. Spiraling teeth on the lower jaw probably cut against flat teeth on the upper jaw.

We only know about Helicoprion from its strange, spiraling lower teeth.



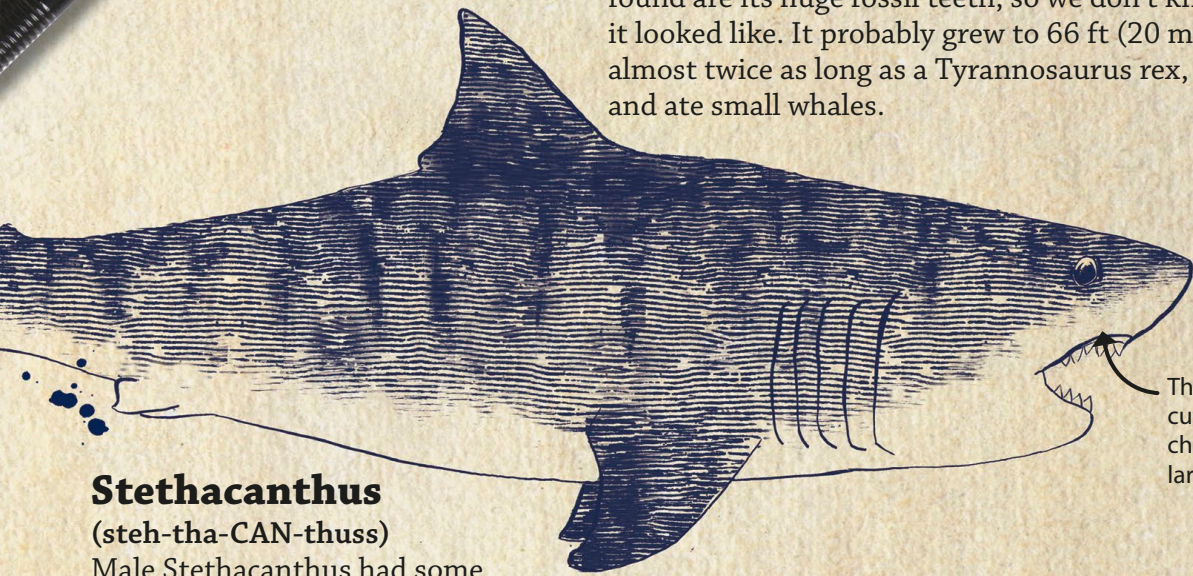




## Megalodon

(MEGA-low-don)

The only parts of this gigantic predator that have been found are its huge fossil teeth, so we don't know what it looked like. It probably grew to 66 ft (20 m) long, almost twice as long as a Tyrannosaurus rex, and ate small whales.

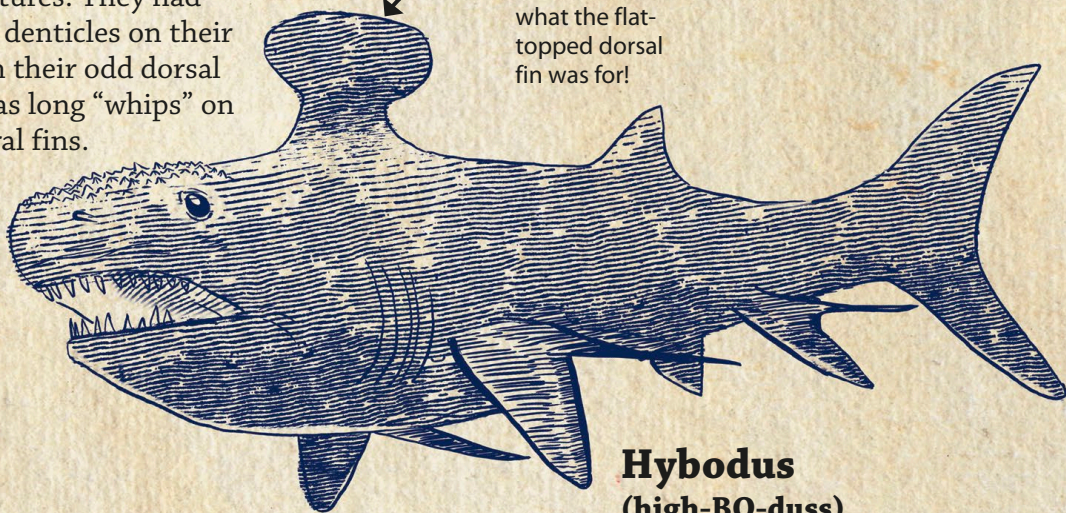


These teeth cut huge chunks from large prey.

## Stethacanthus

(steh-tha-CAN-thuss)

Male Stethacanthus had some unusual features. They had large, spiny denticles on their nose and on their odd dorsal fin, as well as long "whips" on their pectoral fins.



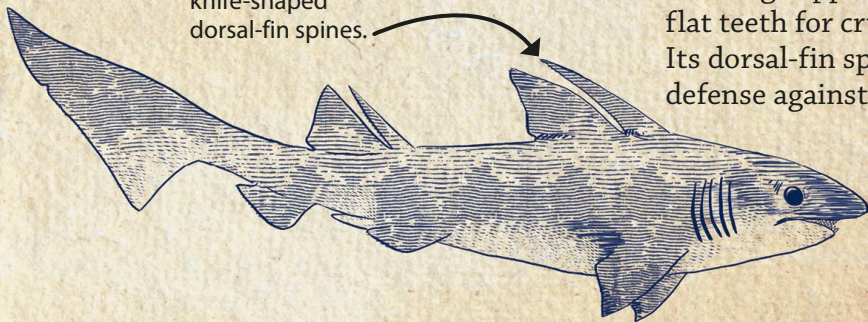
We don't know what the flat-topped dorsal fin was for!

## Hybodus

(high-BO-duss)

Hybodus had sharp teeth for catching slippery prey, as well as flat teeth for crunching up shellfish. Its dorsal-fin spines provided defense against larger predators.

Hybodus had knife-shaped dorsal-fin spines.





# Shark relatives

Sharks aren't the only fish with skeletons made of cartilage. They have many close relatives: the rays, including skates and sawfish, and chimaeras. A few rays look rather sharklike, such as the saw-nosed sawfish, but most appear quite different, with flat bodies and "wings."



## ELECTRIC RAYS



MARbled ELECTRIC RAY

The round, flabby body of electric rays conceals a shocking surprise—the ability to give a powerful electric shock! Paired "batteries" on each side of the body can be triggered to knock out prey, which are then swallowed whole. They are also used to stun predators.



## STINGRAYS



SPOTTED EAGLE RAY

Stingrays have a whiplike tail that may have one or two stinging spines, used for defense. They give birth to live pups rather than laying eggs. Eagle rays are a type of stingray that live in tropical waters and eat shellfish.



## CHIMAERAS



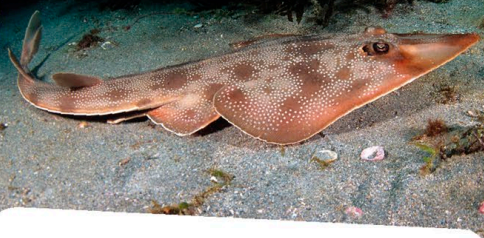
SPOTTED RATFISH

There are about 50 types of chimaera, also known as ghostsharks. They live in deep water, but you may see these large-headed fish in aquariums. Some kinds are protected by a venomous spine in front of their dorsal fin.





## GUITARFISH



ATLANTIC GUITARFISH

These rays have a triangular head and a strong, sharklike tail, which gives them a guitar-shaped outline when seen from above. They use their pointed nose to dig for prey buried beneath the sand. There are around 50 species of guitarfish.



## SKATES



THORNBACK SKATE

There are over 200 kinds of skate. They have fatter tails than rays, and instead of stinging spines, they have tiny dorsal fins near the end. They lay each of their eggs in a case, which may be found washed up on a beach after the baby fish has hatched.



WOW!

The giant manta ray can be **30 ft (9 m)** wide from wingtip to wingtip.



## SAWFISH



LARGETOOTH SAWFISH

Shaped like a flat shark, but with their gills hidden under their head, these warm-water coastal rays are extremely rare and often strictly protected. Unfortunately, their toothed noses, called rostra, still turn up in curiosity shops.

Answer the questions to find out which group an individual shark belongs to.

# Shark detective

Sharks don't all look the same. Scientists use sharks' physical features to divide them into different groups. In total there are nine groups, or orders, of shark. Answer these questions to sort any type of shark into its correct order.

## Bramble sharks

Go to page 18 to bump into these prickly, deepwater sharks.



Prickly shark

YES

Does it have two small dorsal fins and thorny skin?

NO

NO

Does it have a small fin near the base of its tail?

YES

Does it have spines on its dorsal fins?

NO

YES

YES

### START HERE

Does it have more than five gill slits and only one dorsal fin on its back?

NO

## Cow and frilled sharks

Go to page 14 to learn about the world's most ancient sharks.

Seven gill slits



Broadnose sevengill shark



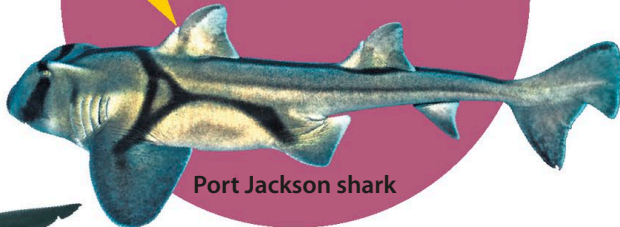
Spine on dorsal fin



## Bullhead sharks

Go to page 20 to learn more about the sharks with eyebrows.

Port Jackson shark



## Angelsharks

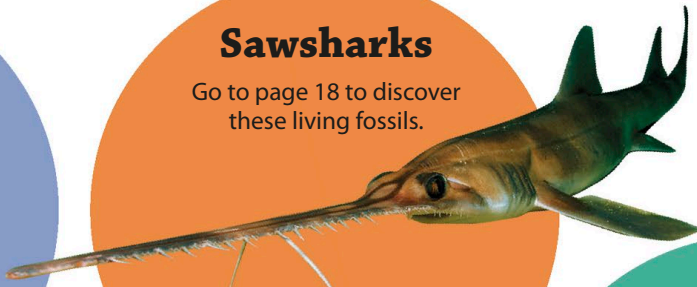
Go to page 20 to find out about these raylike sharks.



Japanese angelshark

## Sawsharks

Go to page 18 to discover these living fossils.



Longnose sawshark

## Dogfish

Go to page 16 to discover some of the world's biggest, and smallest, sharks.



Common spiny dogfish

Is it flat-bodied with a mouth at the end of its head?

YES

NO

Does it have a long saw-shaped nose?

YES

NO

Is its mouth in front of its eyes, which have three eyelids each?

YES

NO

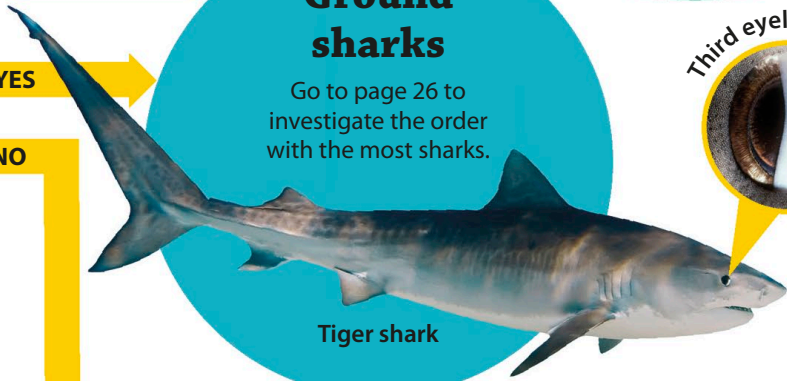
Is its mouth small and far in front of its eyes?

NO

YES

## Ground sharks

Go to page 26 to investigate the order with the most sharks.



Tiger shark

Third eyelid



## Carpets sharks

Go to page 24 to catch sight of the most colorful sharks.



Whale shark

## Mackerel sharks

Go to page 22 to find out about these magnificent sea creatures.



Pelagic thresher shark



## Frilled shark

This mysterious, brown, eellike shark lives in the deep sea and is rarely seen. However, the frilled shark is instantly recognizable because of its snakelike head and large mouth filled with needle-sharp teeth.

This shark has a long, flexible body that finishes in a long tail.

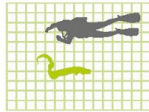
### FACT FILE

» **Depth:** 66–4,920 ft (20–1,500 m)

» **Length:** 7 ft (2 m)

» **Fun fact:** Pregnant females produce extra eggs to feed the long, snaky pups wriggling inside their tummy.

» Scale



### Dorsal fin

The single, tiny dorsal fin is located far back, next to the shark's tail.



Sense organs running along its side help the frilled shark to locate prey in the dark.

# Cow and frilled sharks

These two families of fish make up the oldest, most primitive order of sharks. There are only two frilled shark species and four cow shark species. They all have six or seven gill slits instead of the usual five, and only one dorsal fin. These sharks like cold water and most live in the deep ocean, but sometimes they journey into cool coastal seas.



**! WOW!**

**These are living fossils—the most primitive sharks known.**

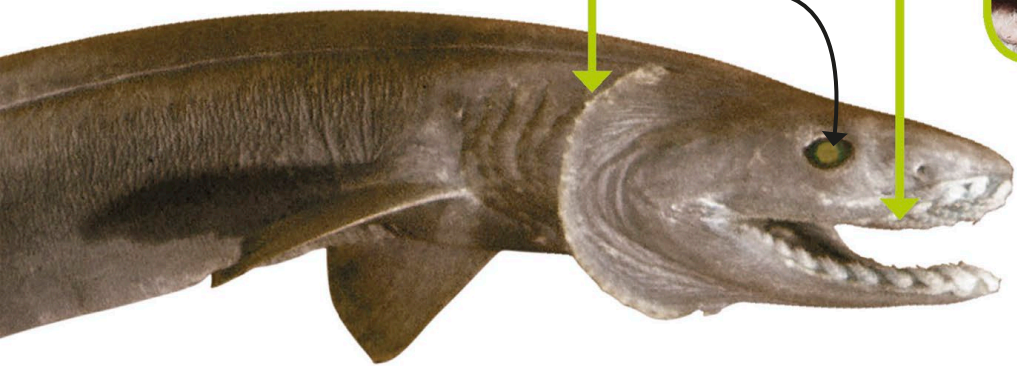


**Frilled gill slits**  
This shark gets its name from its frilly gill slits. The sixth and longest pair are connected to each other underneath its throat.



**Teeth**  
No other shark has three-spined teeth like these—perfect for catching slippery squid and deep-sea fish.

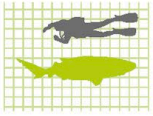
Large, green eyes suggest a life spent in the deep, dark ocean.



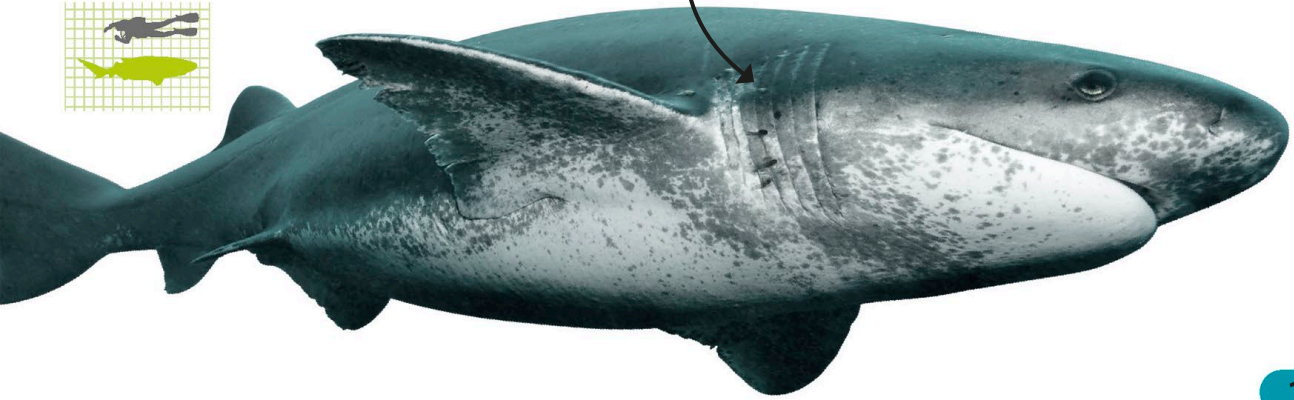
### Broadnose sevengill shark

This wide-mouthed, spotty shark is the only cow shark that lives permanently in shallow water. It is sociable and curious, which makes it popular with divers by day. At night, it hunts in packs.

» Scale



Seven gill slits help to identify this shark.



