



SUPER



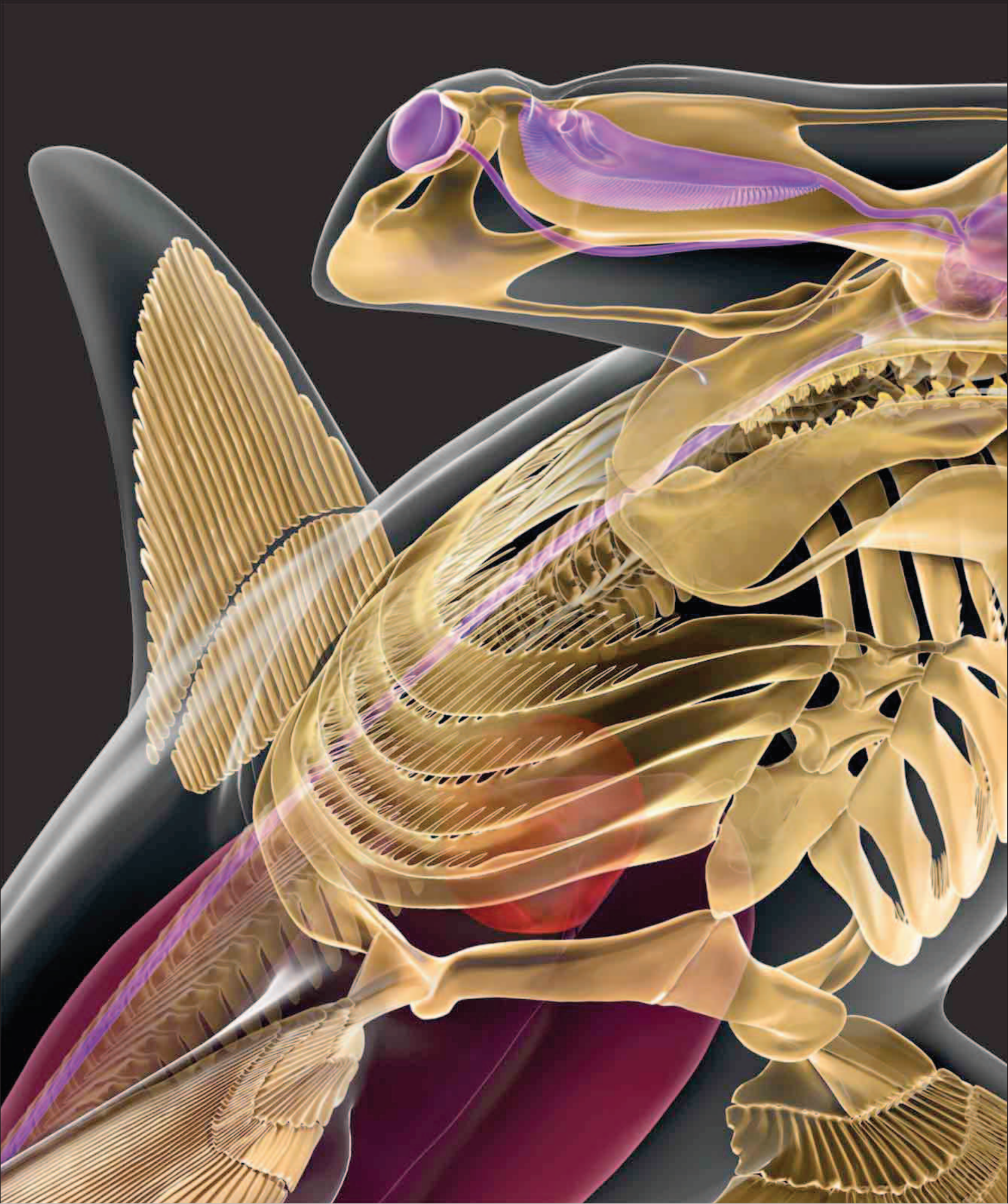
SHARK

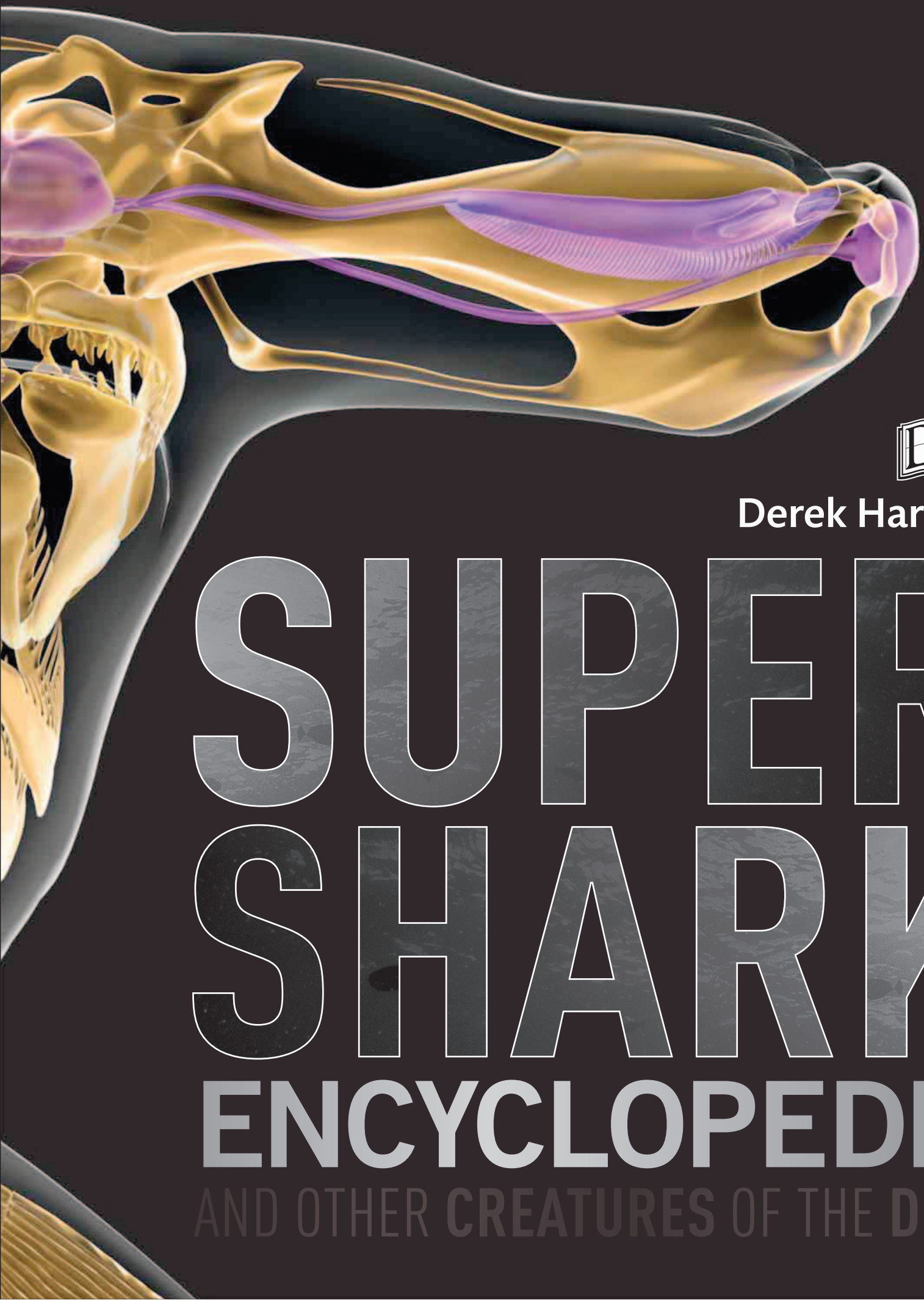
ENCYCLOPEDIA

AND OTHER CREATURES OF THE DEEP

SUPER SHARK ENCYCLOPEDIA







Derek Harvey

SUPER SHARK ENCYCLOPEDIA

AND OTHER CREATURES OF THE DEEP

CONTENTS



AMAZING ANATOMY

8

Discover what makes ocean animals ideally suited for their environment—fins, tusks, teeth, tentacles, colorful camouflage, spines, stings, and very big mouths. From the tiny pink pygmy seahorse to the mighty whale shark, sea creatures come in all shapes and sizes.

ANIMAL ATHLETES

64

Meet the best swimmers, jumpers, flyers, surfers, and spinners the ocean has to offer, along with some other uniquely talented animals. Box with crabs, thrash around with a thresher shark, cross swords with a speedy sailfish, and get in a spin with dolphins.

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LIFE STORIES

90

Living in the sea is challenging, so an animal needs to find the best way to survive. For krill or sardines, there's safety in numbers against hungry fish. More extreme strategies involve parrotfish covering themselves in slime and sea cucumbers squirting their insides at attackers.

SUPERNATURAL SENSES

162

Some sea creatures have secret superpowers. Hammerheads and sawsharks pick up electrical signals, while mantis shrimp can detect light that other animals cannot see. Sandtigers gang up on other fish and sevengill sharks sneak up on their victims, but torpedo rays have a really nasty shock in store.

EXPLORING THE DEEP

188

The deep sea is the only place on Earth that remains largely unexplored. Travel from the warm shallows of a coral reef to the cold, dark bottom of the ocean in a submersible to see what lies below the waves.

GLOSSARY 204

INDEX 206

ACKNOWLEDGMENTS 208

ILLUSTRATORS

Medi-Mation
Medical & Scientific Visualization

Creative Director Rajeev Doshi
Senior 3D Artist Arran Lewis

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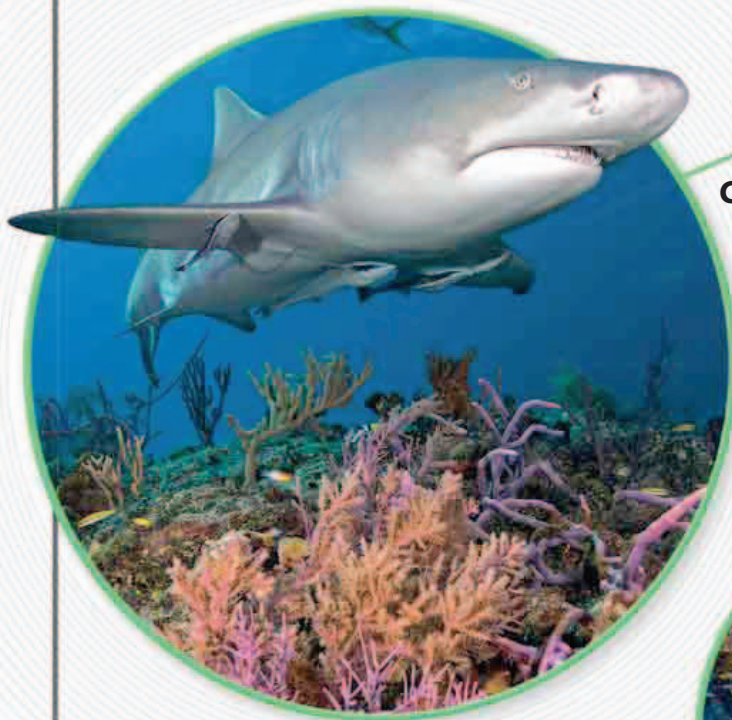
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TEEMING WITH LIFE

From seashore rock pools to the wide open waters and the deep sea beneath, the world's oceans contain an astonishing variety of life and habitats. Some animals stay so close to land that they have to move with the tides. Others spend all their lives in mid-water or prefer to crawl along the sea floor.



CORAL REEFS

Coral reefs grow along shallow coastlines, where bright sunshine and tropical warmth provide exactly the right conditions for thousands of different types of ocean animals, including reef sharks, to live and grow.