#### FACT FILE

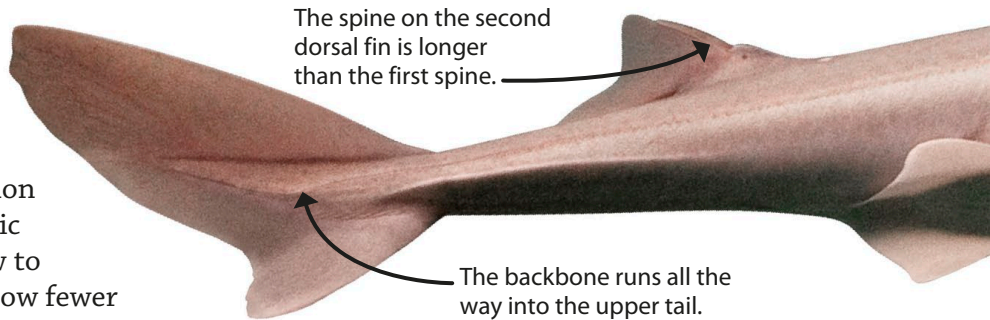
- » **Depth:** 0–165 ft (0–50 m)
- » **Length:** 10 ft (3 m)
- » **Fun fact:** This shark has been seen “spy-hopping”—poking its head above water to see what’s going on.

# Dogfish

The 130 kinds of dogfish shark are scattered throughout the world's oceans. Some live in shallow seas or estuaries, where rivers run into the sea. Others live in the deep ocean. This group includes the only sharks that live under polar ice sheets, but many more can only survive in the warm tropics.

## Common spiny dogfish

This widespread dogfish used to be the most common shark in the North Atlantic Ocean. However, it is slow to reproduce and there are now fewer of them due to overfishing.



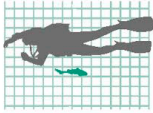
The spine on the second dorsal fin is longer than the first spine.

The backbone runs all the way into the upper tail.

## Slendertail lanternshark

The dark patches on the tummy of this shark contain organs, called photophores, that glow in the dark. Its lights may be for signaling to other lanternsharks.

» Scale



Huge, green eyes make it possible to see in the deep, dark ocean.

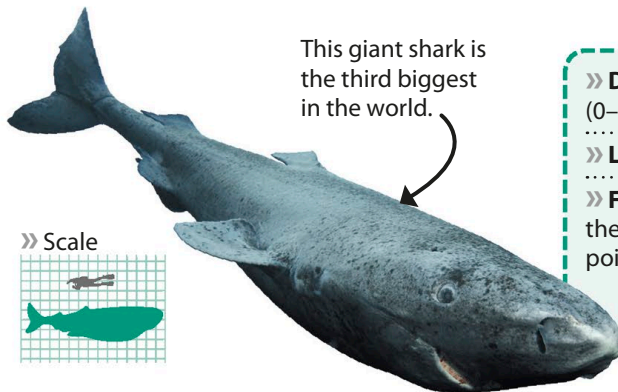
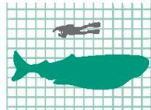
### FACT FILE

- » **Depth:** 655–2,300 ft (200–700 m)
- » **Length:** 18 in (46 cm)
- » **Fun fact:** There are more than 50 species of lanternshark, including the smallest shark in the world.

## Greenland shark

This shark lives in Arctic waters where temperatures average 36°F (2°C). It looks so dopey that it's also called a sleeper shark. A type of crustacean called a copepod often lives on the Greenland shark's eye.

» Scale



This giant shark is the third biggest in the world.

### FACT FILE

- » **Depth:** 0–8,860 ft (0–2,700 m)
- » **Length:** 24 ft (7.3 m)
- » **Fun fact:** The meat of the Greenland shark is poisonous to eat.



Each dorsal fin has a venomous spine. The spines have growth rings, like trees, and can be used to tell a dogfish's age.

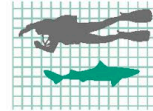
**! WOW!**  
Pups are born at different lengths—the biggest moms have the largest babies.

**FACT FILE**

- » **Depth:** 0–1,970 ft (0–600 m)
- » **Length:** 7 ft (2 m)
- » **Fun fact:** The longest spiny dogfish journey measured was 995 miles (1,600 km).



» Scale

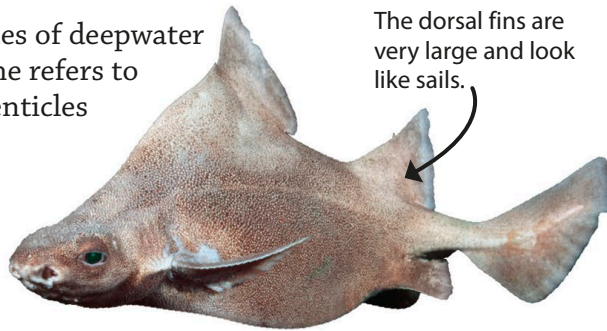
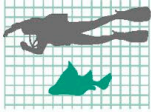


A black eye suggests that this is a shallow-water shark.

## Prickly dogfish

This is one of five species of deepwater “rough shark.” The name refers to the large, sharpened denticles that cover their skin.

» Scale



The dorsal fins are very large and look like sails.

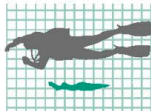
**FACT FILE**

- » **Depth:** 165–3,280 ft (50–1,000 m)
- » **Length:** 35 in (90 cm)
- » **Fun fact:** These sharks aren't good swimmers. They rely on their oil-filled liver to help them float.

## Birdbeak dogfish

The skin of this deepwater shark is armored by large, pitchfork-shaped denticles along its sides, and it has spines on both dorsal fins. The birdbeak dogfish is a type of gulper shark.

» Scale



The very long, flat snout has lots of sense organs for finding prey in the dark.

**FACT FILE**

- » **Depth:** 230–4,920 ft (70–1,500 m)
- » **Length:** 4 ft (1.1 m)
- » **Fun fact:** These sharks sometimes school in large groups, perhaps to hunt.



# Sawsharks

These odd-looking, little sharks are unmistakable because of their long, flat, sawlike snout. They look similar to sawfish, but the “teeth” along a sawshark’s snout are thinner and sharper, and their gill slits are above their pectoral fins. There are eight types of sawshark.

## FACT FILE

» **Depth:** 130–2,070 ft (40–630 m)

» **Length:** 5 ft (1.5 m)

» **Fun fact:** Its long teeth lie flat against its snout until a sawshark pup is born.

## Longnose sawshark

This southern Australian sawshark feeds in schools. Females give birth to litters of pups every other winter. Young sawsharks can be identified by the two or three small teeth between each large one.

» Scale

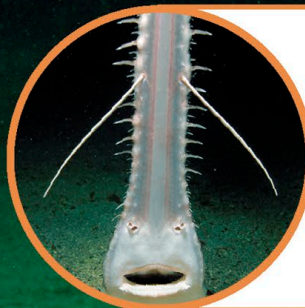


## Thorny skin

The prickly shark’s thin skin is protected by regularly spaced denticles. Each denticle is about 0.2 in (4 mm) across with a sharp central spine and scalloped edges.







### Saw-nosed

A sawshark's snout, called a rostrum, detects vibrations and electric fields. It may be used for hunting and defense. The pair of long barbels smell and feel around for food.



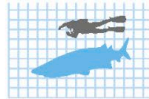
# Bramble sharks

There are only two species of these heavily armored, sluggish, deepwater sharks. Their fragile skin is protected by large thornlike scales, called denticles. When they open their huge mouth it creates a powerful suction, which pulls in unwary fish that stray too close.

## Prickly shark

This shark is most common in the deep ocean, but sometimes it swims along underwater canyons into very shallow water, close to the shore. The prickly shark has been seen alone and in small groups.

» Scale



### FACT FILE

» **Depth:** 13–3,610 ft (4–1,100 m)

» **Length:** 15 ft (4.5 m)

» **Fun fact:** This shark is curious when it meets divers, but it's not dangerous.

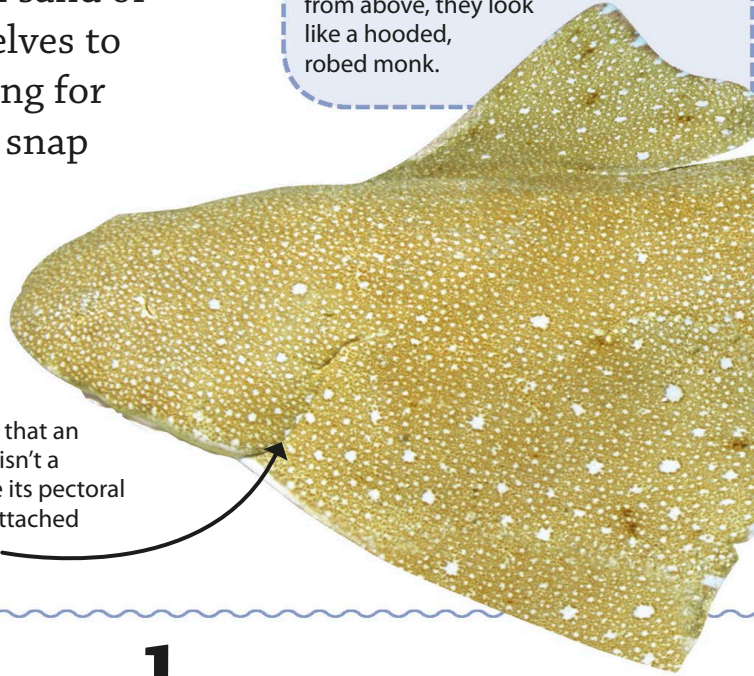
# Angelsharks

These wide, flat sharks live in cold water. Angelsharks prefer habitats with sand or mud, as they like to bury themselves to hide. They lurk in ambush, waiting for passing crabs and fish, and then snap them up with their huge mouth.

## Australian angelshark

This shark is nocturnal, which means it is active at night. During the day it lies buried in the seabed. It prefers areas near seagrass beds and rocks.

You can tell that an angelshark isn't a ray because its pectoral fins aren't attached to its head.



### FACT FILE

- » **Depth:** 0–425 ft (0–130 m)
- » **Length:** 5 ft (1.5m)
- » **Fun fact:** Angelsharks used to be called “monkfish” because, from above, they look like a hooded, robed monk.

# Bullhead sharks

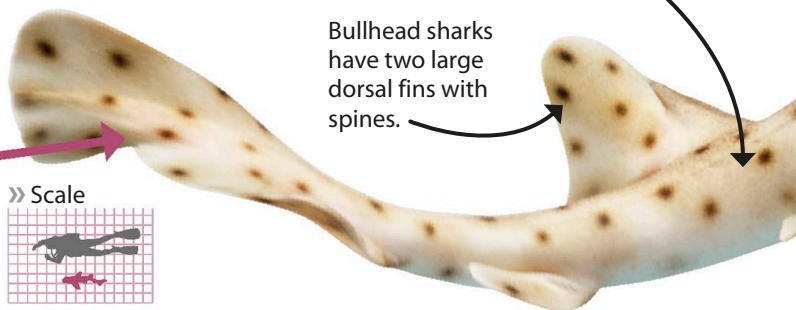
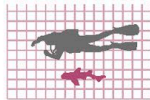
There are bullhead shark fossils older than the first dinosaurs! These ancient sharks have big heads with large snouts, and crests above their eyes. Bullhead sharks live in warm water, often sleeping by day in caves or crevices and hunting shellfish at night.

The horn shark has skin that feels rough to the touch.

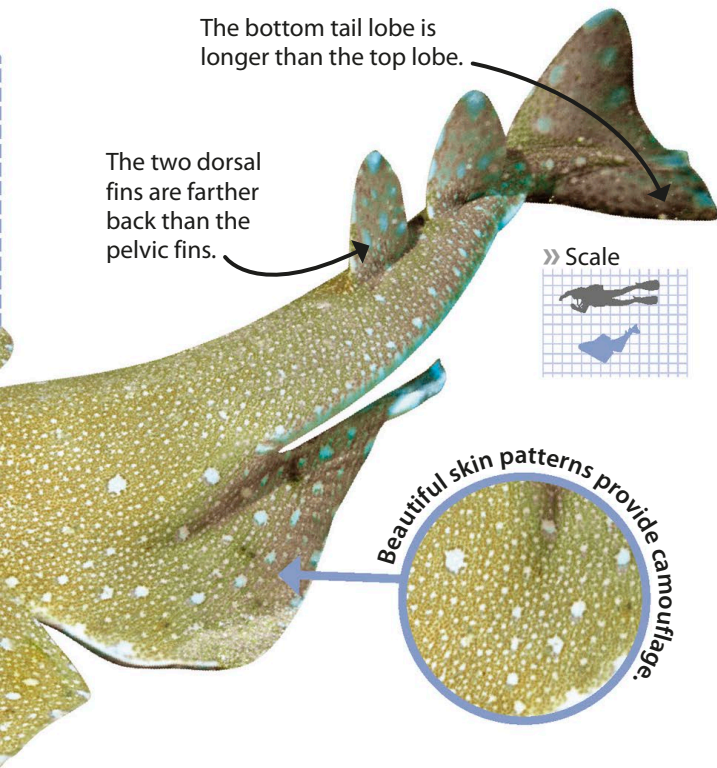
Bullhead sharks have two large dorsal fins with spines.

The tail has a large notch underneath it.

» Scale





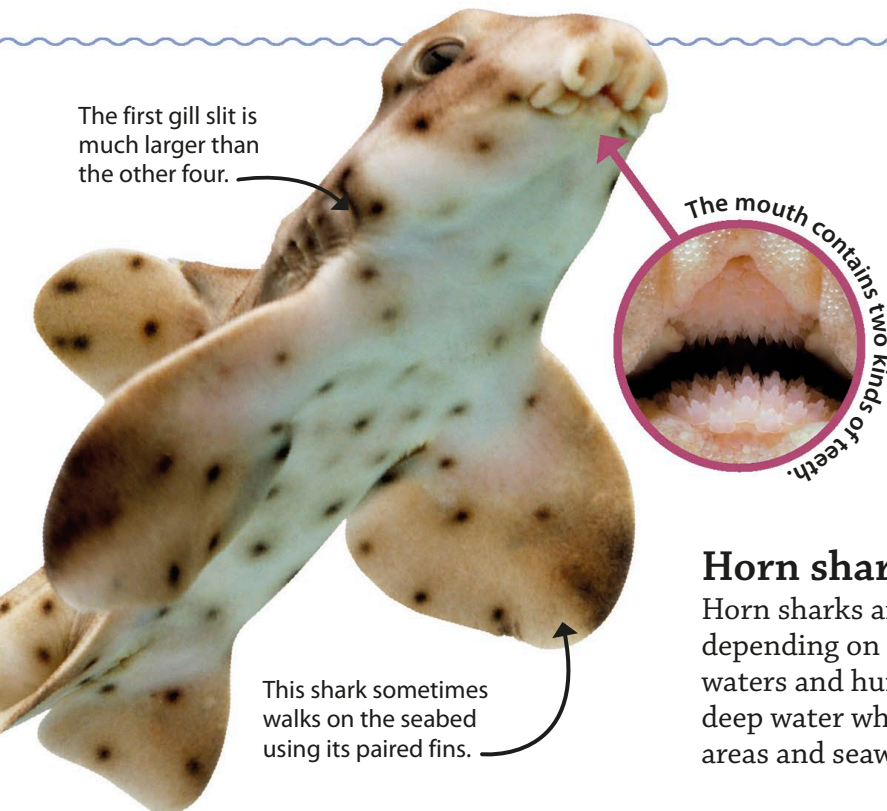


## Becoming endangered

The common angelshark was once found throughout shallow seas in the northeastern Atlantic. However, so many were fished that it almost became extinct, which means there would have been none left in the world. The Canary Islands, near Morocco, are now the only place where you can still see this angelshark.



Common angelshark



### FACT FILE

- » **Depth:** Adults 0–36 ft (0–11 m) and young 0–490 ft (0–150 m)
- » **Length:** 3 ft (1 m)
- » **Fun fact:** These sharks lay corkscrew-shaped eggs that they wedge into crevices in rocks to keep them safe until they hatch.

## Horn shark

Horn sharks are found in different places depending on their age. Pups live in shallow waters and hunt by day, but they move to deep water when older. Adults prefer rocky areas and seaweed beds. They hunt at night.



# Mackerel sharks

There are 15 species of mackerel shark, including some of the largest, fiercest, and weirdest-looking fish in the oceans. Despite their name, these sharks don't all feed on small fish. Some slurp plankton, others hunt seals, and some scavenge on dead whales.

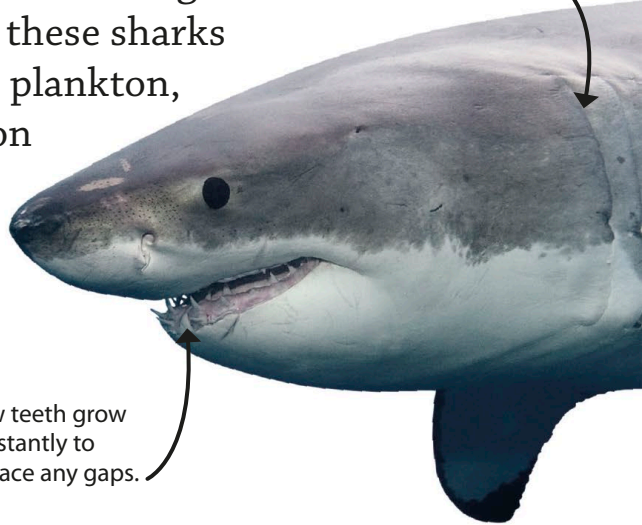
## Why mackerel sharks?

Some sharks in this order like to eat small schooling fish, such as mackerel, which is how they got their name.



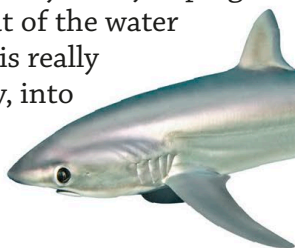
New teeth grow constantly to replace any gaps.

Long gill slits allow water to move fast over the gills underneath.

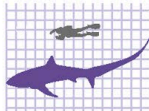


## Pelagic thresher

The pelagic thresher shark lives in the open ocean. This timid shark has a small mouth to feed on small fish and sometimes squid. It is occasionally seen jumping high out of the water or, if it is really unlucky, into a boat!



» Scale



The upper part of the tail is almost as long as the body.

### FACT FILE

» **Depth:** 0–1,800 ft (0–550 m)

» **Length:** 25 ft (7.6 m)

» **Fun fact:** Thresher sharks whip their tail to stun small fish to eat.

## Goblin shark

This may well be the oddest shark in the world. The deepwater goblin shark's shape and color suggest that it lives close to the seabed and swims slowly.

No other shark has a snout like this!



» Scale

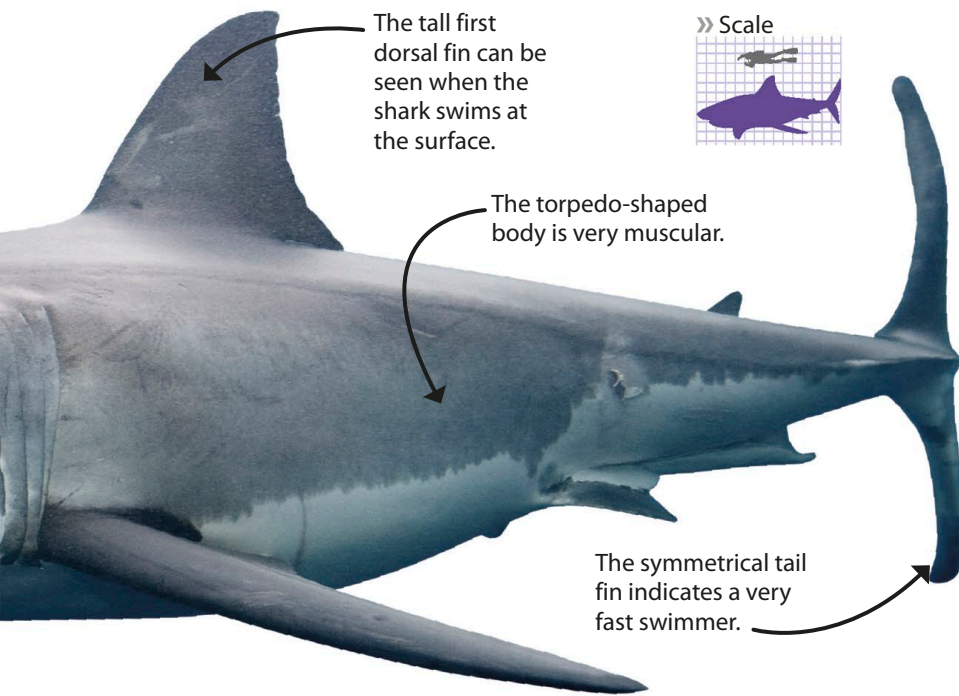


### FACT FILE

» **Depth:** 885–4,270 ft (270–1,300 m)

» **Length:** 13 ft (4 m)

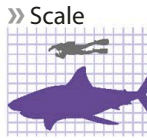
» **Fun fact:** The goblin shark's jaws can extend far out to grab prey.



The tall first dorsal fin can be seen when the shark swims at the surface.

The torpedo-shaped body is very muscular.

The symmetrical tail fin indicates a very fast swimmer.



## Great white shark

This predator is very smart and inquisitive. It swims constantly, migrating thousands of miles a year to find prey. Youngsters eat small fish, but once grown they hunt large marine mammals.

### FACT FILE

» **Depth:** 0–4,270 ft (0–1,300 m)

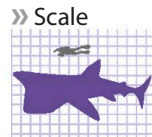
» **Length:** 20 ft (6 m)

» **Fun fact:** This shark is warm-blooded, so its body temperature is higher than the temperature of seawater.

## Basking shark

This gigantic shark filters plankton from the water to eat. It feeds at the surface in cold water but very deeply in the warm tropics.

Gill rakers under the gill slits sieve plankton from the water.



### FACT FILE

» **Depth:** 0–3,940 ft (0–1,200 m)

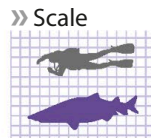
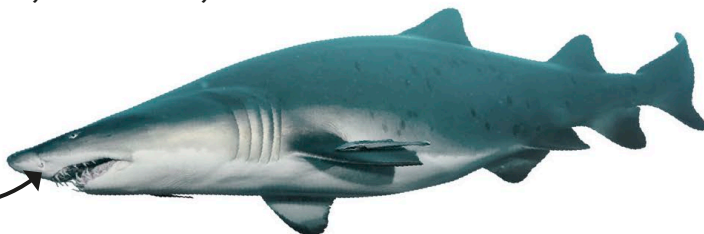
» **Length:** 33 ft (10 m)

» **Fun fact:** This shark can filter 330,000 gallons (1.5 million liters) of water every hour.

## Sandtiger shark

This calm, snaggly toothed shark is commonly displayed in aquariums. Females give birth to one large pup every one or two years.

Sandtiger sharks gulp air to help keep themselves afloat.



### FACT FILE

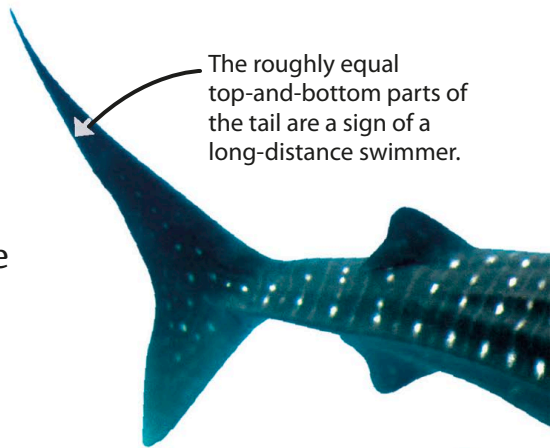
» **Depth:** 0–660 ft (0–200 m)

» **Length:** 10 ft (3 m)

» **Fun fact:** Sandtigers give birth to the biggest pups of any shark—about 3 ft (1 m) long.

# Carpetsharks

There are more than 40 different types of carpetshark, including the largest fish in the world! All carpetsharks have two dorsal fins and a mouth in front of their eyes. As their name suggests, most have colorful patterns and tassellike fringes, and many live on the seabed—just like rugs or carpets on the ocean floor.

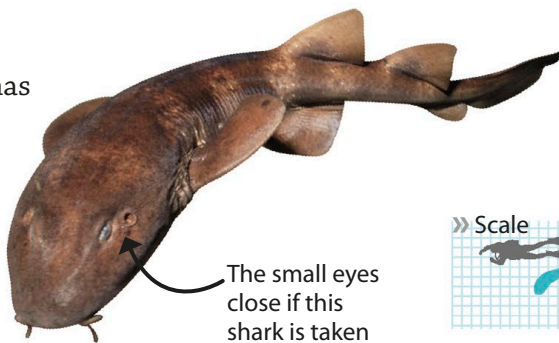


## FACT FILE

- » **Depth:** 0–3,280 ft (0–1,000 m)
- » **Length:** 59 ft (18 m)
- » **Fun fact:** These huge sharks give birth to hundreds of pups that are about 2 ft (0.6 m) long.

## Blind shark

This Australian shark has tiny eyes, but it isn't actually blind. It is nocturnal, which means it feeds at night and hides in holes by day.



» Scale



## FACT FILE

- » **Depth:** 0–460 ft (0–140 m)
- » **Length:** 4 ft (1.2 m)
- » **Fun fact:** This hardy shark lives in surf and rock pools, and survives well in aquariums.

## Nurse shark

This sociable shark sleeps in groups by day on the seabed and hunts at night, vacuuming prey quickly into its mouth. It is often seen in aquariums.

The small mouth can suck sea snails right out of their shells.



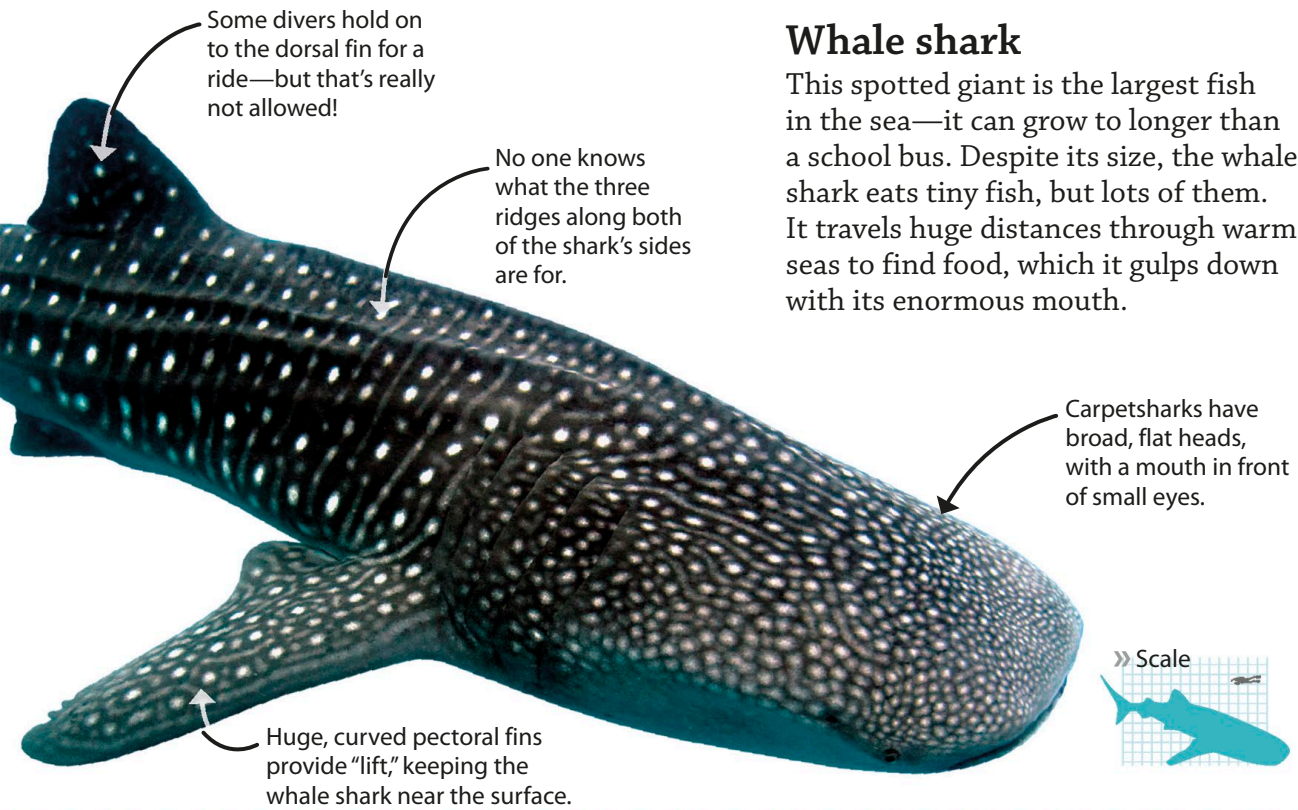
» Scale



## FACT FILE

- » **Depth:** 0–395 ft (0–120 m)
- » **Length:** 10 ft (3 m)
- » **Fun fact:** Females only give birth to pups every second year. In between, they take a rest.





Some divers hold on to the dorsal fin for a ride—but that’s really not allowed!

No one knows what the three ridges along both of the shark’s sides are for.

Huge, curved pectoral fins provide “lift,” keeping the whale shark near the surface.

Carpetsharks have broad, flat heads, with a mouth in front of small eyes.

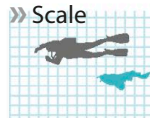
## Whale shark

This spotted giant is the largest fish in the sea—it can grow to longer than a school bus. Despite its size, the whale shark eats tiny fish, but lots of them. It travels huge distances through warm seas to find food, which it gulps down with its enormous mouth.

## Ornate wobbegong

This master of disguise is almost invisible because its patterned skin hides it as it lies asleep. At night, the wobbegong wakes to prowl for food.

Fringes around the mouth make it hard to see the wobbegong’s outline.



### FACT FILE

» **Depth:** 0–330 ft (0–100 m)

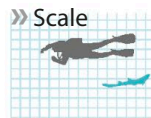
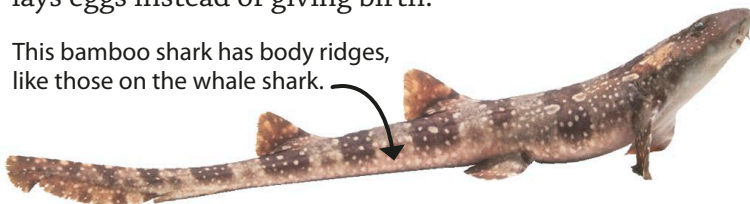
» **Length:** 4 ft (1.1 m)

» **Fun fact:** “Wobbegong” is a native Australian word meaning “shaggy beard.”

## Whitespotted bamboo shark

This common tropical shark is caught for food and often kept in aquariums. It’s the only shark on this page that lays eggs instead of giving birth.

This bamboo shark has body ridges, like those on the whale shark.



### FACT FILE

» **Depth:** 0–165 ft (0–50m)

» **Length:** 3 ft (1 m)

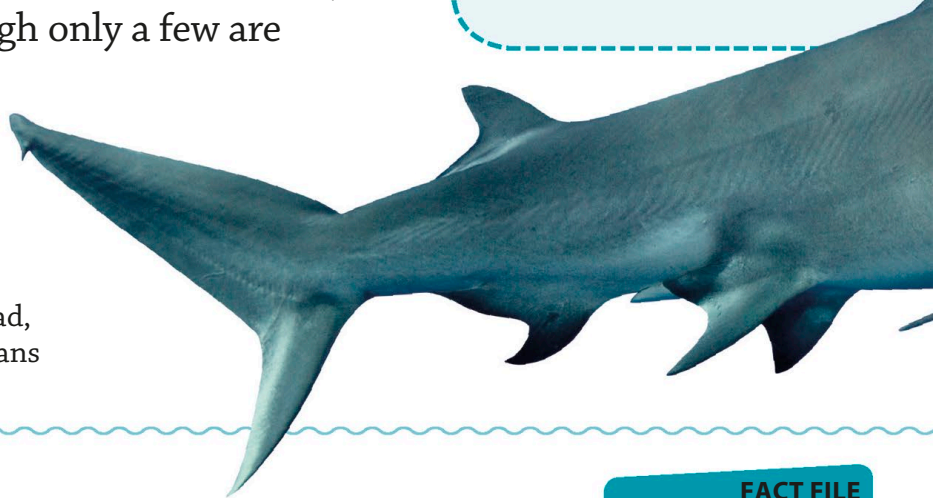
» **Fun fact:** This bamboo shark uses its muscly pectoral fins to crawl over the seabed.

# Ground sharks

Almost half of all shark species are ground sharks. Many live in deep water, but others are common in all the world's oceans. Most, such as catsharks and houndsharks, are very small, rare, and harmless. However, some are very large predators, although only a few are dangerous to people.

## Great hammerhead

The great hammerhead is the largest of the hammerhead sharks. This species has a broad, flat head filled with sense organs for tracking down prey.



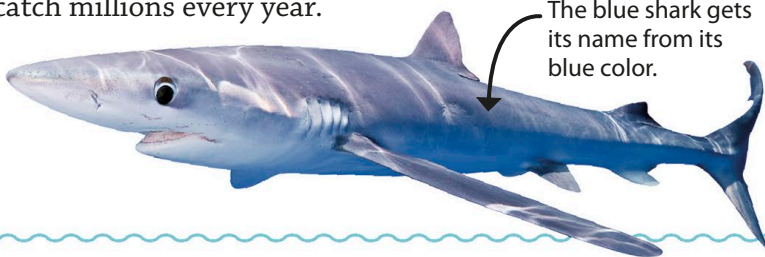
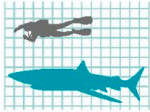
### FACT FILE

- » **Depth:** 0–260 ft (0–80 m)
- » **Length:** 20 ft (6 m)
- » **Fun fact:** Stingrays are the great hammerhead's favorite food, although they can defend themselves with sharp stings.

## Blue shark

The world's most common oceanic shark is the blue shark. It cruises slowly along warm-water currents for thousands of miles, hunting for squid and small fish. Fishermen catch millions every year.

### » Scale



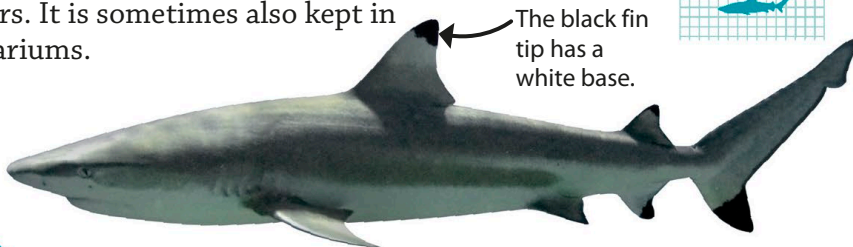
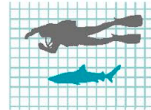
### FACT FILE

- » **Depth:** 0–1,150 ft (0–350 m)
- » **Length:** 13 ft (3.8 m)
- » **Fun fact:** Divers use bait to attract blue sharks for cage diving.