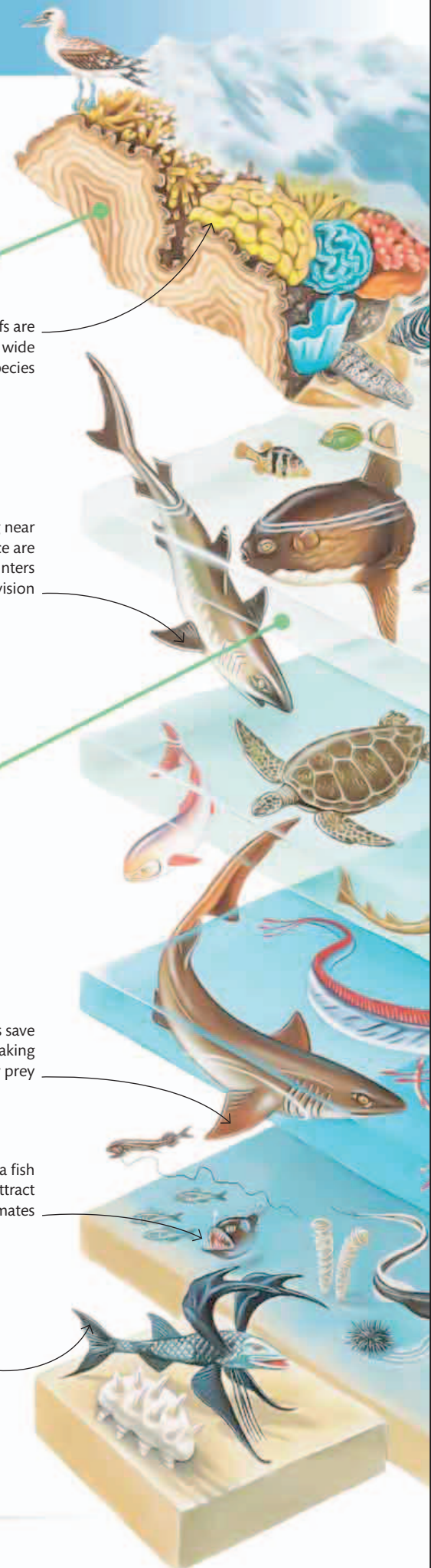
OPEN OCEAN

The wide expanses of the open sea are home to vast amounts of tiny plankton that live in its upper waters. Plankton are the start of a food chain that ends with much larger animals, such as the giant ocean sunfish and meat-eating sharks.



POLAR SEAS

The seas around the poles are so cold that they often freeze over in winter. Under the ice, the ocean is rich in nutrients and oxygen. This supports a wealth of animals, including seals and penguins that rest or breed on nearby land. Fish grow slowly because of the cold, and many have bodies packed with antifreeze chemicals.



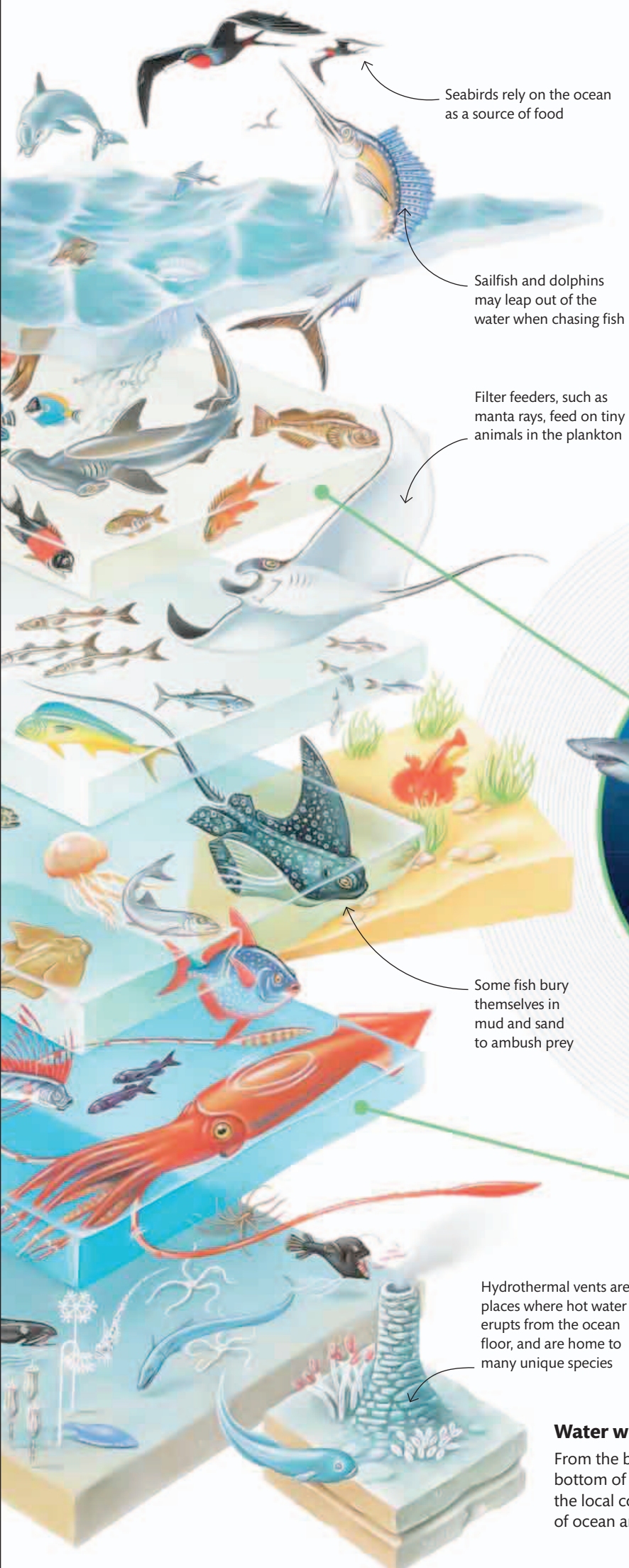
Coral reefs are home to a wide variety of species

Sharks living near the surface are active hunters with good vision

Sharks in deeper waters save their energy for making sudden grabs at unwary prey

Some deep-sea fish use light to attract prey and mates

Bottom-dwelling fish crawl rather than swim



Seabirds rely on the ocean as a source of food

Sailfish and dolphins may leap out of the water when chasing fish

Filter feeders, such as manta rays, feed on tiny animals in the plankton

Some fish bury themselves in mud and sand to ambush prey

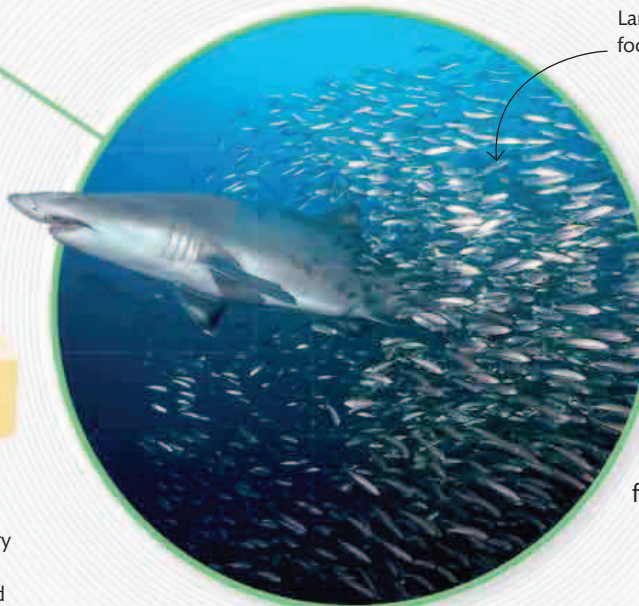
Hydrothermal vents are places where hot water erupts from the ocean floor, and are home to many unique species

ON THE SEASHORE

Where the ocean meets the land, marine life has to cope with the movement of the tides. Some animals stay put at low tide and wait for the water to return. Others have to swim out with the tide. The crash of waves on the seashore can be extremely powerful, and animals such as marine iguanas and crabs need to be able to grip the rocks or hide in crevices to avoid being washed away.



Large schools of fish provide food for many coastal predators



COASTAL WATERS

Deep-water nutrients rise to the surface along coastlines, providing vital nourishment to ocean life. There is so much food that schooling fish collect there, making them a tempting target for sharks. Many people around the world use these schooling fish as a source of food.

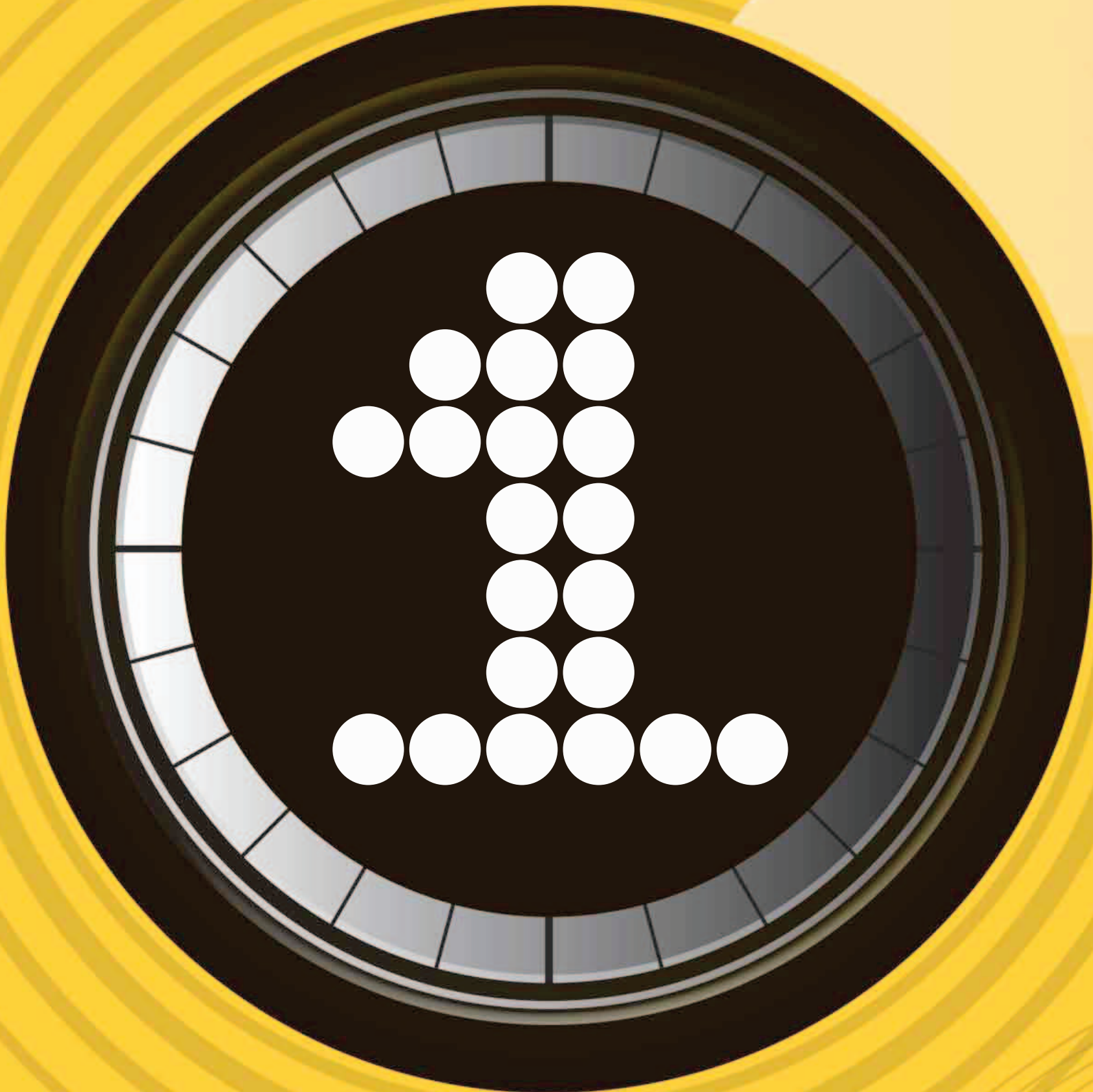


DEEP SEA

The deepest parts of the ocean are dark, cold, and under high pressure. The animals that live there, such as this deep-sea octopus, scavenge on dead material falling from above, or wait in the dark to ambush another animal.

Water world

From the bright, choppy surface to the eerily dark bottom of the ocean, animals have adapted to live with the local conditions. Every layer has its own community of ocean animals, even in places where food is scarce.



AMAZING ANATOMY

Animals that live in the ocean are supremely adapted to their wet, watery world. Fins and flippers, spikes and stingers, terrifying teeth, and your own set of headlights are just some of the things you need to survive in the sea. After all, you never know what's lurking in the depths.

PLANKTON PLUNDERER

BASKING SHARK

When you're the size of a fishing boat, it takes a lot of food to fill you. Having a big mouth helps. The basking shark cruises along with its mouth wide open like a funnel. As water flows over its gills, their bristles rake out anything from little shrimp to fish eggs—all of which is swallowed.



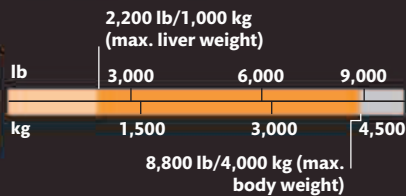
AT A GLANCE

- **SIZE** Males 13–16 ft (4–5 m) long; females 26–33 ft (8–10 m) long
- **HABITAT** Coastal and open ocean waters, especially where there are large concentrations of plankton
- **LOCATION** Worldwide, except for the tropics
- **DIET** Plankton, small fish, and fish eggs



STATS AND FACTS

WEIGHT



50

YEARS

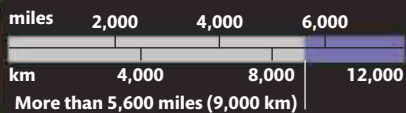
LIFESPAN

WATER FILTERED



The basking shark's giant oily liver makes it very buoyant in water, which helps it stay near the surface and travel long distances with minimal effort.

MIGRATION DISTANCE



MAXIMUM SCHOOL SIZE

100

MASSIVE MOUTH

This shark basks near the brightly lit surface, where the water is rich in nutrients. Unlike other plankton feeders, it cannot gulp water but needs the constant stream created as it swims along.

“Its open mouth is so big a child could stand up in it”



NOT STRAIGHT-FACED

One of the clues that a lefteye flounder is really lying on the right side of its body is the odd position of its mouth—which ends up strangely off-center. Its left side is colored to match the seabed.





SHIFTY EYES

LEFT EYE FLOUNDERS

It takes time to turn into a flatfish like a flounder. There is nothing especially unusual about baby flounders: they swim in the open sea with one eye on each side of their head just like most other fish. But as weeks of growth go by, one eye shifts upward and over the head—until it joins the other one on the opposite side. In lefteye flounders both eyes end up on the left side of the fish. The flounder then settles on the seabed on its eyeless right side and lives the rest of its life with both eyes facing up into the water.

AT A GLANCE

- **SIZE** 2½–35 in (6–90 cm) long
- **HABITAT** Coastal marine waters, on the ocean bed; adults migrate into the open ocean to lay eggs
- **LOCATION** Oceans worldwide
- **DIET** Bottom-living invertebrates and fish



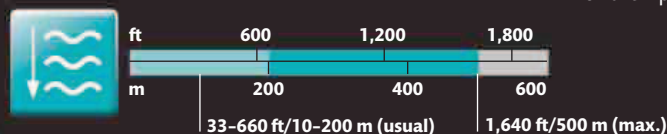
STATS AND FACTS

TIME TAKEN TO TRANSFORM



Some species of adult flounders settle in deeper waters than others. All of them live on sand or mud, often buried for their protection.

DEPTH



POP-OUT JAWS

GIANT MORAY EEL

The moray eel waits patiently in the darkness of its rocky lair until a fish passes by. Then it strikes in an instant, but in a way that is not like any other reef-dwelling animal. First, its sharp-toothed mouth grabs the prey. Then, a second set of jaws shoots forward from the back of its throat to pull the fish into its food pipe.

Long spine gives the body of a moray eel snakelike flexibility

AT A GLANCE

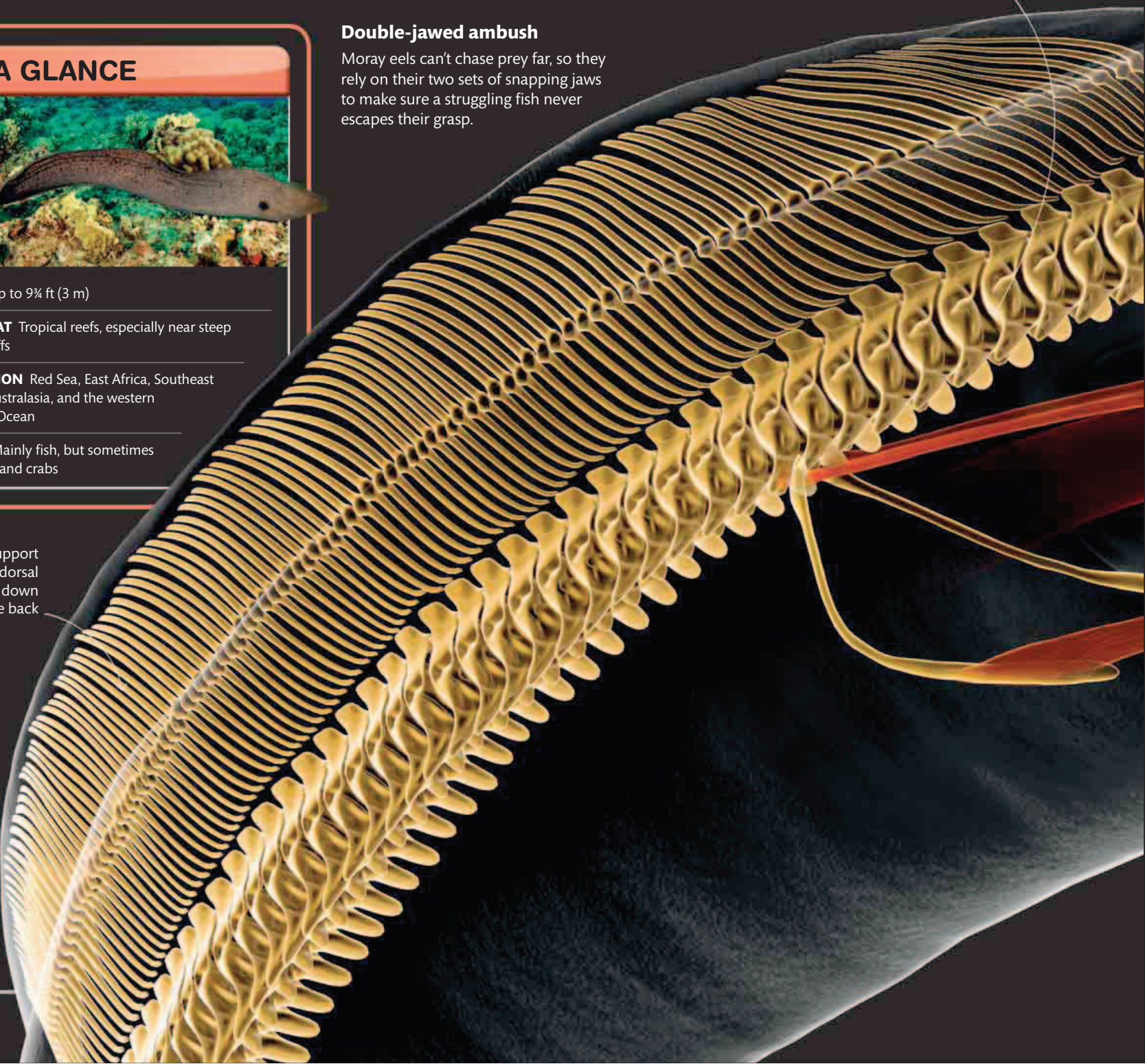


- **SIZE** Up to 9¾ ft (3 m)
- **HABITAT** Tropical reefs, especially near steep drop-offs
- **LOCATION** Red Sea, East Africa, Southeast Asia, Australasia, and the western Pacific Ocean
- **DIET** Mainly fish, but sometimes shrimp and crabs

Double-jawed ambush

Moray eels can't chase prey far, so they rely on their two sets of snapping jaws to make sure a struggling fish never escapes their grasp.

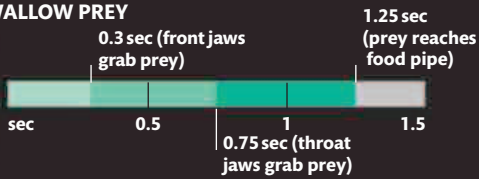
Bony rods support the long dorsal fin running down the back



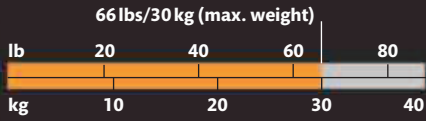
STATS AND FACTS



TIME TO SWALLOW PREY

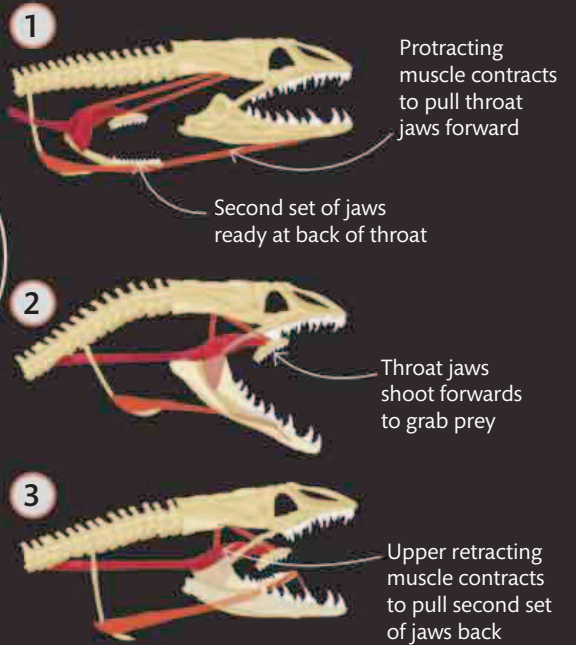


WEIGHT



The moray eel is not a fast swimmer but it makes up for this with its swift double-jawed bite, completed in just over a second.

USUAL NUMBER OF TEETH



Upper retracting muscle pulls second set of jaws back into throat

Front set of jaws takes the first bite

GRABBED BY THE THROAT

Most kinds of fish suck prey into their mouth and then use their throat jaws to crush their victim. Moray eels have poor suction, so they project their throat jaws—complete with teeth—forward to grab and swallow their prey.

Second set of jaws at back of throat shoot out to take second bite

Fish is unable to escape from powerful jaws

Fish is pulled into the food pipe when the jaws retract

Lower retracting muscle helps pull second set of jaws back

FISHING FOR FAVORS

Morays hunt among rocks, but groupers (a type of predatory fish) hunt around the reef too. By cooperating, they scare prey into each other's territory. Both eat so quickly they never squabble over food.



WALKING CRAB-CRUNCHER

CALIFORNIA HORN SHARK

With a head like a bull's and a pig-shaped snout, the horn shark doesn't look like a ferocious killer. Its teeth are for crunching, rather than slicing, but its jaws are as strong as they come—perfect for tackling hard-shelled crabs and snails. It leaves most other animals well alone. But watch out if you ever catch a bullhead in your net: this small and gentle shark has two stinging spines on its back!

The high hornlike ridges over the eyes give the shark its name

Stinging spine

Paddlelike pectoral fins



CRUNCHING TEETH

The small mouth has small jagged teeth at the front for biting. There are stronger, broader teeth farther back. These work like our own back teeth to grind up hard food.

AT A GLANCE



- **SIZE** 23–48 in (58–122 cm)
- **HABITAT** Coastal waters, especially among rocks or thick seaweed
- **LOCATION** California
- **DIET** Bottom-living snails, crabs, sea urchins, and small fish, hunted at night

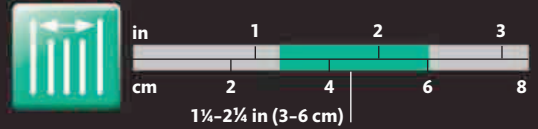


WALKING PREDATOR

The two paired fins at the front of the body are used for swimming, but in very shallow water they work like stumpy legs to crawl over rocks.

STATS AND FACTS

LENGTH OF FIN SPINES



SWIMMING DEPTH



SWIMMING SPEED



“For its size, the horn shark has the strongest bite of any shark”



Pattern of dark brown spots helps shark with camouflage on sea floor



EGG CASES

Most types of sharks give birth to live young, but the horn shark lays eggs in a soft leathery “purse.” For extra protection, the mother picks up the case with her mouth and wedges it into a rocky crevice—where its corkscrew shape helps keep it securely in place. Over a few days it hardens to form a protective casing. This prevents predators from getting to the egg case. It will take at least six months for the young sharks to hatch.

Tail notch

California horn shark

Different species of horn sharks are found around the world and most have a distinctive pattern of dark markings on a lighter background. The California horn shark’s skin is spotted.