## Blacktip reef shark

This strong swimmer always hangs out on Indo-Pacific reefs, where it is popular with divers. It is sometimes also kept in aquariums.

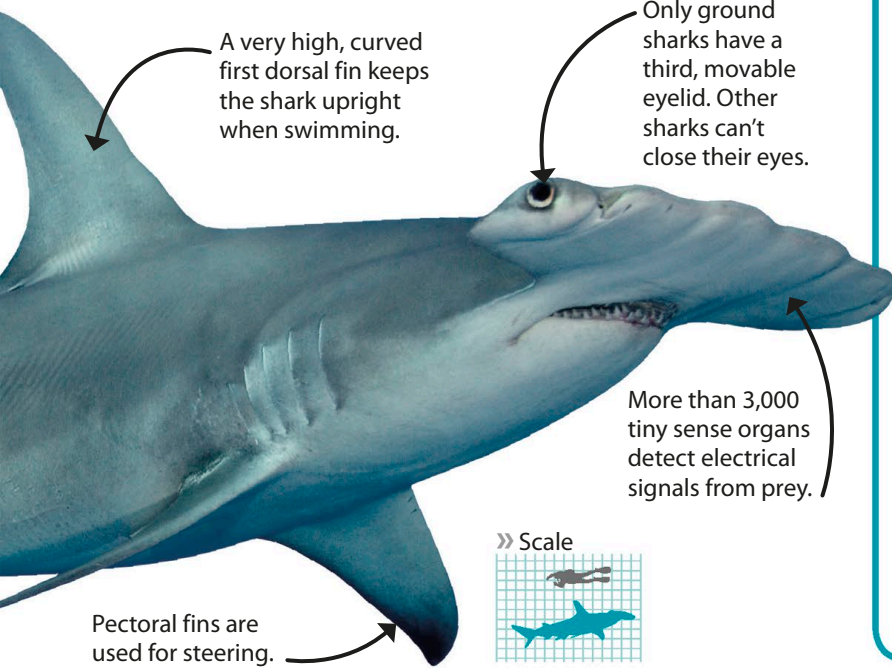
### » Scale



### FACT FILE

- » **Depth:** 0–65 ft (0–20 m)
- » **Length:** 7 ft (2 m)
- » **Fun fact:** Some of these sharks have swum all the way through the Suez Canal, from the Red Sea to the Mediterranean.



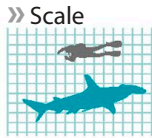


A very high, curved first dorsal fin keeps the shark upright when swimming.

Only ground sharks have a third, movable eyelid. Other sharks can't close their eyes.

More than 3,000 tiny sense organs detect electrical signals from prey.

Pectoral fins are used for steering.



## Huge hammer

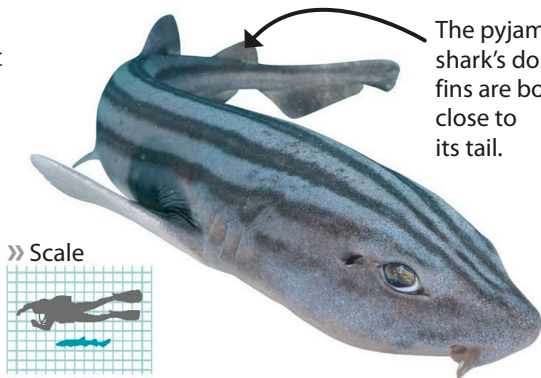
The broad, flattened head of a hammerhead improves swimming control and "lift," which pushes the shark up in the water. Widely separated nostrils help the shark to pinpoint the source of food smells. The winghead shark has a head width almost half the length of its whole body!



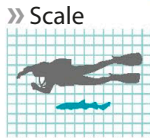
X-ray of a winghead shark

## Pyjama shark

The pyjama shark is a sort of "catshark." Named for their stripes, these sharks are only found in the waters around the tip of South Africa, where they live in surf, caves, and other rocky areas.



The pyjama shark's dorsal fins are both close to its tail.



### FACT FILE

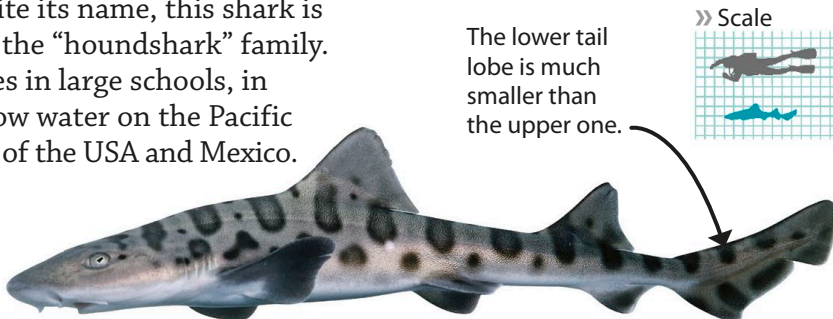
» **Depth:** 0–330 ft (0–100 m)

» **Length:** 3 ft (1 m)

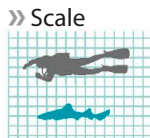
» **Fun fact:** These sharks lay pairs of eggs, which hatch on the seabed.

## Leopard shark

Despite its name, this shark is from the "houndshark" family. It lives in large schools, in shallow water on the Pacific coast of the USA and Mexico.



The lower tail lobe is much smaller than the upper one.



### FACT FILE

» **Depth:** 0–65 ft (0–20 m)

» **Length:** 7 ft (2 m)

» **Fun fact:** Females give birth to their pups in water only 3 ft (1 m) deep.

# Skeleton

A shark's skeleton is not made of bones. Instead, it is made of light, flexible cartilage. This is the same material that your ears and nose are made of, but stronger. There aren't many parts to a shark's skeleton, just a skull, jaws, spine, gill arches, and supports underneath the fins.

## Great white shark skeleton

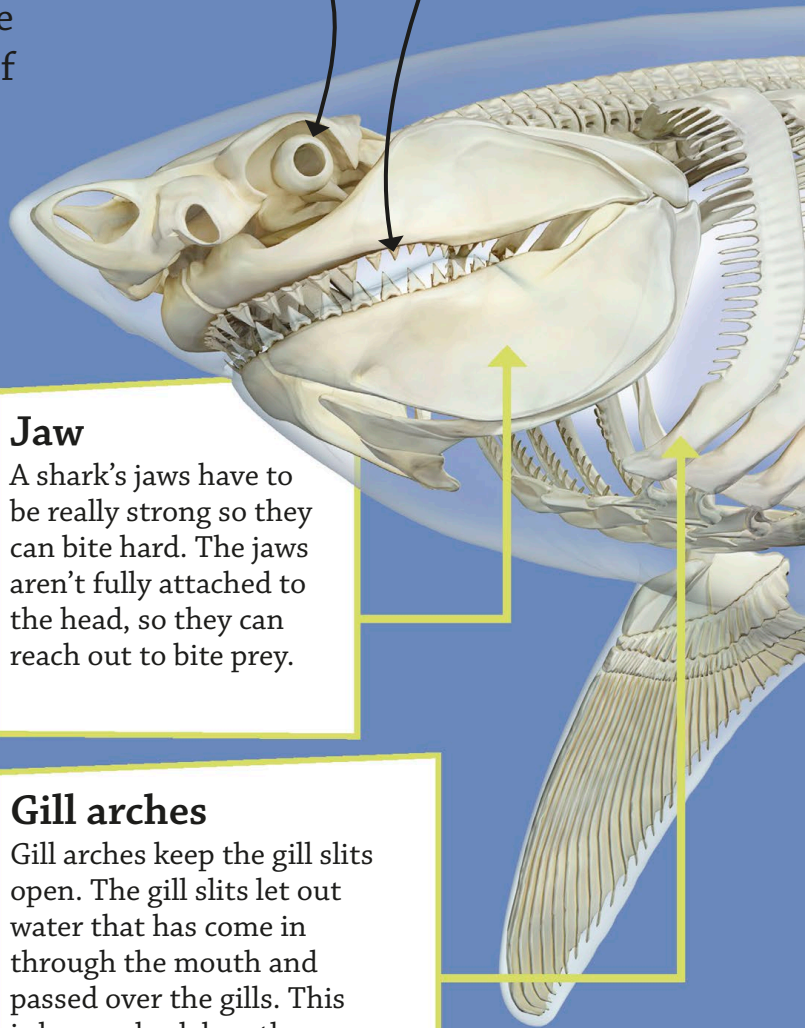
A shark's body is supported by the water around it, so its skeleton can be bendier than a human's. However, in very old, large sharks, the cartilage becomes much harder and more similar to bone.

## Movement

The great white shark swims fast by beating just the end of its tail. Long, thin sharks, such as this dogfish, swim slowly, like an eel, using most of their body length.

The eyes sit in a cup in the skull, called the orbit.

Shark teeth are made of hard enamel, not cartilage, so they can bite through prey.



### Jaw

A shark's jaws have to be really strong so they can bite hard. The jaws aren't fully attached to the head, so they can reach out to bite prey.

### Gill arches

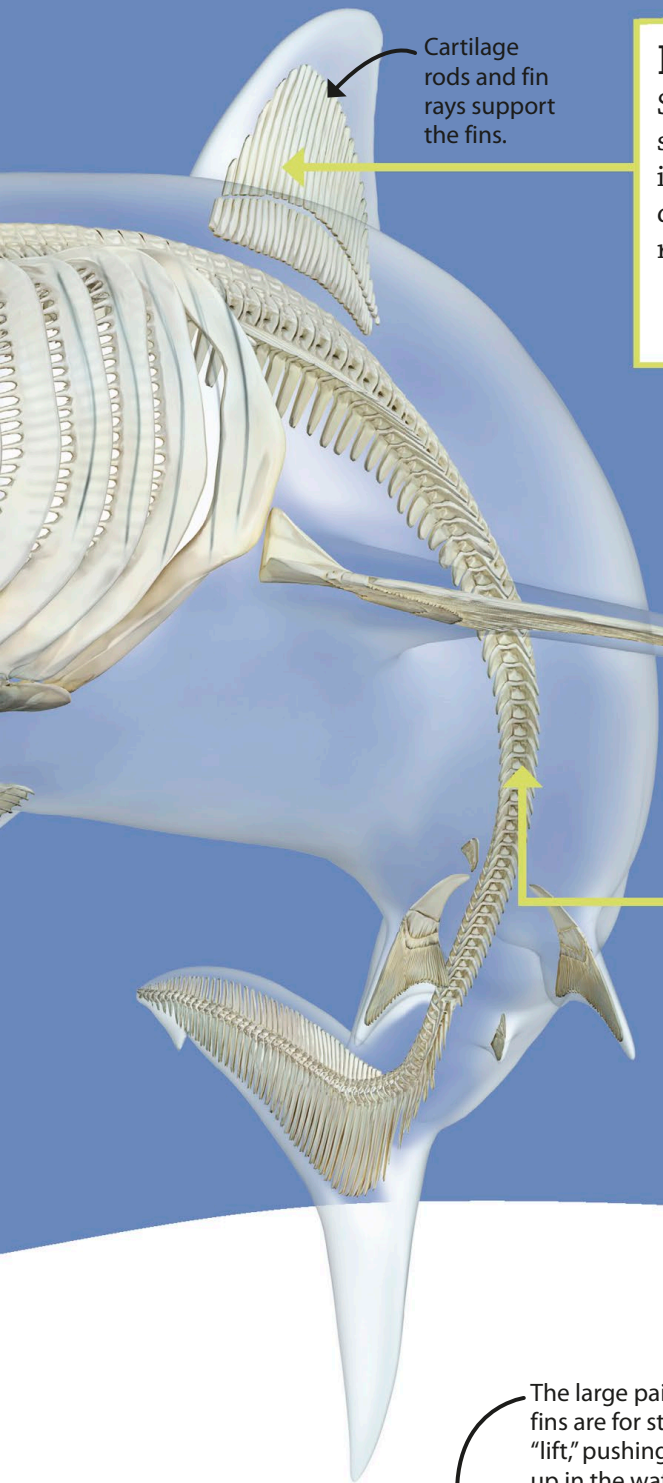
Gill arches keep the gill slits open. The gill slits let out water that has come in through the mouth and passed over the gills. This is how a shark breathes.

Stiff fins push against the water, helping the shark swim.

The tail, which contains zigzag bands of muscle, is more than half the length of this shark.





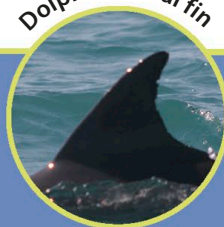


Cartilage rods and fin rays support the fins.

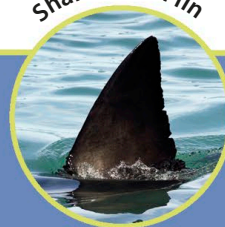
## Dorsal fin

Shark and dolphin dorsal fins look very similar, and they both stop sideways “rolling” in the water. However, on the inside they are completely different. Dolphins don’t have fin rays to support their dorsal fin.

Dolphin dorsal fin



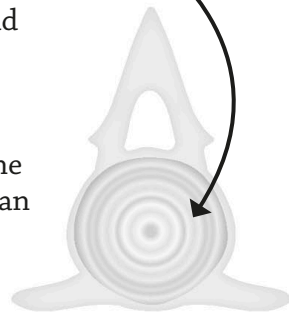
Shark dorsal fin



## Spine

The spine has about 180 sections, called vertebrae, from the head to the tip of the tail. Human backbones are only made up of about 30 bones. A shark’s spine is also much bendier than our backbone!

Vertebrae grow rings, like the inside of a tree trunk. These can be used to tell a shark’s age.



The large pair of pectoral fins are for steering and “lift,” pushing the shark up in the water.



**! WOW!**

Never pull a shark’s tail—it can **bend** all the way around to **bite** you!

# Inside a shark

Beneath a shark's skin are hidden all the important parts it needs to survive. Its muscles are attached to the inside of the thick skin itself, not to the skeleton, like ours are. Underneath the muscles, the organs all play a vital role in keeping the shark swimming.

## Brain

Shark brains come in many different shapes and sizes, depending upon the senses the type of shark uses most. Nerves run from the brain to all parts of the body.

## Liver

A shark's liver is enormous, about 25–30 percent of its body weight! It is full of oil, which is very light—lighter than water. This helps the shark to stay afloat.

## Stomach

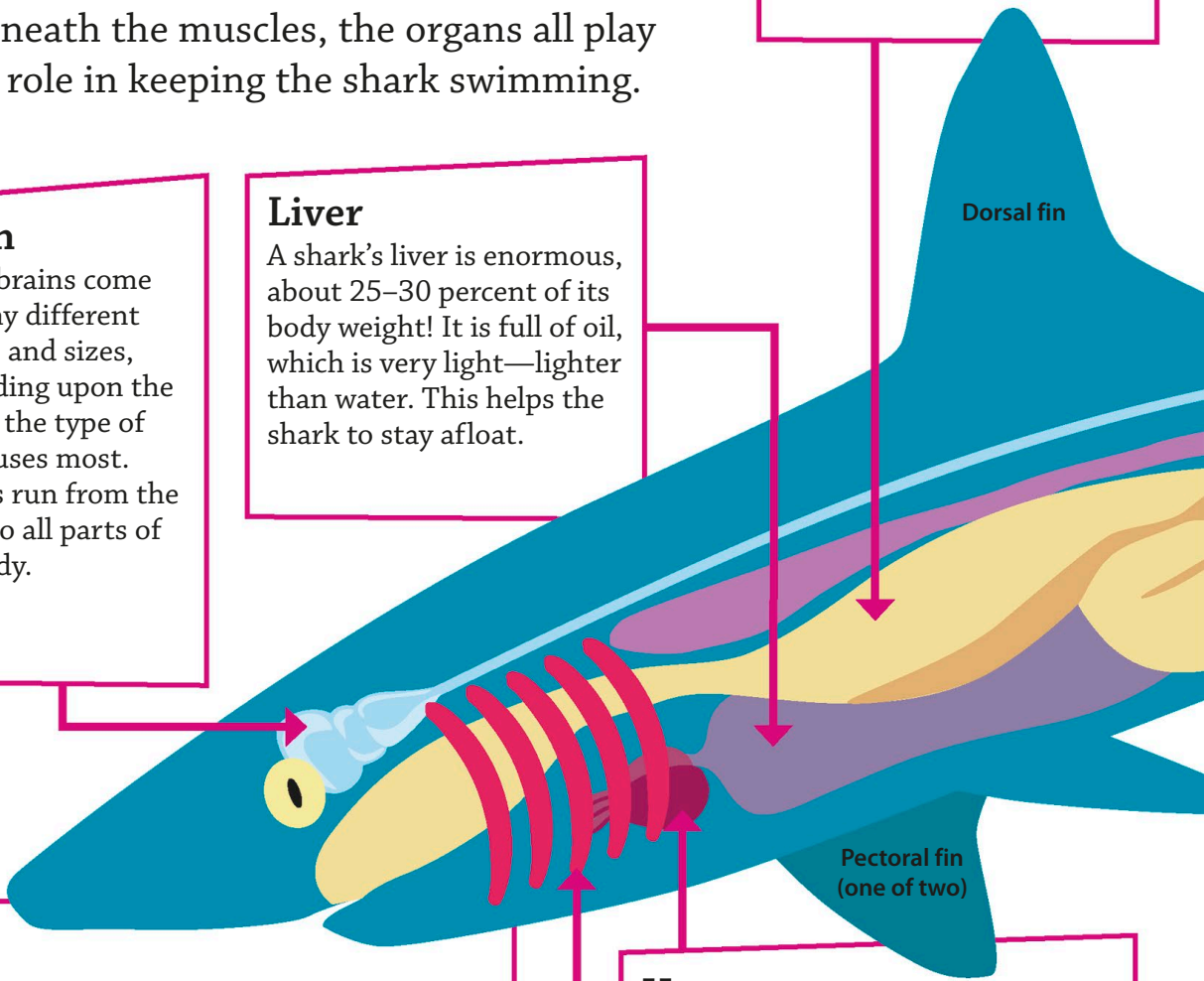
The J-shaped stomach mainly stores food. The shark can turn this inside out, through its mouth, to spit out inedible stuff that was eaten by mistake!