DEVIL OF THE DEEP

DEEP-SEA ANGLERFISH

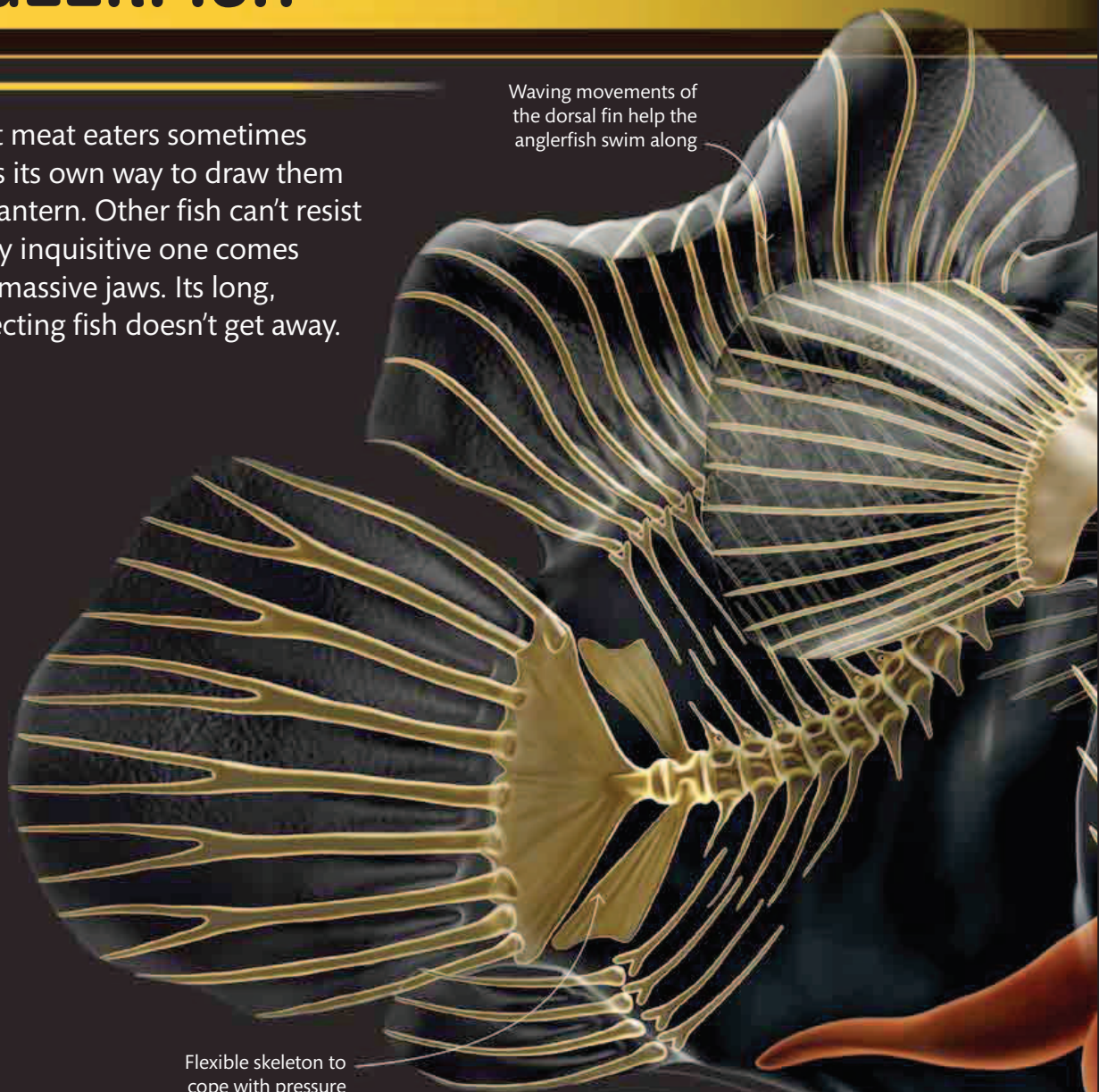
The deep sea is so vast and dark that meat eaters sometimes struggle to find prey. The anglerfish has its own way to draw them out of the gloom—it carries a glowing lantern. Other fish can't resist inspecting the light. When an especially inquisitive one comes close, the anglerfish grabs at it with its massive jaws. Its long, stabbing teeth ensure that the unsuspecting fish doesn't get away.

Waving movements of the dorsal fin help the anglerfish swim along

AT A GLANCE



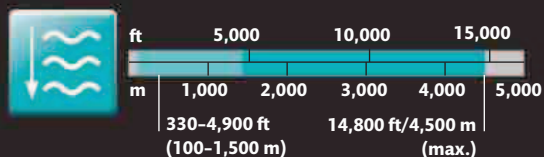
- **SIZE** 3–7 in (8–18 cm) long; males $\frac{3}{4}$ –1 in (2–2.8 cm) long
- **HABITAT** Deep sea; larvae live nearer the surface
- **LOCATION** Oceans all around the world
- **DIET** Fish and other animals of the deep sea



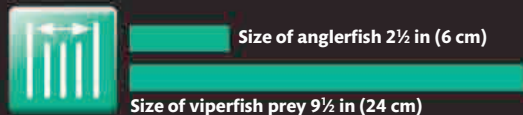
Flexible skeleton to cope with pressure in deep water

STATS AND FACTS

SWIMMING DEPTH



SIZE



Food is so rare in the deep sea that an anglerfish needs to be able to tackle large prey. One anglerfish that was not even fully grown was found with a viperfish four times the length of its own body in its stomach.

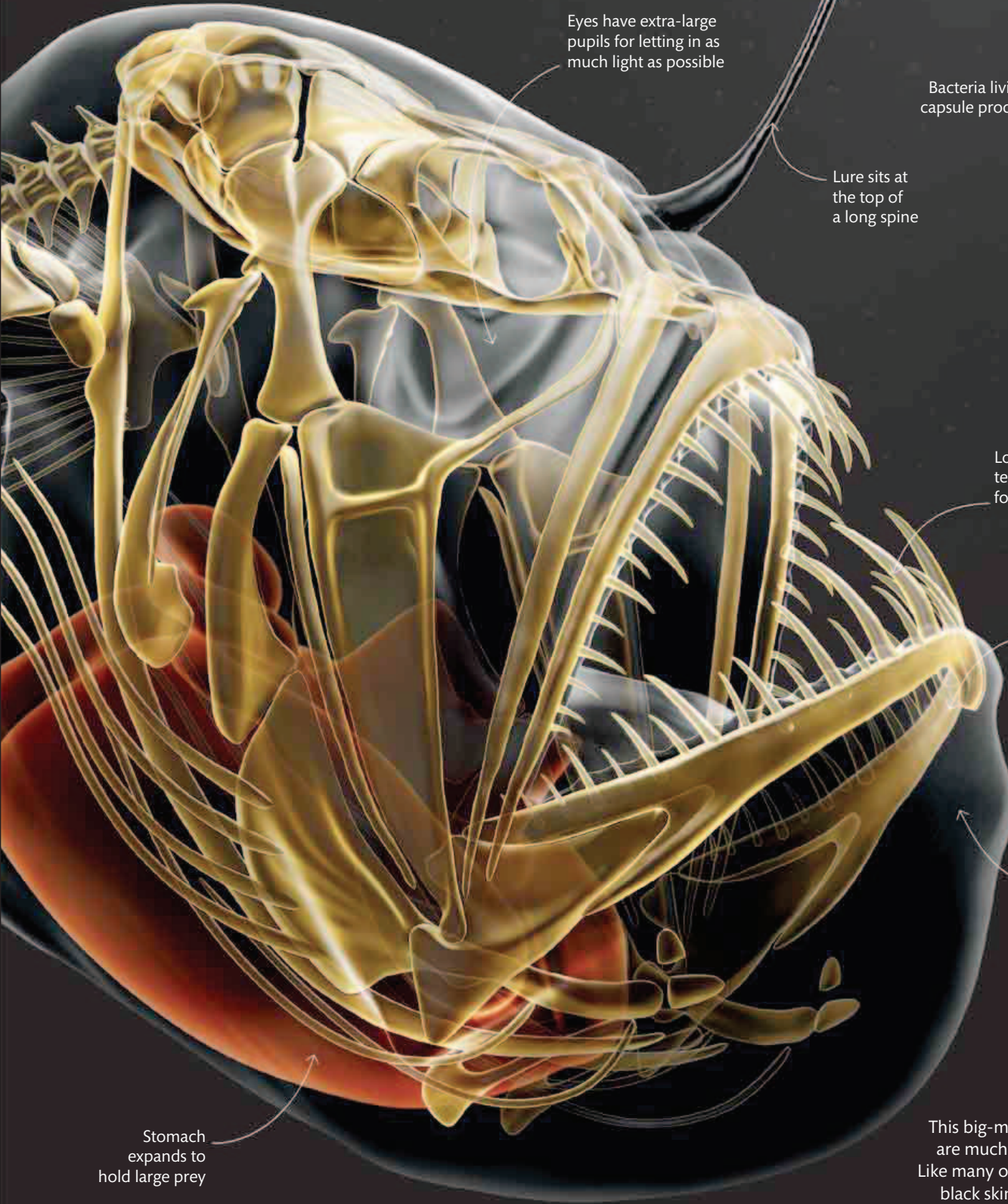
“Its round body makes it wobble as it swims”



Male anglerfish

HANGER-ON

Females also use their lantern to attract a mate. Male anglerfish do not feed, so they cannot grow as big as the females. Instead, once they have found a female, they latch onto her to fertilize her eggs. Males of some species of deep-sea anglerfish even stick to the female permanently, surviving on nourishment provided by her body.



Eyes have extra-large pupils for letting in as much light as possible

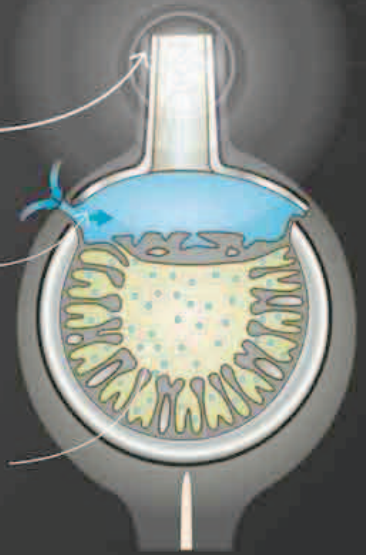
Lure sits at the top of a long spine

Stomach expands to hold large prey

Short tube directs light outward like a flashlight

Seawater flowing in is the source of bacteria

Bacteria living in the capsule produce light



LURING THEM IN

A fleshy "lantern" dangles from a stalk on the anglerfish's head. It contains a thick soup of bacteria that enter the lantern from the surrounding seawater. These bacteria use chemicals produced by the fish to glow.

Long, slightly curved teeth work like fangs for stabbing prey

Massive lower jaw can open wide to swallow large prey

The black skin lacks shiny scales, so it absorbs the light given off by the lure, making it invisible to prey

Luminous lady

This big-mouthed anglerfish is female. Males are much smaller and do not carry lanterns. Like many other deep-sea fish, anglerfish have black skin to blend in with the background.



TUSKS TOGETHER

Like many other whales and dolphins, narwhals socialize with one another and live in groups called pods. Sometimes several hundred narwhals from different pods will gather together to form huge herds.

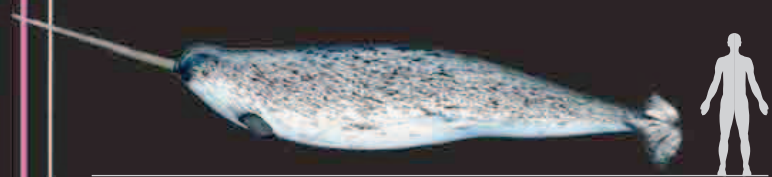
UNICORN OF THE SEA

NARWHAL

The freezing waters of the Arctic are home to the ocean's one-tusked wonder: the narwhal. Its tusk is really a canine tooth that grows through its upper lip. The only other tooth—a second canine—is small and useless for chewing. Instead, this white whale sucks up small animal prey from the bottom of the sea. No one knows for sure why the narwhal has a tusk, but tusks are longer in males—suggesting that they might use them for impressing the females. Sometimes narwhals have been spotted using their tusks in jousting contests.

AT A GLANCE

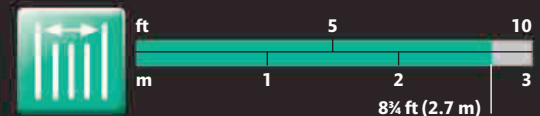
- **SIZE** 13-20 ft (4-6 m) long (not including tusk)
- **HABITAT** Cold, deep ocean waters around pack ice
- **LOCATION** Arctic Ocean, mainly from Canada, Greenland, and western Russia
- **DIET** Fish, squid, and shrimp



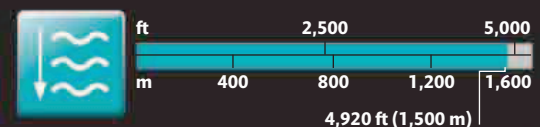
STATS AND FACTS



MAXIMUM TUSK LENGTH



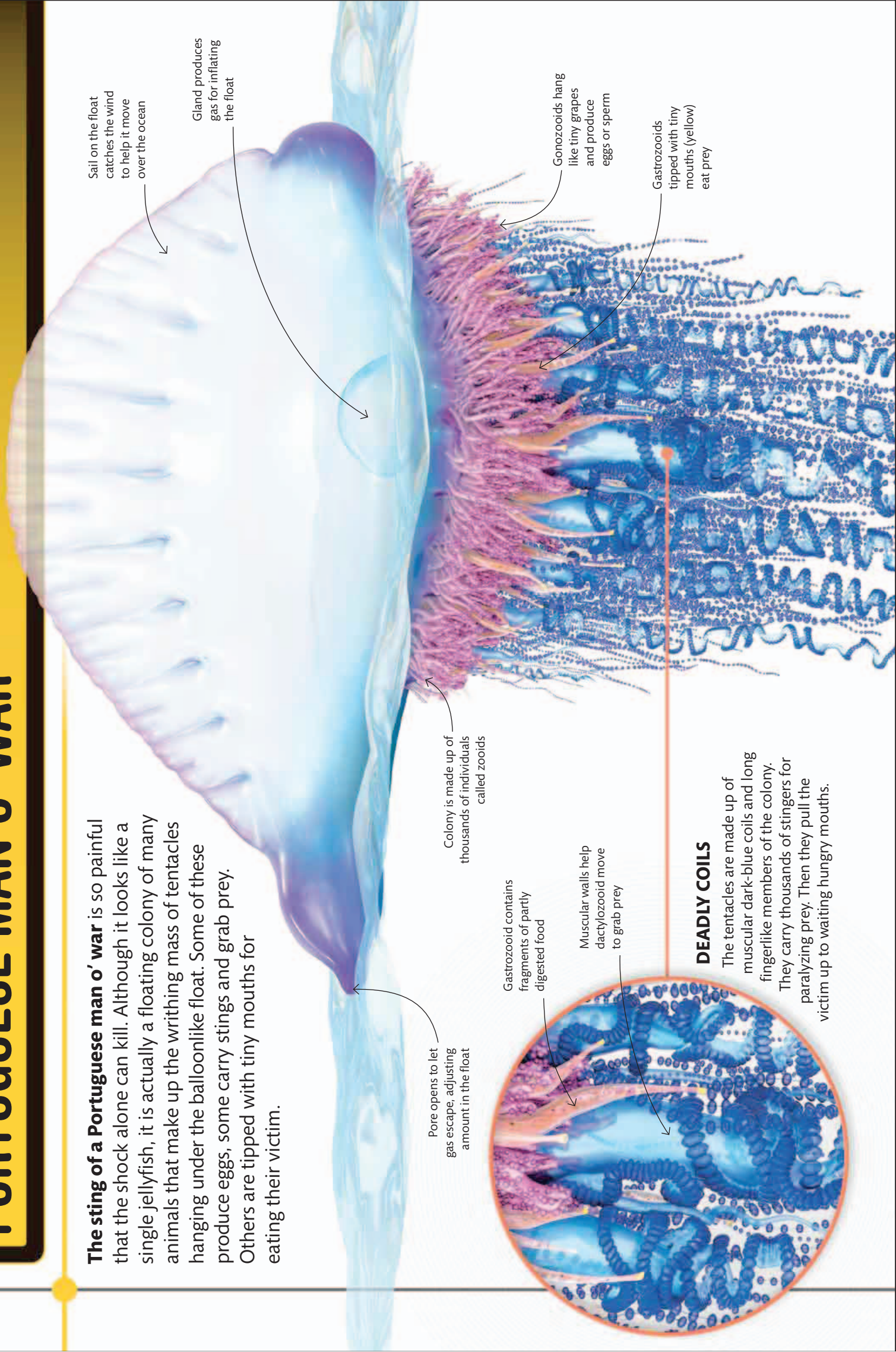
MAXIMUM DIVING DEPTH



STINGING BATTLESHIP

PORTUGUESE MAN O' WAR

The **sting of a Portuguese man o' war** is so painful that the shock alone can kill. Although it looks like a single jellyfish, it is actually a floating colony of many animals that make up the writhing mass of tentacles hanging under the balloonlike float. Some of these produce eggs, some carry stings and grab prey. Others are tipped with tiny mouths for eating their victim.



Sail on the float catches the wind to help it move over the ocean

Gland produces gas for inflating the float

Gonozooids hang like tiny grapes and produce eggs or sperm

Gastrozooids tipped with tiny mouths (yellow) eat prey

Colony is made up of thousands of individuals called zooids

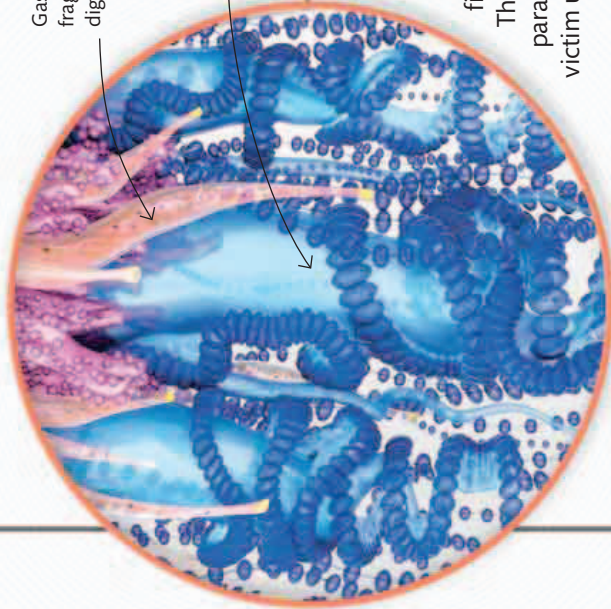
Gastrozooid contains fragments of partly digested food

Muscular walls help dactylozooid move to grab prey

Pore opens to let gas escape, adjusting amount in the float

DEADLY COILS

The tentacles are made up of muscular dark-blue coils and long fingerlike members of the colony. They carry thousands of stingers for paralyzing prey. Then they pull the victim up to waiting hungry mouths.



AT A GLANCE



- **SIZE** 33–165 ft (10–50 m) long
- **HABITAT** Surface of the open ocean
- **LOCATION** Worldwide in warm and tropical oceans
- **DIET** Small floating animal plankton, such as young fish and shrimps

Dactylozooids grab prey and are entwined with stinging tentacles

Tentacles have beadlike clumps of stingers

Stingers remain dangerous even if tentacle is broken off

Working together

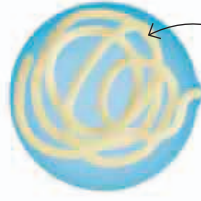
Members of this floating colony have different functions but they all work together as one. Many form long chains that hang down to sting and catch prey. Up nearer the float are shorter ones with mouths. As prey is dragged close, these reach out to suck and digest the flesh of the victim.

“Each harpoon fires with the pressure of a bullet”

HARPOON IN MINIATURE

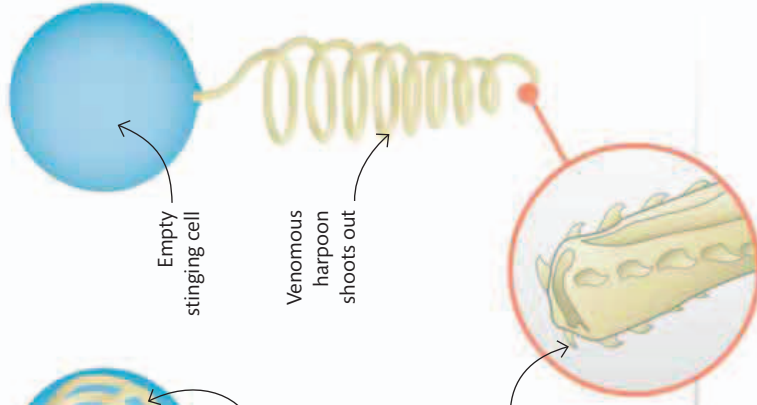
You would need a microscope to see the tiny stingers in the skin of a tentacle. When touched, the stinger fires a venomous harpoon into the prey's flesh. Hundreds of stingers fire at once, causing excruciating pain.

BEFORE FIRING



Each stinger contains a coiled-up harpoon

AFTER FIRING



Sharp barbs on the harpoon stick in the flesh of the victim

STATS AND FACTS

HEIGHT



When the wind blows on the floating “sail,” the colony moves over the ocean, snagging prey as it goes. The amount of gas in the float is adjustable and affects how far the colony travels.

SAILING SPEED

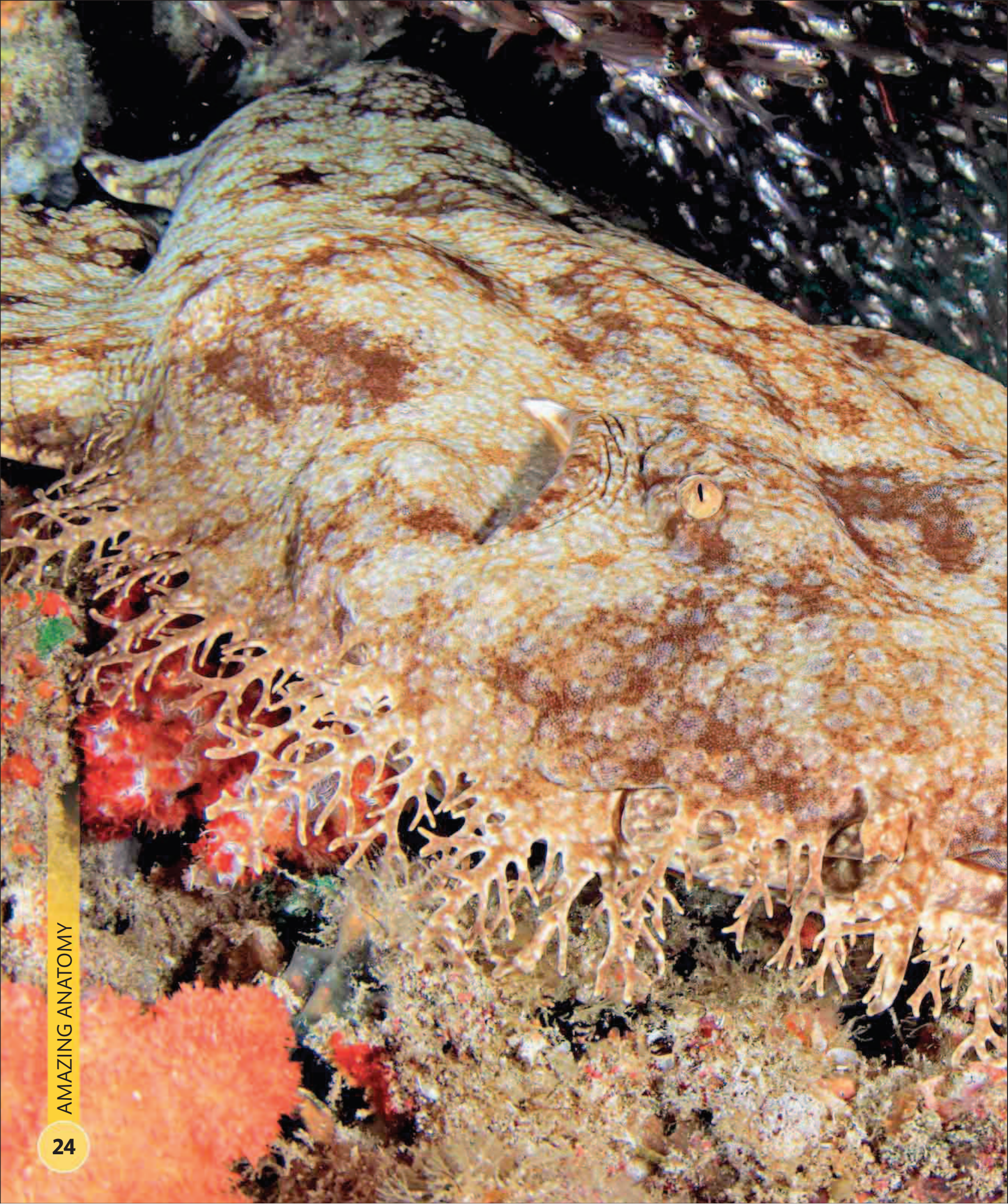


DIET



FISH CAUGHT

430 PER DAY



HIDDEN FROM PREY

A motionless wobbegong is perfectly disguised on the sea floor. It uses its side fins to clamber over rocks and has been seen breaking the surface in shallow waters.

TASSELED AMBUSHER

WOBBERGONG

Looking more like a piece of shaggy seaweed than a shark, the wobbegong has the perfect way to snatch a meal. It relies on its disguise and waits for prey to come close before making a grab. Its wormlike tassels might even lure a fish in. The flattened body of this shark is not much good for building up speed in a chase, but when it comes to attacking, the wobbegong is no laggard. It can snap its jaws in the blink of an eye, and sharp needlelike teeth ensure that even the most slippery prey is trapped.

AT A GLANCE

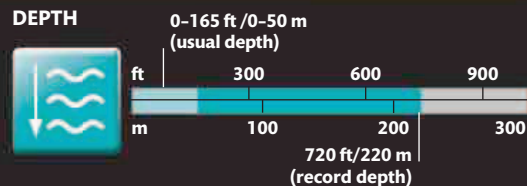
- **SIZE** 3¼–12 ft (1–3.6 m) long
- **HABITAT** Rocky shallow ocean waters and coral reefs
- **LOCATION** Coastlines of tropical eastern Asia and Australasia
- **DIET** Crabs, lobsters, octopuses, and bottom-living fish



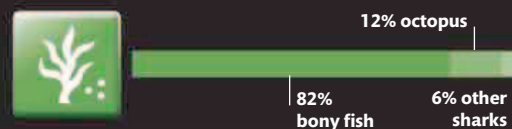
STATS AND FACTS

The sensitive tassels of a wobbegong can detect when prey comes within its reach. Then it strikes, much faster than many other kinds of sharks.