## Gills

Water comes in through the mouth and goes out over the gills, which collect oxygen for the shark to breathe. Some sharks can't breathe if they stop swimming. Others can pump water over their gills as they lie on the seabed.

## Heart

There are two main chambers in a shark's heart. One chamber has thick, strong walls, to pump blood through the gills and all around the body. The other one collects returning blood.





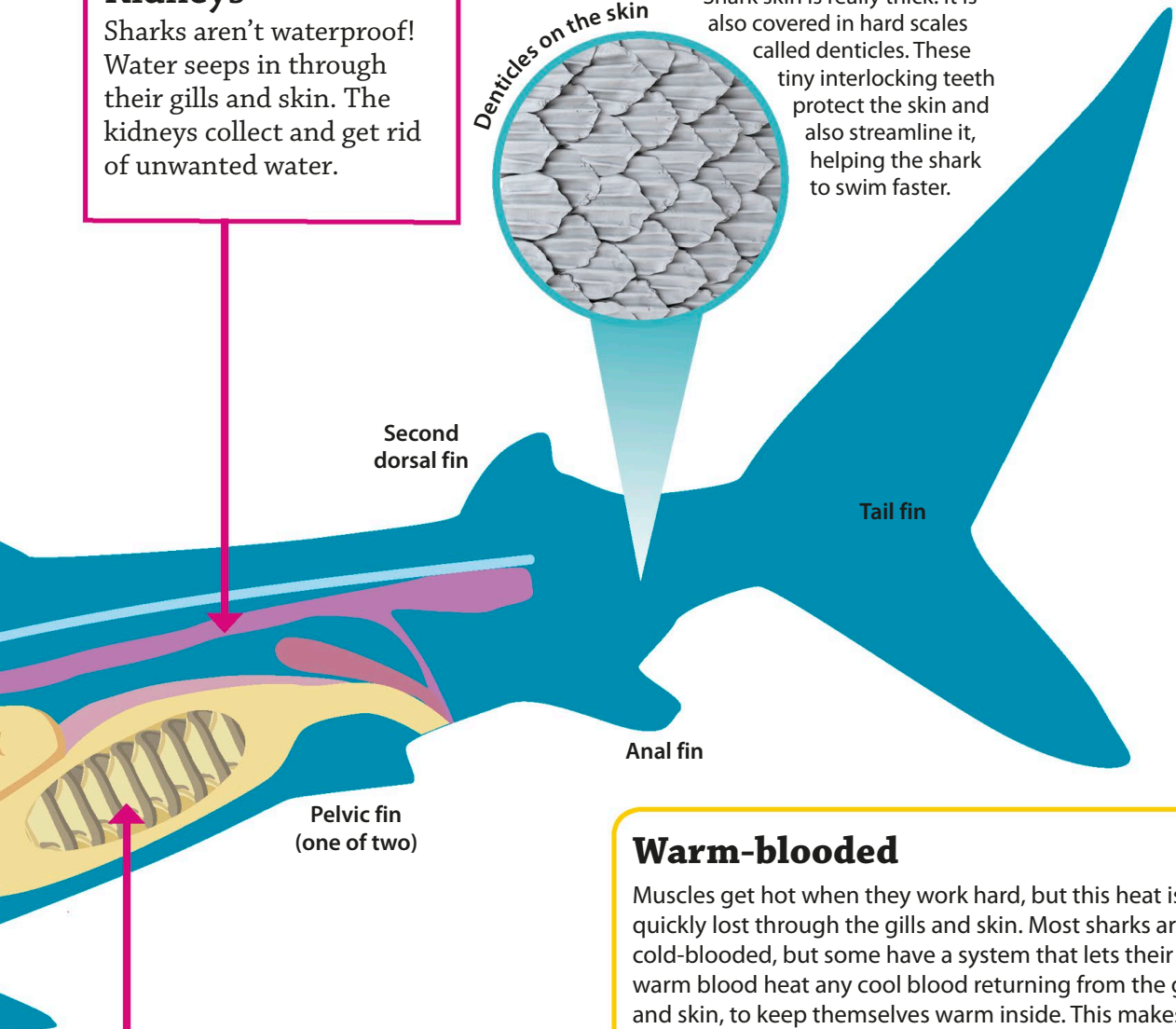
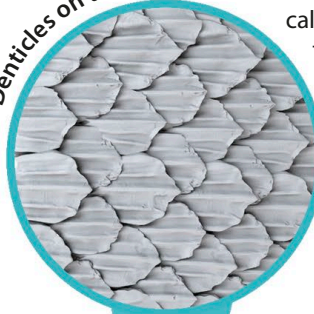
## Kidneys

Sharks aren't waterproof! Water seeps in through their gills and skin. The kidneys collect and get rid of unwanted water.

## Skin

Shark skin is really thick. It is also covered in hard scales called denticles. These tiny interlocking teeth protect the skin and also streamline it, helping the shark to swim faster.

Denticles on the skin



Second dorsal fin

Tail fin

Anal fin

Pelvic fin  
(one of two)

## Warm-blooded

Muscles get hot when they work hard, but this heat is quickly lost through the gills and skin. Most sharks are cold-blooded, but some have a system that lets their warm blood heat any cool blood returning from the gills and skin, to keep themselves warm inside. This makes them faster-growing and more efficient hunters.



Salmon sharks live in the North Pacific Ocean.

## Intestine

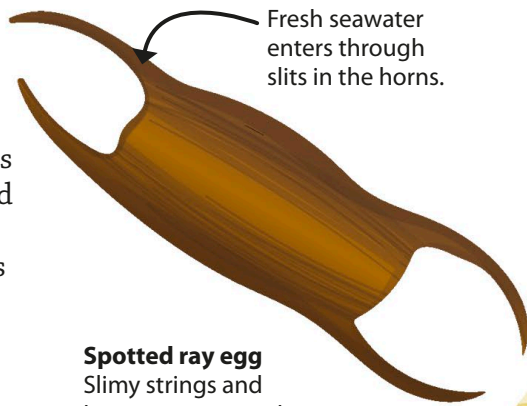
This is where food is digested. A shark's intestine is curled into a very tight spiral, making it look much shorter and fatter than a mammal's long intestines.

# Shark eggs

Many sharks lay leathery eggs in nursery grounds—safe places where shark mothers can anchor their eggs to the seabed. The pups inside live off a yolk sac while they grow into miniature copies of their parents—it may take up to a year before they are ready to hatch. Many rays and all chimaeras are also egg-layers.

## Types of egg

Sharks and their relatives lay eggs in pairs, but each species has differently shaped eggs. An empty, washed-up egg case is called a “mermaid’s purse.” It has an opening where the pup wriggled out.



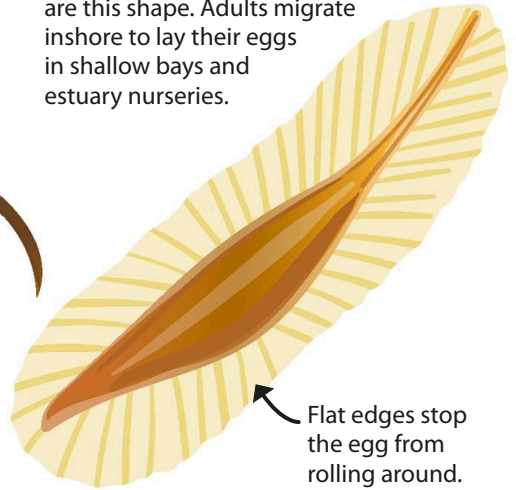
Fresh seawater enters through slits in the horns.

### Spotted ray egg

Slimy strings and horns stop spotted ray eggs from washing out of the nursery grounds where they are left.

### Australian ghostshark egg

Chimaeras, also known as ghostsharks, all lay eggs that are this shape. Adults migrate inshore to lay their eggs in shallow bays and estuary nurseries.



Flat edges stop the egg from rolling around.

## Hatching

The embryo of a growing shark, ray, or chimaera curls up to fit inside its egg. Its tail pumps in fresh seawater so it can breathe, but it stops if it senses danger. When its yolk is finished, the baby wriggles out of its case.



An undulate ray hatches from its egg case.

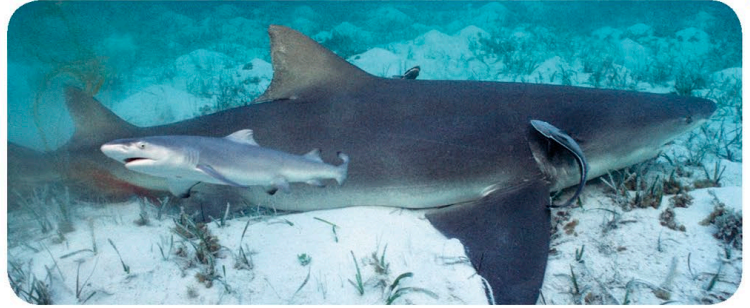


The pup uncurls its fins as it escapes.

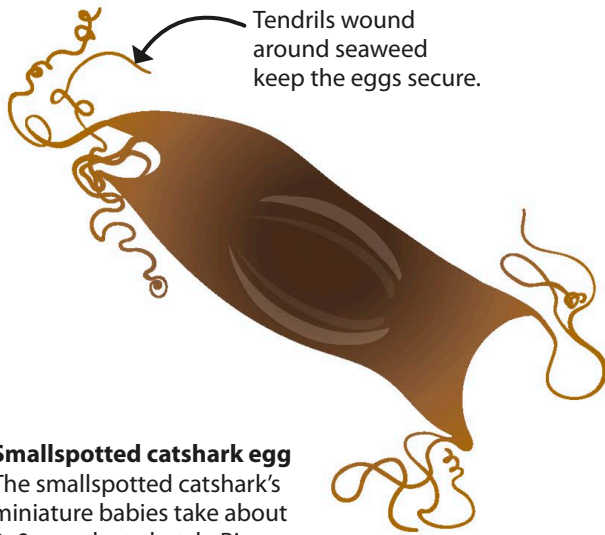


## Live birth

About 60 percent of sharks give birth to pups, rather than laying eggs. Some pups are born soon after hatching from eggs inside their mom. Others hatch earlier, and feed on spare eggs before birth. A few sharks have placentas, like mammals, which connect the mom to the pup and provide them with food.



A lemon shark pup being born



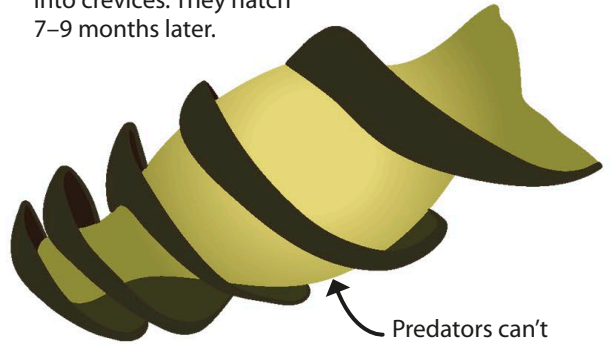
Tendrils wound around seaweed keep the eggs secure.

### Smallspotted catshark egg

The smallspotted catshark's miniature babies take about 8–9 months to hatch. Bigger moms lay bigger eggs!

### Horn shark egg

Horn sharks wedge their eggs securely under rocks and into crevices. They hatch 7–9 months later.



Predators can't easily pull this screw-shaped egg out of its crevice.

Free at last! The empty egg case may wash up on a beach nearby.



**! WOW!**

**Shark egg cases are made from the same material, called keratin, as your hair and fingernails!**



# Baby sharks

Mother sharks never look after their young, and growing up is a dangerous time. Big sharks often like eating little ones! Many pups spend a few years hiding in places that big sharks can't reach. Others use a disguise to avoid being spotted by hungry predators.

## Lemon shark nursery

A mother lemon shark gives birth in the place where she grew up safely. This warm lagoon in the Bahamas provides shelter and food for lots of pups. They will spend four years living here with many brothers, sisters, and cousins.



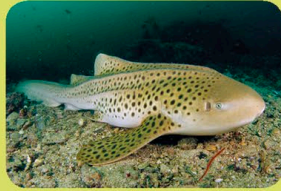
WOW!

Baby sharks  
are born with  
**teeth**, ready to  
**hunt**.



## Stay away

Shark pups sometimes look very different from their parents, not just in size but also in shape and color. Pups are often camouflaged, which means their appearance makes them hard to spot. A few pups disguise themselves as completely different animals.



### Adult zebra shark

Adult zebra sharks have spots—they don't look like a zebra at all! Only youngsters have stripes, as well as long, thin bodies.



### Zebra shark pup

These pups have black and white stripes, but these aren't to help them hide. They make the pups look like dangerous sea snakes.



### Sea snake

The stripes on this sea snake warn that it's venomous. Baby zebra sharks even swim like sea snakes so that predators stay clear!

## Nursery features

### Safety

- This nursery ground is a warm lagoon.
- Pups swim far into it, where it's much too shallow for adult sharks or big fish to hunt.
- The roots of mangrove trees provide safe hiding places for baby sharks.

### Food

- The lagoon and mangroves are full of little fish for the pups to eat. As they grow older, they start hunting bigger fish in slightly deeper water.

### Friends

- Scientists studying baby lemon sharks in their nurseries have discovered that pups are often found with the same companions. They even have individual personalities—some are timid, but others are much braver.



# Social sharks

Many sharks live in groups, called schools. Schools usually contain sharks of the same species and size, but not always. When living side by side, these sharks need to be able to communicate with each other about food and mates.

## Types of behavior

Sharks need to cooperate when they are hunting together, looking for a mate, or to avoid fights. They use different signals to let each other know what they mean.

### Schooling

Sharks may swim together all the time, or only at particular times during the day or year. Head-flicking and swimming in spirals in these groups may let other sharks know to keep out of the way. These behaviors may also be done to impress a mate.

**! WOW!**  
Certain **unrelated sharks** tend to hang out together—they might be **friends**.



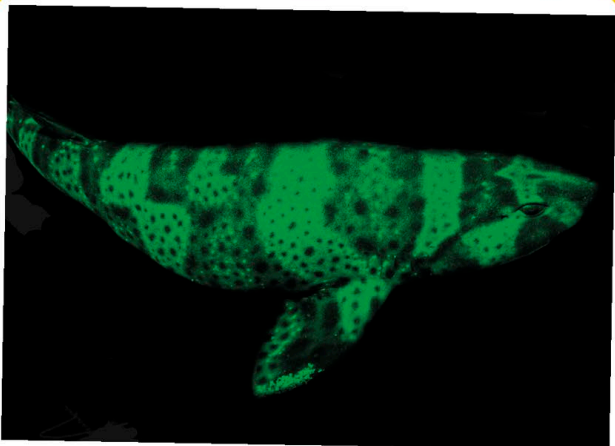
Scalloped hammerhead sharks schooling



A great hammerhead and a nurse shark swim together.

### Getting along

When different shark species school together, they must be able to understand each other's signals.



A swellshark glows green in moonlight.

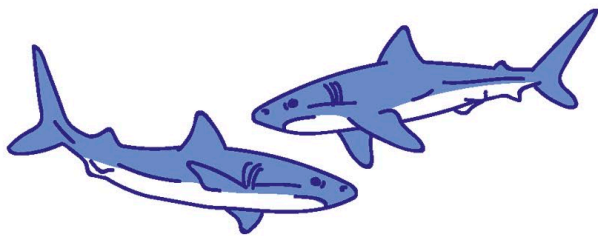
### Glow-in-the-dark shark

This swellshark absorbs moonlight to make its skin glow. Humans can't see this light without special cameras, but other swellsharks can. Scientists haven't yet decoded this secret signal.



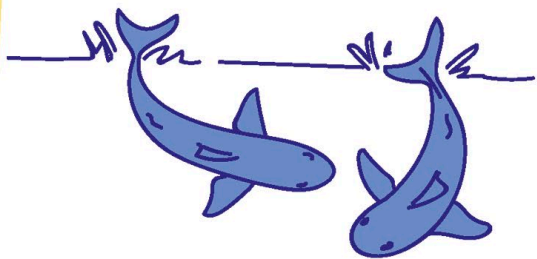
## Body language

Sharks can't talk, but they can use their body position to communicate with each other. Many shark behaviors are used to decide who is bigger and stronger. This can prevent fights, as smaller sharks will avoid larger sharks, or show who would make the best mate.