DEPTH



DIET



TIME TO GRAB PREY



SHELL SHEDDER

BLUE SWIMMING CRAB

Big crabs are heavy on land because of their cumbersome hard shell, but they are buoyant in the ocean—and this crab even has paddles to get around in midwater. Hard shells offer good protection, but are too stiff to expand—so crabs must discard their old shell and make a new, bigger one so that they can grow.

AT A GLANCE

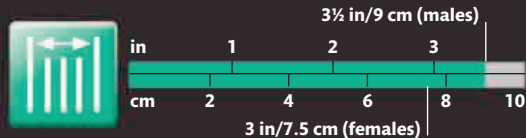


- **SIZE** 6½–10½ in (17–27 cm) shell diameter
- **HABITAT** Estuaries and bays with muddy or sandy bottoms, going upstream into rivers
- **LOCATION** Western North America, Gulf of Mexico south to Argentina, introduced to Europe and Japan
- **DIET** Oysters, clams, mussels, worms, small fish, seaweed, and carrion

“Only one
in a million
baby crabs
survives to
become an adult”

STATS AND FACTS

WIDTH OF SHELL



TIME



Back legs
are used for
swimming

Thick muscles at the base of the claw pull on flat blades to open and close the pincers

Muscles in each leg segment work in pairs: one bends the leg, the other extends it

Armored athlete

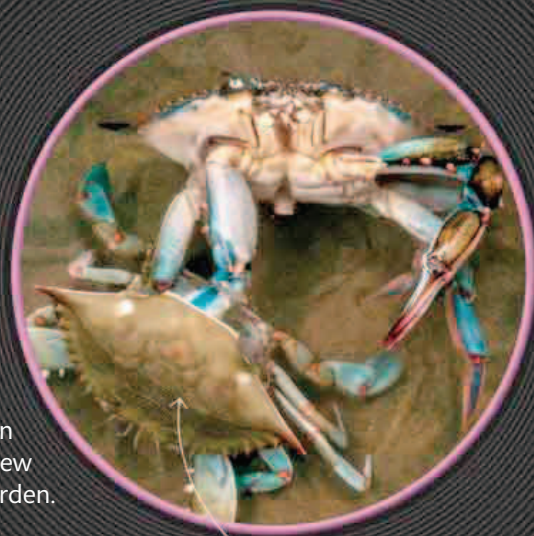
The blue swimming crab has especially large and powerful muscles at the rear of its body to help work the flat-tipped back legs. These paddle furiously when the crab swims.

Strong muscles at the base of the leg power it through the water

Last segments of swimming legs are flat like paddles

A CHANGE OF SHELL

A new shell—thin and papery at first—grows underneath the old one. The old shell cracks open and the crab crawls out so its new shell can expand and harden.



Empty shell

Hard shell is edged with nine spikes either side of each eye to protect crab from predators

Gills pack out the upper part of the crab's body and take up oxygen from the seawater

Mouth

Eyes stand out on stalks

Males have longer claws than females

Ridged pincers have a strong grip and are used in defense

Three pairs of pointed walking legs

MOBILE NURSERY

For two weeks, a female crab carries a spongelike bundle of eggs underneath her. The eggs contain developing babies. As they eat the yolk, the sponge turns from orange to black.



Bundle of over a million eggs carried beneath female, who can produce two batches of eggs in a season



A TINY MOUTH

The mouth of a seahorse is like the end of a tiny trumpet. Instead of chewing, it sucks microscopic animals out of the plankton. Even these minuscule creatures are a big meal for a pygmy seahorse.

CAMOUFLAGE IN MINIATURE

PYGMY SEAHORSE

Being a slowpoke is a problem on a reef filled with speedy predators, especially when you are small enough to fit in everyone's mouth. Seahorses are among the slowest of small fish, but fortunately they are also experts at camouflage. These tiny pygmy seahorses—smaller than your little finger—are colored pink, white, and red to blend in with the coral. Their coiling tails hold fast to a coral branch, just in case a sudden current sweeps through the reef and threatens to wash them into dangerous open water.

AT A GLANCE

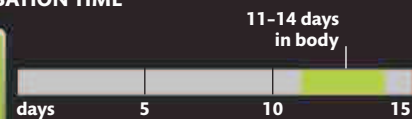
- **SIZE** ½-1 in (1.4-2.7 cm) long (from tip of tail to tip of snout)
- **HABITAT** Tropical coral reefs, where they are camouflaged among the coral branches
- **LOCATION** Tropical western Pacific coastlines, including Japan, Southeast Asia, New Guinea, Australia, and Pacific Islands
- **DIET** Tiny crustaceans



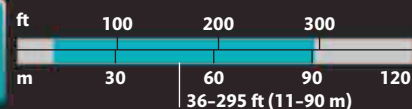
STATS AND FACTS

Most male seahorses have a pouch for brooding young, but for a pygmy seahorse a slit in the belly is good enough.

EGG INCUBATION TIME



SWIMMING DEPTH



YOUNG PER BROOD

UPTO

34

SEAWATER SWALLOWER

SWELL SHARK

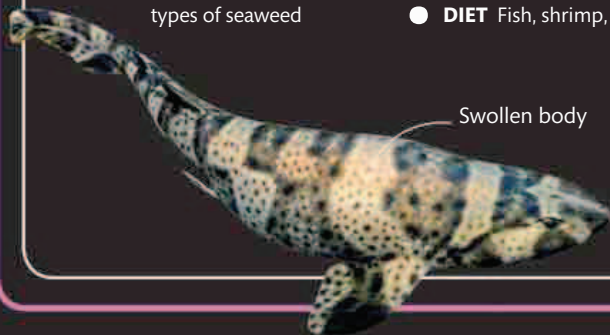
The striped pattern on this little shark helps it blend into the dense thickets of brown seaweed in its habitat. This usually helps hide it from the prying eyes of larger sharks, but if danger threatens it has another trick for defending itself. The shark can make its body bigger by gulping water into its stomach. It will even grab its tail with its mouth to make a U-bend with its body, making it more difficult for a predator to pull it out from rocky crevices and overhangs.

UNDERCOVER SHARK

Swell sharks hide among rocks and seaweed, where they can ambush small prey or hide from predators. They can even do their expanding trick when removed from the sea by swallowing air instead of water.

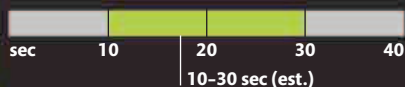
AT A GLANCE

- **SIZE** 2½–3½ ft (0.8–1.1 m) long
- **HABITAT** Usually in shallow waters covered in a bed of kelp or other types of seaweed
- **LOCATION** Eastern Pacific Ocean off the coasts of California, Mexico, and central Chile
- **DIET** Fish, shrimp, crabs, and snails

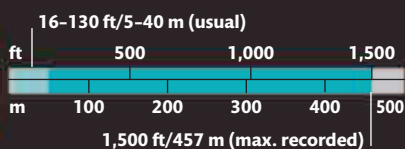


STATS AND FACTS

TIME TO SWELL



DEPTH



A detailed photograph of a swell shark swimming in a kelp forest. The shark is the central focus, showing its spotted pattern and dog-like snout. The background is filled with various types of kelp and seaweed, creating a rich, textured environment. A circular graphic with concentric lines is overlaid on the upper part of the image, framing the text.

“The swell shark makes a **doglike bark** when releasing air”

SPIKY PREDATOR

LIONFISH

A lionfish has good reason to be confident as it swaggers around the ocean reef. Pencil-long spines stick out from its body in all directions, many spiked with venom. The lionfish is a top predator that will eat almost anything that fits into its big mouth. And if that weren't enough, its stomach can expand massively to squeeze in as much prey as possible.

VENOMOUS SPINES

Each spine has two grooves to carry venom. In a human, the pain from a jab can last for days. The victim gets sticky with sweat and could end up with a paralyzed limb.



Venomous spines used in self-defense

Stinging invader

The bright striped markings of a lionfish warn of danger. Lionfish are popular aquarium pets, but if released into the ocean they can devastate local wildlife.

AT A GLANCE

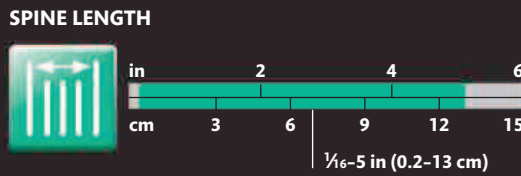
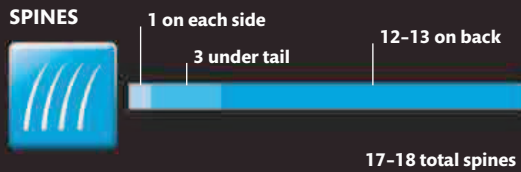


- **SIZE** 8–15 in (20–38 cm)
- **HABITAT** Coral reefs, rocky outcrops, lagoons, and muddy waters
- **LOCATION** Tropical coastlines from the Indian Ocean to the central Pacific Ocean; introduced elsewhere (such as the Caribbean)
- **DIET** Fish, crabs, shrimp, snails, and other marine animals

"Whiskers" help break up outline of mouth as fish approaches prey

STATS AND FACTS

MILLION
EGGS PRODUCED PER YEAR



Most lionfish have 17 spines, but the red lionfish (seen here) has an extra one on its back.

30
TIMES
STOMACH EXPANSION WHEN FULL

“80 lionfish on a mile of reef eat 900 lb (400 kg) of prey each year”

GIANT MOUTH

The mouth of a lionfish is so broad that it looks like a shovel on the front of its head. A hornlike tentacle above each eye helps lure prey in.



Long spines on pectoral fins are not venomous

Pectoral fins flare outward to gather prey into tighter groups



PERFECT PREDATORS

With a huge, ferocious appetite, lionfish rule the reef. A lionfish blows jets of water to distract and confuse its prey. It can also stay motionless in the water waiting to snatch its prey in one gulp. In some species, fish work together by flaring their fins to “herd” a tasty school, and even take turns to strike. Lionfish breed quickly too—producing 30,000 eggs in each batch.

WHITE-BLOODED WONDER

CROCODILE ICEFISH

It takes a special kind of fish to survive the deep Antarctic Ocean, where temperatures are only just above freezing. The crocodile icefish not only has built-in antifreeze, but is the only backboned animal with colorless blood. All other backboned animals need red blood cells to carry oxygen, but cold polar waters contain so much oxygen that the icefish does not need them.



Long snout is full of sharp teeth that help in grabbing prey

Massive heart helps pump extra oxygen around the body

Only the food-filled digestive system shows color

Without the redness of blood, lines of muscle appear white

AT A GLANCE



- **SIZE** 10–28 in (25–72 cm)
- **HABITAT** Cold Antarctic ocean waters, near the ocean floor
- **LOCATION** Coastlines of Antarctica and southern South America
- **DIET** Other fish, shrimp, and crabs

Bleached baby

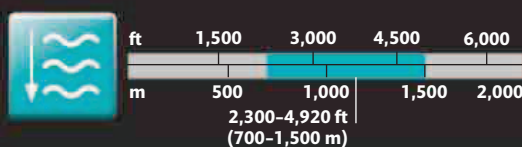
This baby icefish looks as though its body is made from glass. In cold water, it can be hard for a fish to pump blood with lots of red cells around its body because it gets too thick, but the icefish has no red cells at all. The whiteness of its bones, muscles, and organs shows through its transparent skin.

STATS AND FACTS

HABITAT TEMPERATURE



SWIMMING DEPTH



Fresh water freezes at 32°F (0°C), but in the chilly marine habitat of the crocodile icefish, the presence of salt means seawater can get much colder before it freezes.



“An icefish has four times as much blood as a red-blooded fish of a similar size”

WINGS OF THE SEA

ANGEL SHARK

Angel “wings” might make for graceful swimming, but these sharks are bad-tempered “angels.” During the day, angel sharks settle on the bottom, perfectly camouflaged, and strike with lightning speed using needlelike teeth. If you accidentally tread on one, you’ll see why it has the nickname of “sand devil.”

AT A GLANCE



- **SIZE** 1–6½ ft (0.35–2 m) long
- **HABITAT** Mostly shallow ocean waters near coastlines
- **LOCATION** Worldwide, mainly in the tropics and warmer ocean regions
- **DIET** Small fish, squid, octopuses, snails, and clams

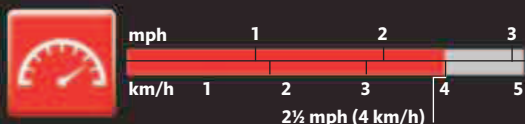
STATS AND FACTS

“WING” SPAN

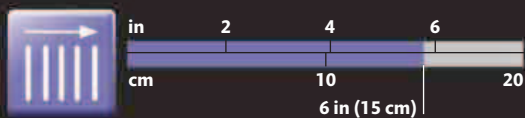


The angel shark cannot swim fast, so it prefers to ambush its prey. Its eyes face upward to spot anything that comes within range. Then it extends its jaws to grab its victim.