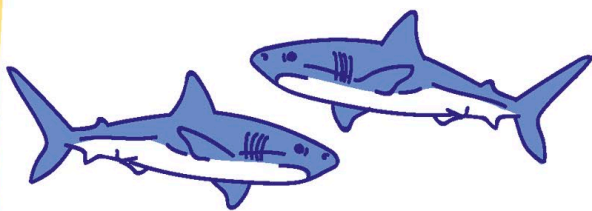
### Size display

A size display shows which out of two sharks is larger—bigger sharks are in charge. The biggest sharks get to swim in the middle of a school, while smaller ones have to hang out at the edges.



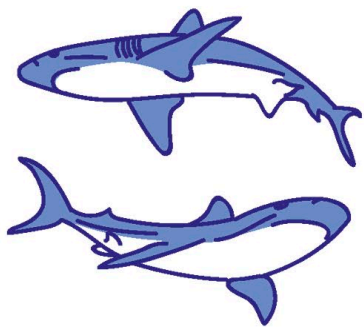
### Splashing

Tail slaps are common when several great white sharks are feeding together. The sharks may be trying to scare each other away from their food.



### Swim-by

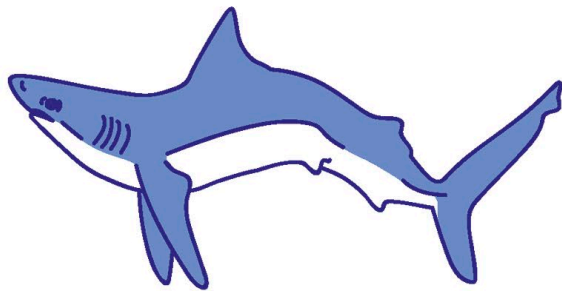
A slow swim-by is a good way to check out another shark. This gives sharks a chance to see if they know one another.



### Circling

Sometimes sharks circle each other before feeding in a group. They might be deciding who gets to start first.

## WARNING!

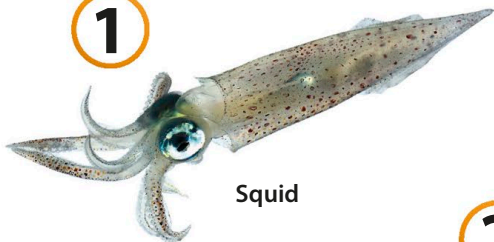


### Hunching

A hunched back, with the head up, and fins pointed down means "Stay away from me! I'll bite if you come closer!"

**Match the prey with the shark that eats them!**

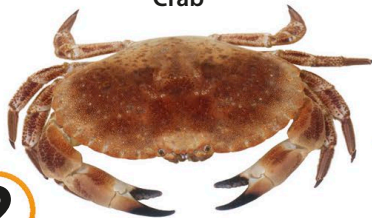
1



Squid

Crab

2

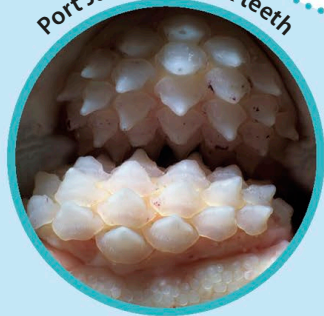


3

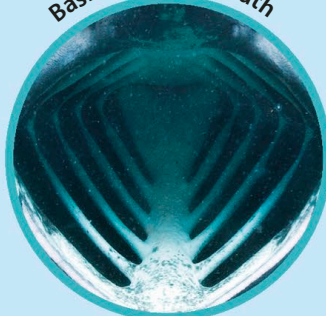
Tuna



Port Jackson shark teeth



Basking shark mouth



Shortfin mako shark teeth



**A** Port Jackson shark

Sharp teeth at the front grab prey, while rounded pads at the back grind up tough food.

**B** Basking shark

Filter feeders use gill rakers to sieve out their tiny food from seawater.

**C** Shortfin mako shark

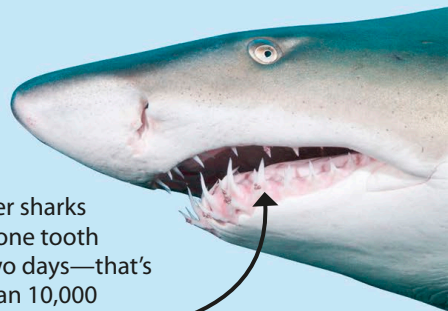
Needlelike teeth pointing backward mean slippery prey can't escape this shark.

# Dinnertime

It is possible to guess what sharks prefer to eat from the shape of their teeth—particularly if they are choosy. Some sharks catch and swallow their dinner whole. Others have jagged teeth like knives that cut up larger prey. A few have grinding teeth for smashing up tough shells.

## Conveyor-belt teeth

Sharks lose all their teeth every month or two, but a replacement set moves forward right away.



Sandtiger sharks replace one tooth every two days—that's more than 10,000 in a lifetime!





**4** Plankton

Great white shark teeth



**D** Great white shark

Jagged, pointed teeth bite out chunks of large prey for this shark to swallow.



# Big teeth

Big teeth are used to bite chunks out of animals that are too large to be swallowed whole. The biggest-ever shark teeth are from the prehistoric shark Megalodon. These teeth are 7 in (18 cm) long.

**Megalodon tooth**  
This tooth is between 2 and 16 million years old. It is a fossil from a huge Megalodon. This shark probably ate whales.

**!** LIFE SIZE!



**Great white shark tooth**  
The great white shark's teeth have serrated edges for sawing off chunks of flesh as the shark shakes its head from side to side.



## Surprise attack

Great white sharks surprise prey by attacking from below. Tourist boats in South Africa tow model seals to encourage the sharks to breach out of the sea—don't try this yourself!

The eye is rolled back to avoid being damaged by prey during an attack.

# Hunting

There are no vegetarian sharks! All of them are hunters, but they catch their dinner in different ways. Some sharks dig for shellfish in the sandy seabed, while others hide and ambush passing prey. The fastest swimmers chase down squid and fish, grabbing them with razor-sharp teeth.

**! WOW!**

Many sharks **change** tooth shape and their favorite food as they grow.

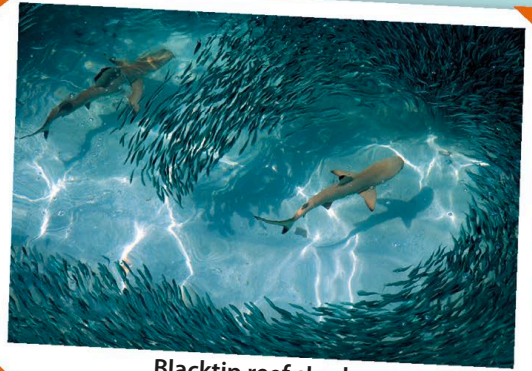


### Test bite

This shark is "mouthing" a boat's engine to decide whether it's good enough to eat. Sharks often give objects a test bite to find out whether they are edible.



Galapagos shark



Blacktip reef sharks

### Cooperative

Some sharks hunt in packs, working together to herd, confuse, and capture shoaling prey that would escape a lone hunter.



Cookiecutter shark

### Quick bite

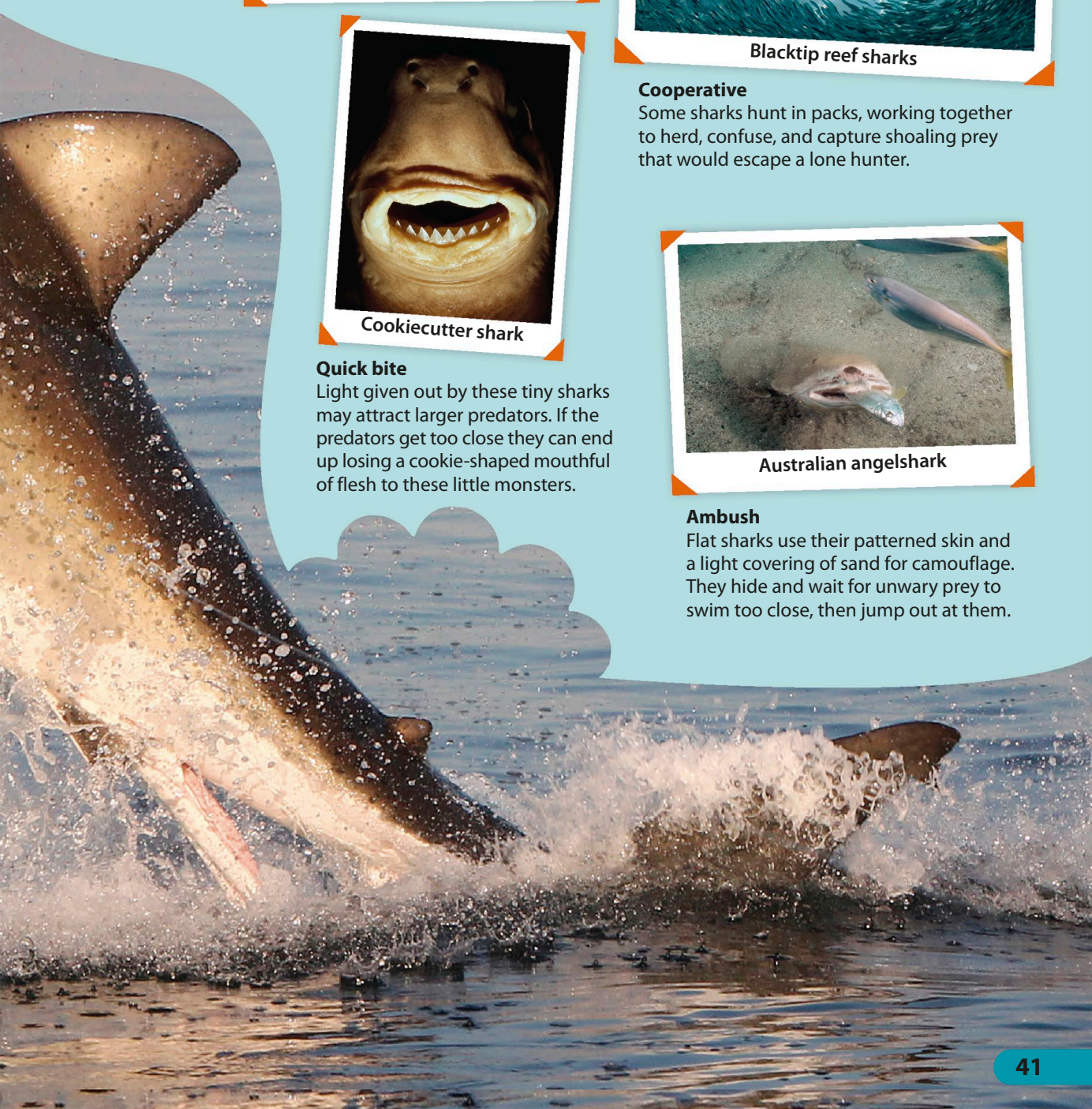
Light given out by these tiny sharks may attract larger predators. If the predators get too close they can end up losing a cookie-shaped mouthful of flesh to these little monsters.



Australian angelshark

### Ambush

Flat sharks use their patterned skin and a light covering of sand for camouflage. They hide and wait for unwary prey to swim too close, then jump out at them.





# Filter feeders

The world's biggest sharks feed on the smallest animals—plankton. Because plankton are tiny, they have to be filtered out of seawater—teeth are useless! Filter feeders use their gills to trap plankton, as well as for breathing.

## **Whale shark**

This shark stops swimming to take huge gulps of water. It closes its mouth to push the water over its gills, straining out the plankton and squeezing the excess water out of its gill slits, before swallowing its catch.





## Plankton

Plankton includes all sorts of tiny swimming and floating animals, including crabs and other shellfish, miniature eggs, and baby fish.



## Gentle giants

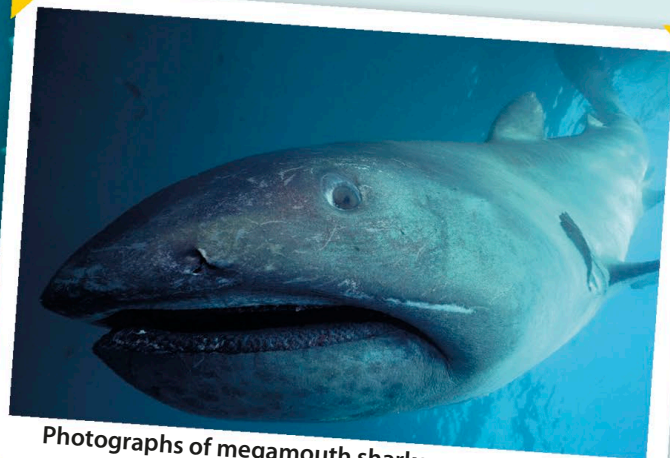
Divers love swimming with these huge sharks because they don't have big teeth or bite, and aren't dangerous.



Basking shark with mouth open, showing open gill slits

### Basking shark

The basking shark is a "ram feeder"—it never stops swimming and lets water pass over its gills continuously. It collects minute plankton at the surface and in deep water.



Photographs of megamouth sharks are rare because they live in very deep water.

### Megamouth shark

This deepwater plankton eater has never been seen feeding, but probably gulps mouthfuls of water, like the whale shark.

**! WOW!**

Filter feeders have **tiny teeth** because they **don't chew** their food!

## Human senses

A human's five senses are sight, hearing, smell, taste, and touch. Our sense organs detect signals such as light, noise, and pressure, and then send messages to the brain, which tells the body how to react.

### Smell

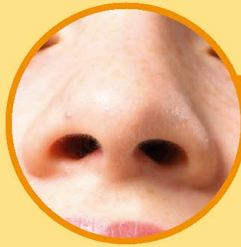
The inside of the nose is full of tiny cells that can detect thousands of different smells!

### Sight

A lens inside our eyes focuses light onto special cells that detect light and color.

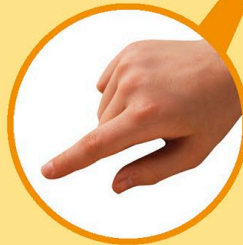
### Hearing

Our ears collect sound, which travels to internal sense organs that detect vibrations—and gravity.



### Taste

Taste buds on top of our tongue detect salty, sweet, bitter, sour, and savory tastes.

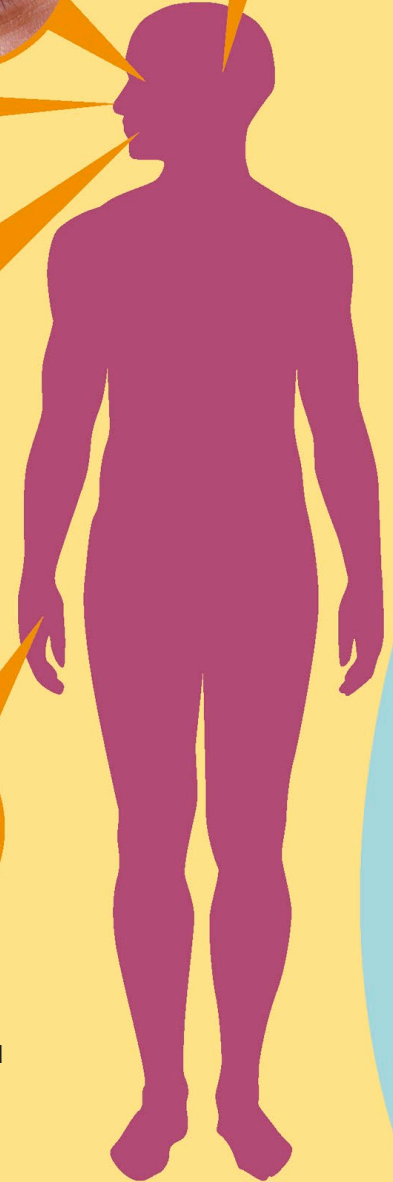


### Touch

The skin is our biggest sense organ. It detects pressure, or touch, and temperature.

# Senses

Animals need senses to find out about the world. They are essential for locating food and avoiding danger. Signals are detected by sense organs. Most sense organs are on the head, but one covers the whole body—it's the skin! Sharks have the same five main senses as us, but some are higher-powered than ours. They also have an amazing sixth sense—they can detect electricity.





**! WOW!**

**Some sharks could smell a scrap of food in an Olympic swimming pool.**

### Taste

Sharks have taste cells inside their mouth and on their barbels—if they have them.

### Smell

Sharks have a fantastic sense of smell. They don't use their nostrils for anything else!

### Sight

The eyes of sharks living in shallow, clear water are very like ours. Deepwater sharks need huge eyes to capture the tiniest glimmer of light.

### Hearing

It's almost impossible to see the tiny openings leading to a shark's ears. On the inside, they are very like ours.