TYPICAL SWIMMING SPEED



STRIKE DISTANCE



TIME TO STRIKE PREY



Five gill slits on the upper surface of the body

Small eyes on top of flattened head

Enlarged pectoral fins flap to help the shark swim

Angel of death

At night, angel sharks move off the bottom and cruise the sea floor to look for food. Their “wings” are really pectoral fins that extend from either side of the body, making them look more like a ray than a shark.

Lower lobe of tail fin is bigger than upper lobe, unlike most other sharks

The first of two small dorsal fins is at the rear of the body

HOT-BLOODED KILLER

GREAT WHITE SHARK

The **great white shark** is the most infamous killer of them all, and a hungry great white is a speedy hunter. It has a particular taste for warm-blooded meat and often targets mammals, such as seals or dolphins. It matches their speed because it has special strips of muscle that generate its own body heat, while a clever system of blood vessels keeps the heat trapped inside.



AT A GLANCE

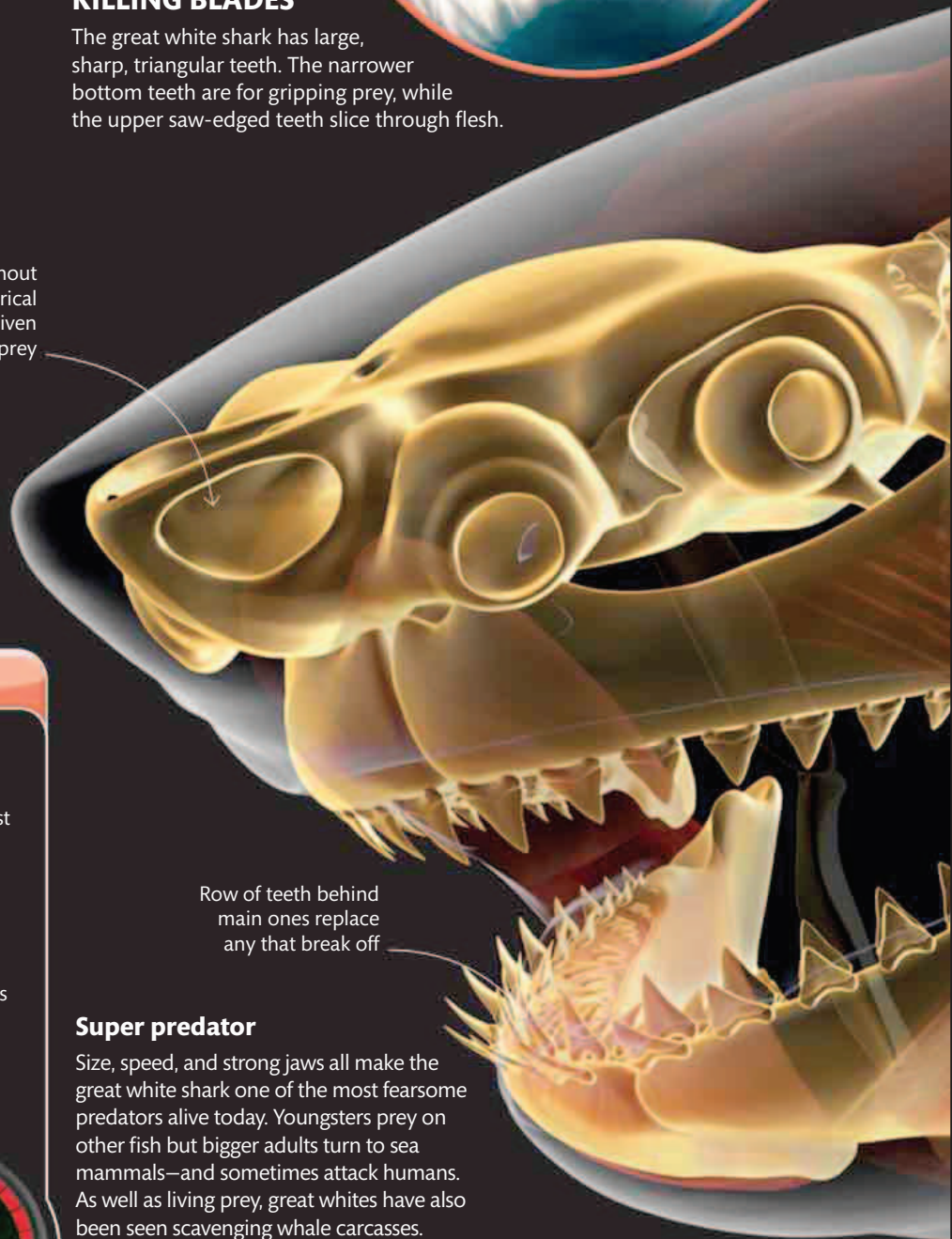


- **SIZE** Up to 20 ft (6 m) long
- **HABITAT** Most coastal and offshore ocean waters
- **LOCATION** Worldwide
- **DIET** Seals, dolphins, turtles, seabirds, and large fish

KILLING BLADES

The great white shark has large, sharp, triangular teeth. The narrower bottom teeth are for gripping prey, while the upper saw-edged teeth slice through flesh.

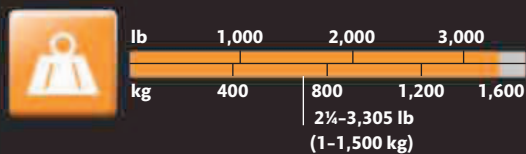
Sensitive snout detects electrical activity given off by prey



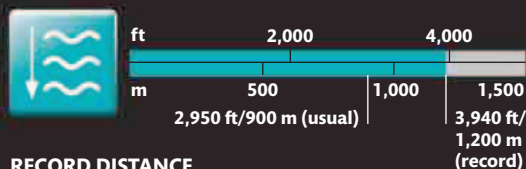
Row of teeth behind main ones replace any that break off

STATS AND FACTS

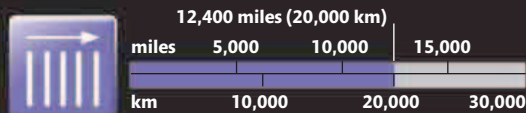
PREY WEIGHT



SWIMMING DEPTH



RECORD DISTANCE



The great white shark is one of the longest-lived and most wide-ranging of any shark. Although it is more usually seen near coastlines, it often migrates long distances, sometimes crossing entire oceans to do so.

Super predator

Size, speed, and strong jaws all make the great white shark one of the most fearsome predators alive today. Youngsters prey on other fish but bigger adults turn to sea mammals—and sometimes attack humans. As well as living prey, great whites have also been seen scavenging whale carcasses.

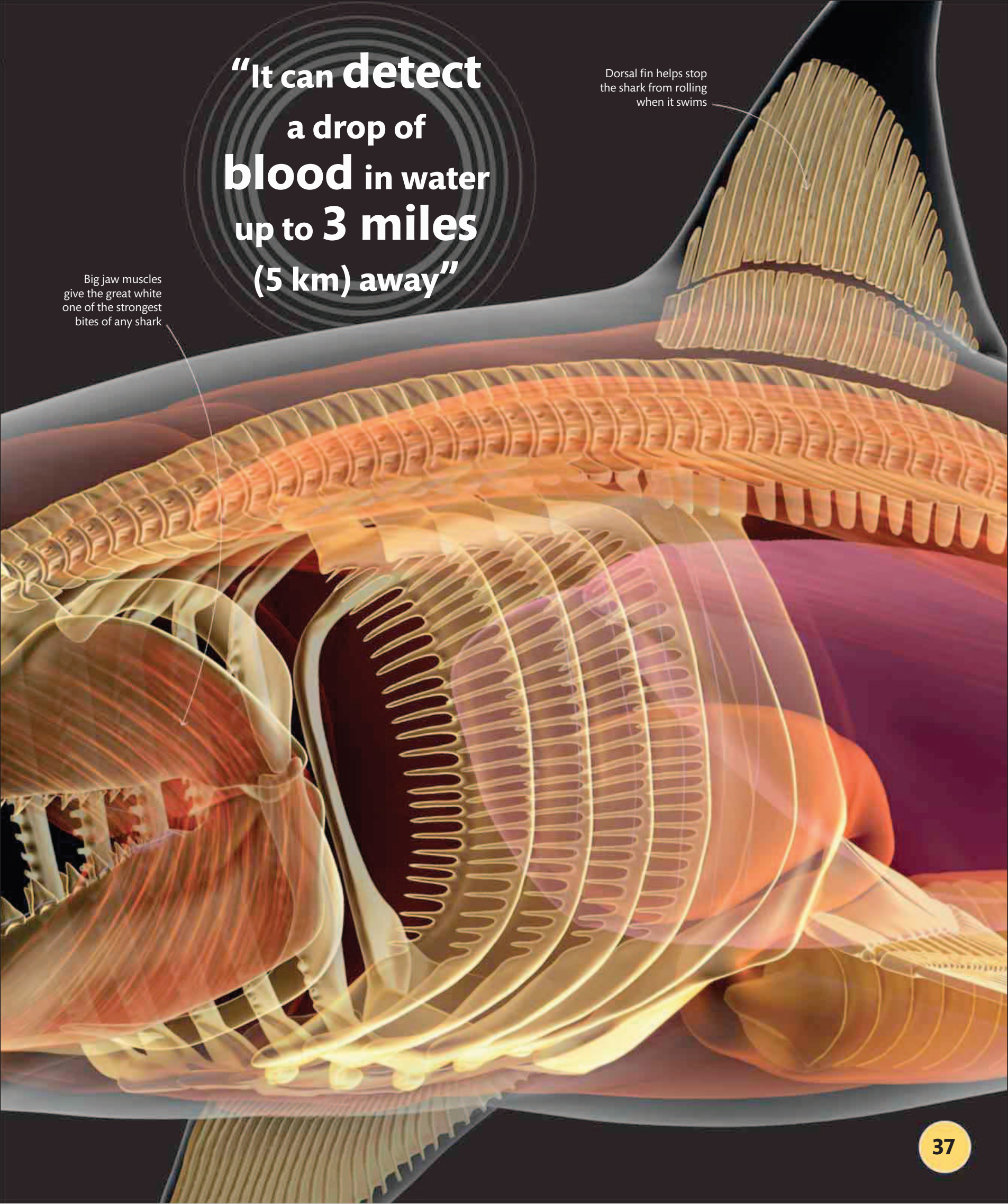
LIFESPAN



**“It can detect
a drop of
blood in water
up to 3 miles
(5 km) away”**

Dorsal fin helps stop
the shark from rolling
when it swims

Big jaw muscles
give the great white
one of the strongest
bites of any shark







JUMPING JAWS

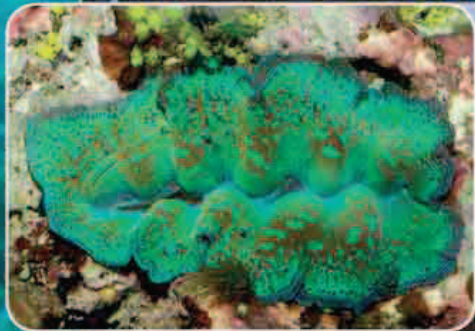
A fat seal makes a filling meal for a hungry great white shark, which is why they patrol the waters around seal colonies. The shark charges upward from below the seal so fast that it often launches into the air as it grabs its victim between its fearsome jaws. The seal is left badly wounded; a bite to the head and neck kills it quickly. The shark then drags the body below the surface to eat.

“Great white sharks can jump up to 10 ft (3 m) out of the water”

BIG-LIPPED MOLLUSK

GIANT CLAM

Most clams can fit on a teaspoon, but this giant would just barely fit in your bathtub. Weighing as much as two baby elephants, with most of the weight taken up by its shell, it lives on shallow reefs. Like small clams, it is a bivalve, which means its shell is in two parts, hinged along the bottom. Strong muscles allow the shell to open and close. When gaping wide, its fleshy body can bask in the warm tropical sunshine. Light provides much of the energy needed for the clam to grow big.