### Lateral line

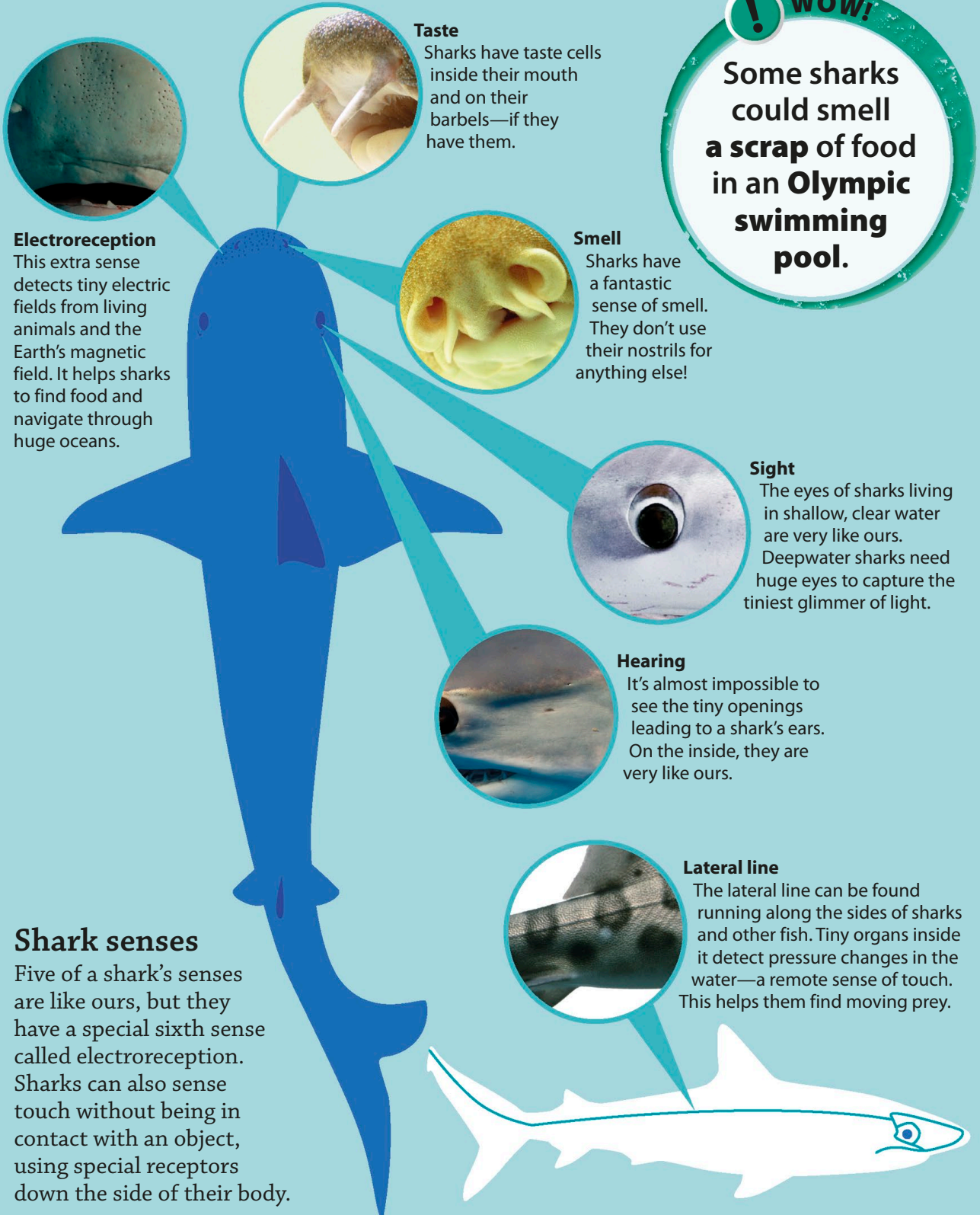
The lateral line can be found running along the sides of sharks and other fish. Tiny organs inside it detect pressure changes in the water—a remote sense of touch. This helps them find moving prey.

### Electroreception

This extra sense detects tiny electric fields from living animals and the Earth's magnetic field. It helps sharks to find food and navigate through huge oceans.

## Shark senses

Five of a shark's senses are like ours, but they have a special sixth sense called electroreception. Sharks can also sense touch without being in contact with an object, using special receptors down the side of their body.



# Sensing electricity

Sharks have an amazing super-sense, called electroreception. They use special cells, known as ampullae, scattered under their head and around their mouth to detect electricity. All animals produce tiny amounts of electricity, and electroreception can pick this up. Electroreception is also useful to help a shark find its way on long journeys, as it can identify the direction of the Earth's magnetic field.

## Hunting rays

Sharks use their eyes, nose, and electric sense organs to find prey. Scent is a long-distance clue and sight is useful closer up, but electroreception is important when prey is only inches away—even when it's hidden from view.

## Torpedo ray

Torpedo rays generate electricity in special cells. They store it in "battery" organs and then release it as electric shocks to stun prey or for defense. A common torpedo ray can produce 200 volts. Ancient Greek doctors used electric rays to shock patients for pain relief, but don't try this at home!



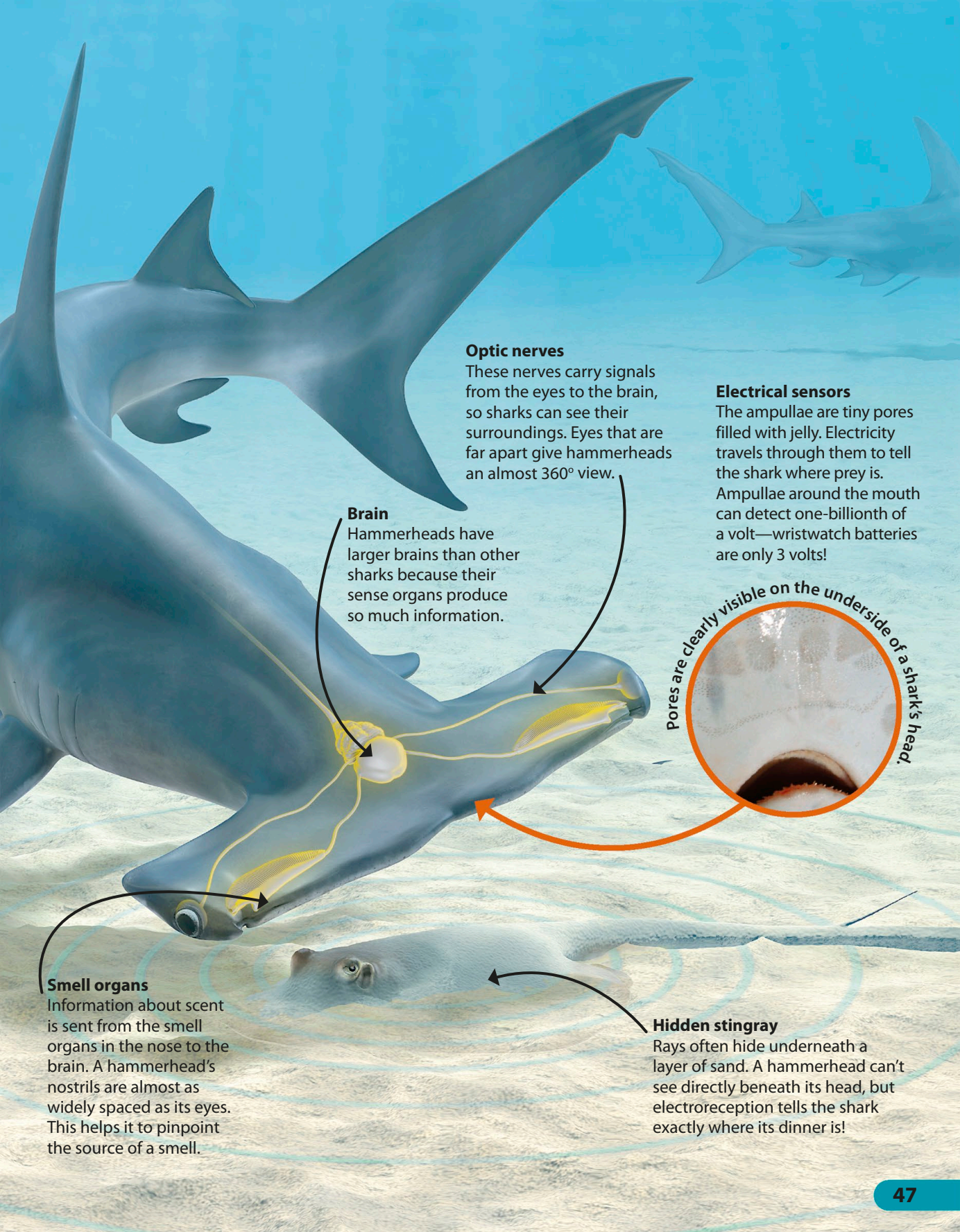
Common torpedo ray

**! WOW!**  
Deepwater sharks **chew** underwater **phone cables** because the wires produce **electric fields!**

## Electric field

All animals' muscles produce tiny pulses of electricity that form electric fields. Electricity travels well through salty water, so sharks can pick it up to find hidden fish.





### Optic nerves

These nerves carry signals from the eyes to the brain, so sharks can see their surroundings. Eyes that are far apart give hammerheads an almost 360° view.

### Brain

Hammerheads have larger brains than other sharks because their sense organs produce so much information.

### Electrical sensors

The ampullae are tiny pores filled with jelly. Electricity travels through them to tell the shark where prey is. Ampullae around the mouth can detect one-billionth of a volt—wristwatch batteries are only 3 volts!

Pores are clearly visible on the underside of a shark's head.

### Smell organs

Information about scent is sent from the smell organs in the nose to the brain. A hammerhead's nostrils are almost as widely spaced as its eyes. This helps it to pinpoint the source of a smell.

### Hidden stingray

Rays often hide underneath a layer of sand. A hammerhead can't see directly beneath its head, but electroreception tells the shark exactly where its dinner is!

# Where do sharks live?

Sharks live almost everywhere under water. They are found in the open ocean, shallow and deep seas, and even some rivers. However, most kinds of shark choose to live in one particular part of the ocean. You may even need to watch out on land—the epaulette shark can sometimes be found walking on the shoreline!

## The walking shark

The epaulette shark of New Guinea and Australia is able to survive out of water for short periods of time. It scuttles between rock pools on its muscular fins. However, the shore can be dangerous and it has two large eyespots near its pectoral fins to scare predators away.



Epaulette shark

## Freshwater

It is rare for sharks to live in freshwater. The only ones that do live in warm, tropical rivers. A few species can adjust to changing salt levels, and travel back and forth between freshwater and the sea.

## Coast

Many small, harmless sharks spend their entire lives in the shallow water near the shore. Some may live unseen just a few feet away from beachgoers.

## Coral reef

Coral reefs provide habitats filled with food in otherwise empty tropical seas. Sharks use the reefs as homes, or may visit occasionally to hunt for food.

## Open ocean

Oceans are home to long-distance travelers. Some sharks commute daily from the surface to a depth of 1,640 ft (500 m) and travel thousands of miles a year.

## Seafloor

The sharks that live on this rich feeding ground don't need to travel far to eat. The seafloor is home to many types of shark that never move far away from the sandy bottom.

## Deep sea

Very little light reaches this cold, barren habitat. It is home to sharks that can glow in the dark and others with huge, green eyes that can see the slightest glimmer of light.





### **Bull shark**

Young bull sharks are most likely to be found in rivers. They may use them as freshwater nurseries. Adults sometimes bite unwary river swimmers.



### **Nursehound**

This spotty shark winds its eggs onto seaweed in very shallow water. It may even be found by people paddling at low tide!



### **Whitetip reef shark**

These stout sharks often sleep by day, but gather in packs to hunt at night. They search out dozing fish that are hidden in the coral.



### **Oceanic whitetip shark**

This large, inquisitive animal never stops swimming. Once a very common oceanic shark, it's now under threat from fishing.



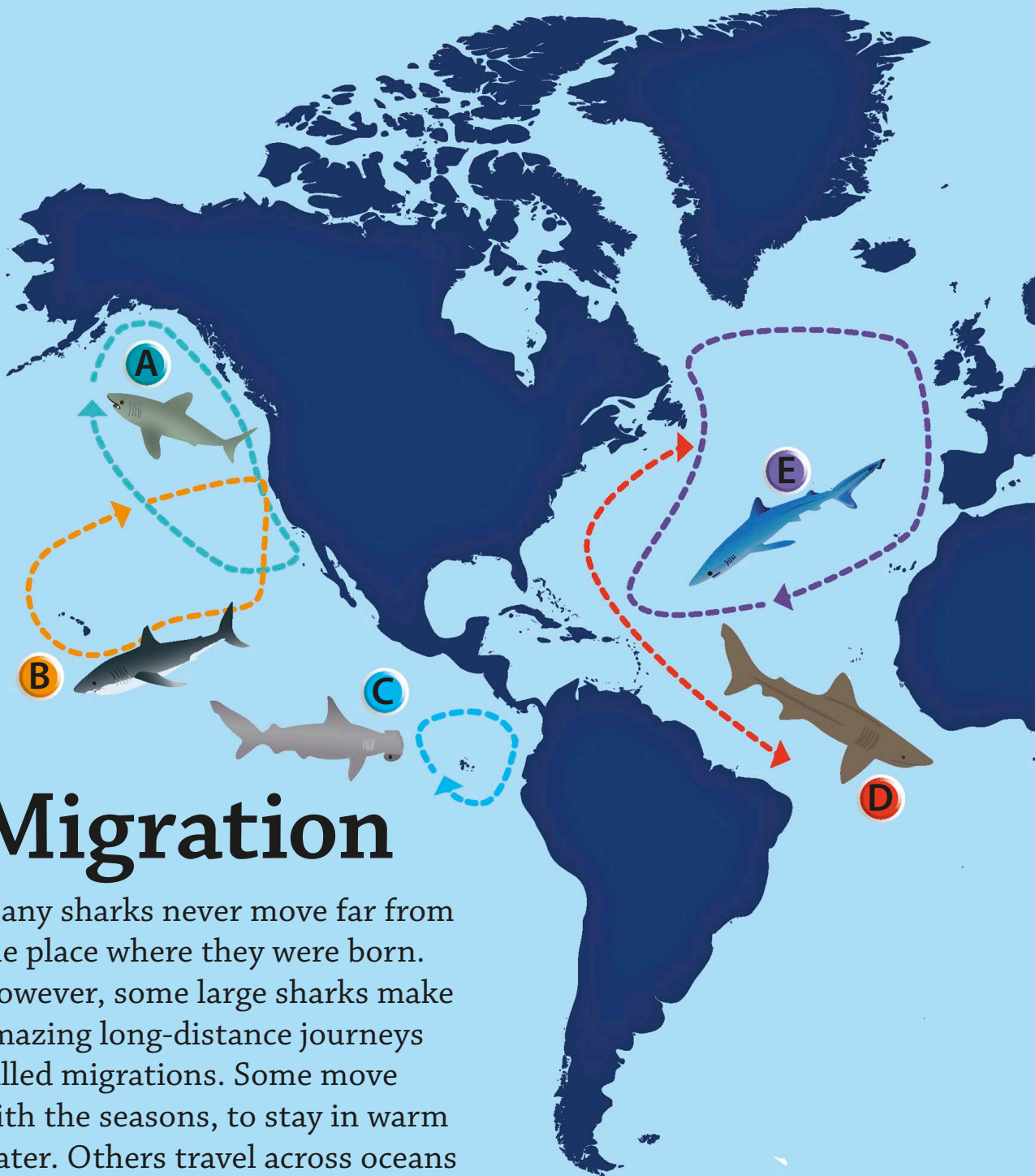
### **Australian angelshark**

Angelsharks can hide perfectly on the sandy bottom of the seafloor. This means they can stay still, waiting for prey to come to them.



### **Bigeye houndshark**

These little sharks live in the very deep waters of the Red Sea and Indian Ocean. They need huge eyes to catch small fish and squid in the dark.



# Migration

Many sharks never move far from the place where they were born. However, some large sharks make amazing long-distance journeys called migrations. Some move with the seasons, to stay in warm water. Others travel across oceans to good feeding spots or to find a mate.



## MIGRATION ROUTES

- A Salmon sharks** These warm-blooded sharks prefer cold water. They swim between the coasts of California and Alaska, and out to the middle of the North Pacific Ocean.
- B Great white sharks** Great white sharks spend the summer in California, then swim 2,490 miles (4,000 km) to Hawaii for the winter, and then go back again.
- C Scalloped hammerheads** Hammerheads may use their electric sense to follow underwater magnetic highways between the islands of Malpelo, Cocos, and the Galapagos.
- D Basking sharks** These sharks don't like warm water. They feed on the surface in the North Atlantic, but dive very deep to cross the equator.
- E Blue sharks** Blue sharks use an ocean current, called the North Atlantic Drift, to help them swim clockwise around the Atlantic Ocean.
- F Whale sharks** It may take two or three years for a whale shark to travel around an ocean, visiting feeding grounds along the way.
- G Shortfin makos** A shortfin mako named Carol swam from New Zealand to Fiji and back, and then out to Tonga, all in one year!



### REALLY?

Great white sharks meet in an empty patch of ocean near Hawaii called the “white shark café,” probably to find a mate!

# Interview with...

We put some questions to Rob Allen, a shark conservationist, photographer, and adventurer. He travels the world diving with sharks and working to help protect them from the threat of extinction.



**Q: We know it is something to do with sharks, but what do you actually do?**

**A:** I lead scuba-diving expeditions to remote parts of the world to dive with and photograph sharks.

**Q: What made you decide to become a photographer and conservationist?**

**A:** I have always loved photography and the sea—photographing sharks was a natural way to combine these. I have been a shark conservationist for about 20 years, since learning how dangerously close to extinction most shark species are. Back then, most people didn't care about saving sharks, but the tide is turning now, with many people far more interested in conservation.



Great hammerhead shark

**Q: Is your job dangerous?**

**A:** Sharks are wild animals, and so you have to be very careful around some of the larger ones. However, if you take the right precautions and have someone watching your back (they do like to creep up on you) then it is safe. I have done over 600 shark dives and never felt threatened—not by the sharks at least; there are some pretty aggressive fish, too.

**Q: What sort of equipment do you use?**

**A:** I have a Canon 5D Digital SLR camera that is put in a solid metal case so I can take it underwater. Two big strobe lights, which produce a quick flash, help to light up the water when it's dark. I use wide angle lenses, which means I have to get very close to the sharks.

**Q: What are the best and worst parts of your job?**

**A:** Every shark encounter is fantastic and it's a real privilege to be with them in their environment. Unfortunately, the sea and weather can't be controlled and I have spent many hours on boats in storms—luckily I don't get seasick.





Great white shark

**Q: What is the most exciting thing you have ever photographed?**

**A:** I love the annual Sardine Run off the coast of South Africa, where millions of fish are herded into large bait balls by dolphins. All the marine predators are attracted, including sharks, whales, sea lions, and gannets, which plunge in to feast. Being close to all that energy and action is incredibly exciting.

**Q: What are the biggest problems facing sharks and what can you do to help them?**

**A:** Many types of shark are close to extinction. As the top predators in the ocean, they are essential for a healthy ecosystem, as they keep fish populations in balance. You can help by understanding the conservation issues and educating others. Also avoid buying shark products like teeth necklaces.



Rob scuba-diving with a great hammerhead shark

**Q: Do you have a favorite type of shark?**

**A:** That's a difficult question. Blue sharks are the prettiest sharks, bull sharks have the most attitude, and great whites are magnificent and make you feel totally insignificant, but my favorites are tiger sharks as they have so much character.



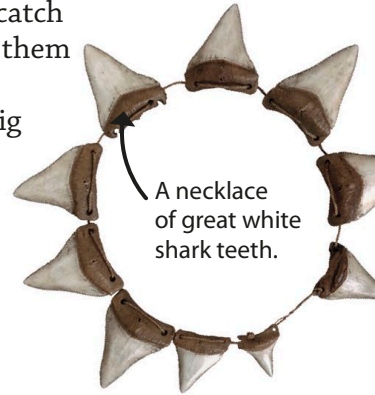
Tiger shark

# Sharks in danger

Scientists estimate that about one quarter of all shark species are in danger. Millions of sharks are killed each year. The biggest sharks and those that live in shallow coastal water are at greatest risk. If sharks are overfished or lose their habitats they could face extinction. Many conservationists, however, work to protect sharks and try to stop their numbers from dropping too far.

## Trophy hunting

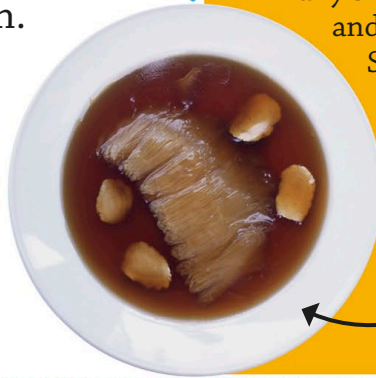
Many anglers like to catch sharks, but most put them back in the sea alive. Trophy hunters kill big sharks for their jaws and teeth, or to weigh, measure, and photograph them during fishing competitions.



## PRODUCTS

Many sharks have meat that can be eaten, and their fins are used in soup.

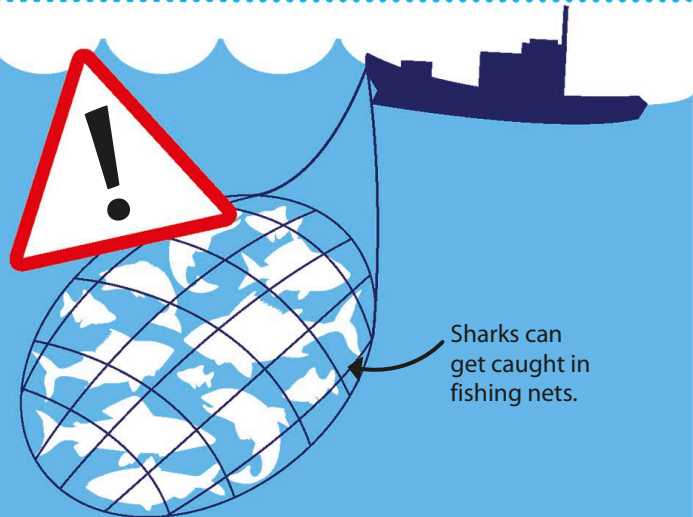
Sometimes when a shark's fins are removed the rest of it is thrown away. People also use sharks' thick skin for leather, oil from their livers for makeup, and cartilage in pills.



Shark fin soup is sometimes eaten at banquets in East Asia.

## OVERFISHING

This is the greatest threat to sharks. Some are hunted for food and others for parts to make products, such as oil. Sharks are caught with a hook and line or with nets. They can also be killed accidentally by fishermen trying to catch other fish.







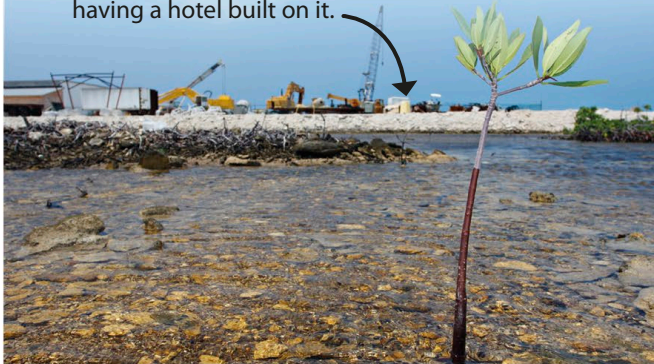
## TOURISM

Cage diving with great white sharks and swimming with whale sharks are amazing experiences. They also bring lots of people and money to coastal areas. However, they should be organized carefully so that sharks aren't disturbed or harmed.

## Habitat loss

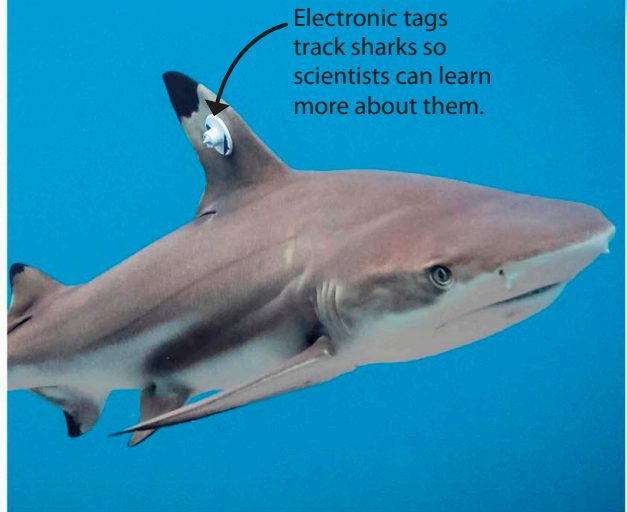
Some sharks only live in shallow coastal areas, or have nursery grounds there. Unfortunately many people live right next door. Coastal habitats are often used for housing, ports, and industrial development. Sharks have nowhere else to go!

This mangrove forest, a lemon shark nursery, is having a hotel built on it.



## Conservation

Many people support shark conservation. Some join organizations for saving marine wildlife, while scientists carry out research to learn about the lives of sharks and how to help them. Managers of fisheries try to make sure catches are sustainable, which limits the number of sharks caught.



Electronic tags track sharks so scientists can learn more about them.



## POLLUTION

Marine litter can entangle and harm wildlife. Sometimes it's eaten by sharks and other sea animals. Invisible pollution, such as chemical waste, is also dangerous. Sharks can live for a long time and can build up enough toxic chemicals to make them bad for us to eat.

# Shark facts and figures

Sharks are a fascinating group of fish. Here are some weird and wonderful facts you might not know about them!



## OPEN WIDE!

Sharks let fish called remoras clean parasites from their skin, even inside their mouths, without eating them!



**Tiger sharks**  
have been found to eat  
**cans, shoes, and even  
license plates  
from cars!**



# 99 days

A great white shark called Nicole traveled 6,900 miles (11,100 km) from Australia to South Africa in 99 days.



# 100 million

sharks are killed by people a year.



Baby sandtiger sharks  
have been known to  
**eat each other**

while still inside  
their mother!

**GALEOPHOBIA**  
is the fear of sharks.



the **thickest** skin of any animal.

**Bull  
sharks**

are one of the most  
**dangerous** species of  
shark, along with  
**great white sharks**  
and **tiger sharks**.

**1640**

ft (500 m) is how  
far male great white  
sharks swim down  
and back up again  
to impress females.

**400**

Greenland sharks  
can live as long as  
400 years.



**1976**

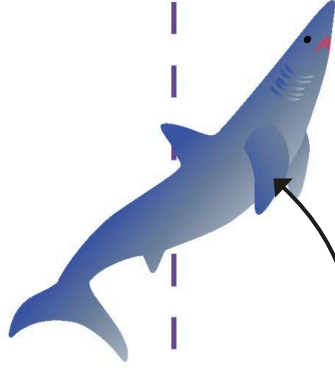
The megamouth  
shark wasn't  
discovered  
until 1976.



# Top sharks

You've read this far, so you already know that sharks are amazing animals! Here are a few more facts that you can use to astonish your friends. Find out which shark is the fastest, which can jump the highest, and which lives the deepest.

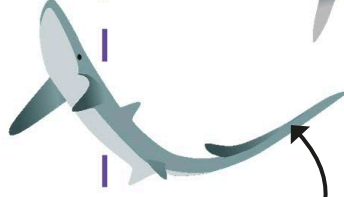
**20 ft (6 m)**



**Shortfin mako**

This shark has to swim very fast to jump that high!

**10 ft (3 m)**



**Thresher shark**

A thresher shark may jump several times in a row. Even their long tail clears the water.

**8 ft (2.5 m)**



**Great white shark**

Great white sharks breach when charging from deep water to hit prey swimming on the surface.

## Highest leaper

Sharks jump to show how strong they are, or when they are swimming too fast to stop! A jump can also knock off a parasite, such as a blood-sucking copepod (a type of crustacean) or a fisherman's hook.

**32 mph (20 kph)**



**Blue shark**

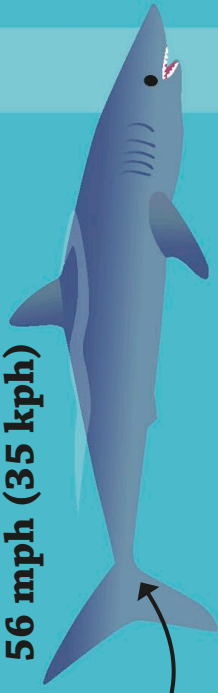
The blue shark usually glides slowly around oceans, but it can sprint much faster.



## Fastest swimmer

A shark must be very fast to eat fast food (meaning speedy fish, not burgers). Otherwise they need to be very good at sneaking up on their dinner, ambushing it.

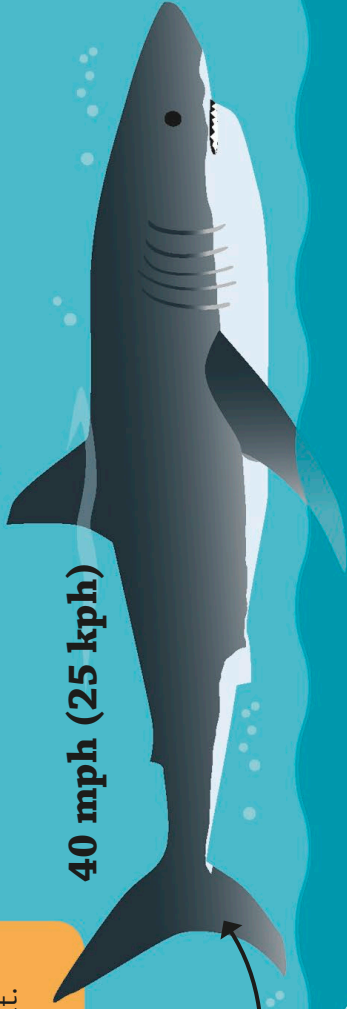
**56 mph (35 kph)**



### Shortfin mako shark

The shortfin mako is the world's fastest shark. It can catch fast prey such as tuna.

**40 mph (25 kph)**



### Great white shark

This shark reaches its top speed when chasing prey. It often surprises its dinner from below.

## Deepest living

The sharks here have been fished up from very deep water. Other types of shark might live or dive even deeper—but no one has yet caught them doing it.

### Cookiecutter shark

In third place is the cookiecutter shark. This tiny predator sneaks up on prey in the dark. It has the biggest teeth for its size of any shark.

**11,480 ft (3,500 m)**



### Portuguese dogfish

Runner-up is the Portuguese dogfish. It bites chunks out of its prey like the cookiecutter does.

**12,060 ft (3,675 m)**



**14,760 ft (4,500 m)**



### Great lanternshark

The deep-diving champion is the great lanternshark. This shark shines its light in the dark depths.



# Glossary

Here are the meanings of some words that are useful for you to know when learning about sharks.

**adaptation** Way in which an animal becomes better suited to its habitat

**ampullae** Special jelly-filled pores that detect electricity

**anal fin** Single fin underneath a shark's body, near the tail

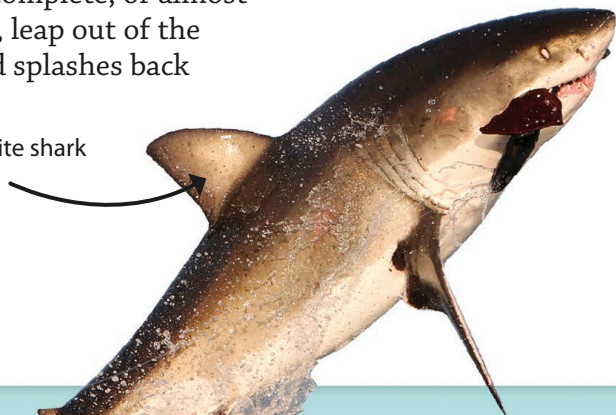
**ancestor** Animal to which a more recent animal is related

**armor** Naturally hard body covering that provides protection for an animal

**barbels** Feelers near a shark's nostrils, or on the rostrum of a sawshark

**breach** When an animal makes a complete, or almost complete, leap out of the water and splashes back

A great white shark breaching



**camouflage** Colors or patterns on an animal's skin that help it merge with the environment

**carnivore** Animal that eats only meat

**cartilage** A tough but flexible material that makes up the skeletons of sharks and their relatives

**chimaera** Unusual type of fish related to sharks. Also called ghostsharks and ratfish

**cold-blooded** Animal with a body temperature that goes up and down to match the surrounding air or water temperature

**conservation** Trying to stop an animal or plant from becoming extinct

**courtship** Special types of animal behavior that are used to attract a mate

**denticle** Small, toothlike scale found on the skin of sharks and rays

**dorsal fin** Fin on the back of a shark. There may be one or two, with or without a spine in front of it

**ecosystem** A living community of plants and animals found together, and their environment

**egg case** Tough, outer capsule that protects a developing shark, ray, or chimaera

**elasmobranchs** Sharks, rays, guitarfish, and sawfish

**electroreception** Sharks' ability to sense electricity

**environment** Surroundings in which an animal lives

**estuary** End of a river where freshwater meets the sea

**extinction** When all of a particular animal species dies out and there are none left in the world



**filter feeding** When small animals in water are sieved out with gill rakers and eaten

**gill rakers** Small, hard projections on a shark's gills that filter small food items from the water

**gills** Organs that allow fish to breath underwater

**gill slits** Openings that allow the water that comes in through a shark's mouth to pass out over the gills

**habitat** Natural home environment of an animal

**lagoon** Area of shallow water partly or completely enclosed by a barrier of land

**mangrove** Tree that grows in shallow sea water

**marine** Describes animals that live in the sea, their habitat, and environment

**migration** Regular movement of animals, often to feed or breed

**nocturnal** Animals that are awake at night, when they hunt or feed

**nursery ground** Area, often in a shallow sheltered place, where newborn sharks live



**parasite** Animal that lives on or inside another animal and feeds off it

**pectoral fins** First pair of large fins underneath a shark. In skates and rays, they are joined to the head to form wings

**pelvic fins** Second pair of fins underneath a shark, before the tail

**poison** Harmful substance released by an animal that may be deadly if touched or eaten

**polar** Describes areas near the North and South poles

**predator** Animal that hunts other living animals for food

**prey** Animal that is hunted for food

**pup** Newborn or newly hatched young of a shark or ray

**reproduce** To have young. Sharks and rays may lay eggs or give birth to live young

**rostrum** Long part of a shark's snout. It is flat and edged with teeth in sawsharks and sawfish

**snout** Part of the head in front of an animal's eyes and mouth

**species** Specific types of animal with shared features that can mate and produce young together

**temperate** Area or climate with mild temperatures

**vemon** Harmful substance that may be deadly if injected into the skin by a sting

**tropical** Area or climate with hot temperatures

**warm-blooded** Animal that keeps a constant body temperature



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# Acknowledgments

The publisher would like to thank the following people for their assistance in the preparation of this book: Ann Cannings, Abi Wright, Surya Deogun, Suzena Sengupta, Garima Sharma, and Nand Kishor Acharya for design assistance, Arran Lewis for CGI artwork, Polly Goodman for proofreading, and Helen Peters for compiling the index. The publisher would also like to thank Gill Pitts and Jolyon Goddard for editorial assistance and Rob Allen for the “Interview with...” interview.

The publisher would like to thank the following for their kind permission to reproduce their photographs:

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