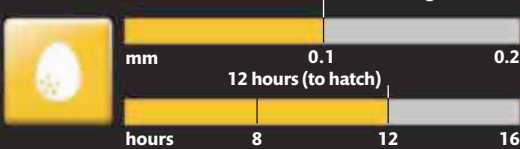
AT A GLANCE

- **SIZE** Up to 4 ft (1.2 m) long
- **HABITAT** Shallow ocean waters
- **LOCATION** Tropical oceans, mostly of the Indo-Pacific
- **DIET** Plankton and food produced by live-in algae



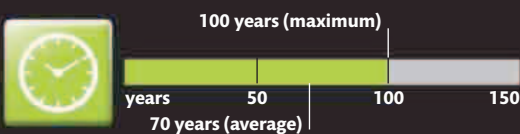
STATS AND FACTS

EGGS



A giant clam's eggs hatch into larvae that spend about a week floating in the water before settling on the bottom.

LIFESPAN



EGGS RELEASED AT ONCE

500
MILLION

**BIGGEST
SHELLED MOLLUSK**

“A giant clam releases up to 6 billion eggs during its lifetime”



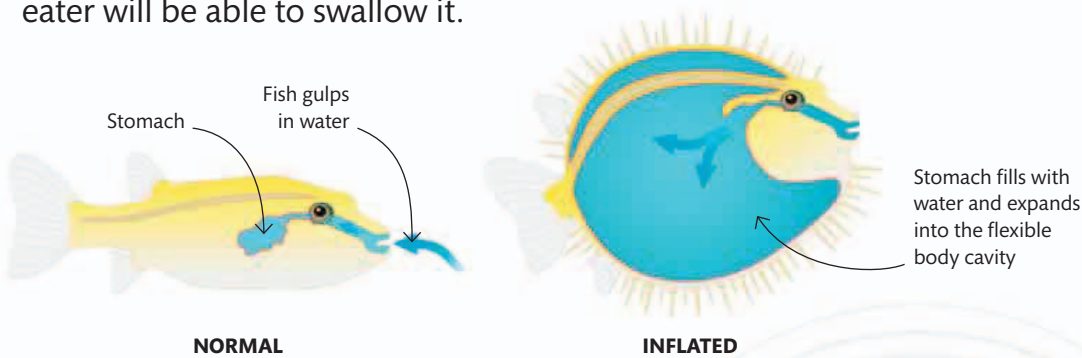
FOOD SOURCES

Giant clams get some food from plankton. The rest is made by microscopic algae living in their flesh that use the Sun's energy to make food—just like plants do—which they share with the clams.

PRICKLY CHARACTER

PUFFERFISH

Pufferfish get their name because they puff up like a balloon when threatened by danger. They do this by swallowing seawater. It is usually enough to put most predators off, but this kind of pufferfish has something extra just to make sure. Its skin is covered in spines that stick out when it is fully inflated, so not even the hungriest meat eater will be able to swallow it.



NORMAL

INFLATED

ALL PUFFED UP

The pufferfish performs its inflation trick by swallowing plenty of seawater. Its stomach walls are folded so they can expand outward as the stomach fills with water. The fish's skin is extra elastic, too.

“The flesh and organs of the pufferfish contain a lethal poison”

AT A GLANCE

- **SIZE** 6–20 in (15–50 cm) long
- **HABITAT** Rocky shallows, coral reefs, and among mangroves and seagrass
- **LOCATION** Worldwide in the tropics
- **DIET** Snails, sea urchins, and crabs, mainly hunting at night

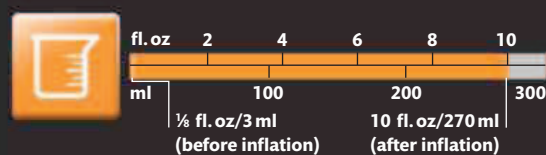
Teeth are fused to form a hard beak



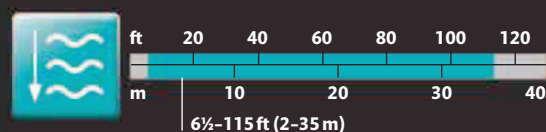
Spines lie flat along body when not inflated

STATS AND FACTS

STOMACH VOLUME



USUAL DEPTH



Adult pufferfish usually stay hidden near the sea floor, but are vulnerable to predators if they are swimming in open water.

TIME TO INFLATE



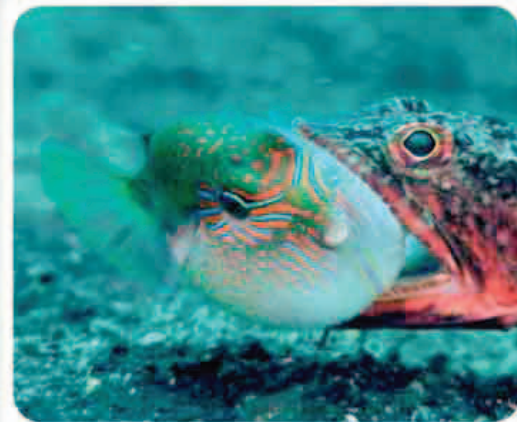
Thick, flexible skin



Spines stick out when inflated

Spotted pattern on a yellow background is typical of porcupinefish

Stomach inflates to fill most of fish's body space with seawater

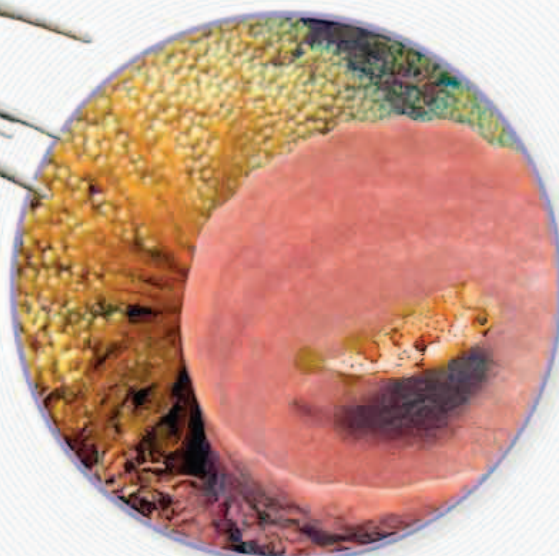


MORE THAN A MOUTHFUL

Most types of pufferfish lack spines but they can still more than double their body depth when they puff outward. This usually makes them too big to fit into the mouth of many predators, who soon give up and leave the fish alone. Only the most persistent hunters, such as this lizardfish, might succeed in getting a meal.

Spiky defender

This spiny-skinned pufferfish is sometimes called the porcupinefish. It is one of the biggest pufferfish, but still relies on its puffing defence. Its spines lie flat when the fish is swimming normally, but stick out when it puffs up.



A SAFE HAVEN

Baby pufferfish rely on staying hidden from big predators. Their dark patches can help disguise them among fronds of seaweed—but this one has opted for a cup-shaped barrel sponge.

POP-UP PREDATOR

BITING REEF WORM

Worms often fall prey to hungry fish, but this one breaks all the rules. It can grow to the length of a car but most of its body is hidden under the sand and only its murderous head pokes out. Should any fish swim too close, the worm attacks, slicing madly with jagged jaws that can cut a small body clean in half. It even has a knock-out poison to stop larger prey from getting away.



AT A GLANCE

- **SIZE** 3¼-9¾ ft (1-3 m)
- **HABITAT** On tropical reefs, under boulders, in crevices, and in mud or sand
- **LOCATION** Indian Ocean and western Pacific Ocean
- **DIET** Shrimp, worms, fish, seaweed, and dead material; it emerges at night to feed



STATS AND FACTS

JAW SPAN

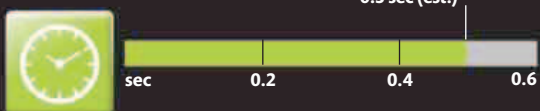


HEIGHT OUT OF BURROW



The biting reef worm senses prey with the feelers on its head before taking a fast, slashing bite.


TIME TAKEN TO STRIKE



FIERCEST WORM BITE

SCISSORLIKE JAWS

By firing its throat out through its mouth, the biting reef worm's jaws can reach even farther to grab its prey. The bite of the sharp, jagged jaws is so powerful that it can draw blood from a human finger.

A detailed close-up photograph of a biting reef worm's head and jaw apparatus. The worm's body is segmented and has a yellowish-brown color with darker bands. Its head is large and complex, featuring several pairs of long, segmented, and slightly curved jaws. The background is dark and out of focus, showing some blurred shapes of other marine life.

**“The biting
reef worm has
five pairs of
fast-action
jaws”**

**“This aggressive
shark often
follows ships
in its hunt
for food”**



LONG-FINNED BULLY

The oceanic whitetip is a solitary shark, but often gathers at feeding frenzies, where it bullies the other sharks to get a better share of the food. It will also follow pods of dolphins and pilot whales to scavenge their catch.

FABULOUS FINS

OCEANIC WHITETIP SHARK

The **oceanic whitetip shark** likes to cruise just beneath the surface of warm tropical oceans, with its long, paddlelike fins spread outward. Despite its sedate lifestyle, it hunts some of the fastest oceanic fish, including tuna and mackerel. It swims along with its mouth wide open until prey comes close enough for it to make a grab with its jaws.

AT A GLANCE

- **SIZE** 9¾–13 ft (3–4 m) long
- **HABITAT** Warm open ocean, usually near the surface
- **LOCATION** Tropical and subtropical oceans around the world
- **DIET** Mainly fish and squid, but sometimes seabirds, marine mammals, and human rubbish



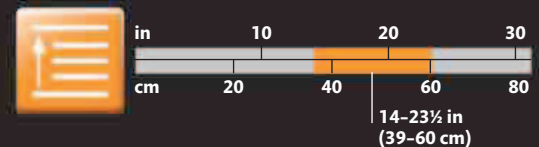
STATS AND FACTS

In proportion to its body, this shark's dorsal and pectoral fins are bigger than those of many other species of sharks. It gets its name because the rounded edges of its fins are tipped with white.

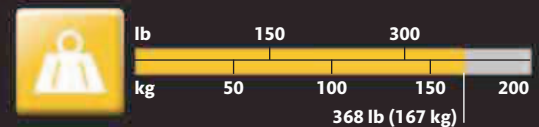
LENGTH OF PECTORAL FINS



HEIGHT OF DORSAL FIN



MAXIMUM WEIGHT



MAXIMUM LIFESPAN



SHARPSHOOTER

CONE SNAIL

A slow snail has to have a secret weapon to catch a fish, and the cone snail is the most dangerous snail of all. Like its vegetarian cousins, it has a single creeping foot, which makes it too slow to chase prey. Instead, when a fish comes close, it sends out a fleshy snout that is tipped with a venomous dart for harpooning its victim. The poison makes the fish go limp so the snail can swallow it whole.

“Cone snails
make up to
20 new
harpoons
at a time”

Dreadful dart

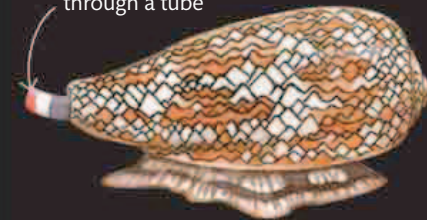
A cone snail waits for prey to come close before firing a poison dart. It will shoot at a careless human hand too, sometimes with fatal results.

Shiny, cone-shaped shell has a colorful pattern

Long, tubular mouthparts fire a poison dart into prey

AT A GLANCE

Snail senses prey by tasting the water through a tube



- **SIZE** $\frac{3}{8}$ –9 in (1–22 cm) shell length
- **HABITAT** Coastal ocean waters, often buried in sand
- **LOCATION** Warm and tropical oceans
- **DIET** Fish, worms, and other snails

STATS AND FACTS

CAPTURE TIME



12
HOURS

TIME TO DIGEST PREY

SPEED OF FIRING HARPOON



NO. OF POISONS IN VENOM

200

OCEAN VAMPIRE

SEA LAMPREY

The sea lamprey is a bloodthirsty animal, but it cannot bite because it has no jaws. Instead it has a mouth like a sucker, with teeth that rasp a wound into the flesh of other fish. It is a gory life for a fish that spends its early years in rivers as a tiny, harmless, wormlike larva. The larva grows by filtering plankton, before swimming into the sea and turning to meatier things.

Horny teeth around rim of mouth

"Tongue" also carries sharp teeth

Jawless maw

A lamprey attacks anything big enough to take its weight. Its teeth hook onto the side of a fish. Then the mouth rasps away until it draws blood, swallowing the odd scale along the way.

AT A GLANCE



- **SIZE** 23½–47 in (60–120 cm) long
- **HABITAT** Seas and oceans as blood-sucking adults; migrate inland to rivers and streams to breed
- **LOCATION** Northern Atlantic Ocean, Mediterranean Sea, North America, and Europe
- **DIET** Sucks blood of other fish and sometimes blood of whales or dolphins; larvae filter feed on tiny plankton

STATS AND FACTS

MIGRATION DISTANCE



TIME



SPOTTED STINGER

RIBBON-TAILED STINGRAY

In a tropical fish, blue spots can be used to attract attention, but this ray uses them to disguise itself. When the ribbon-tailed stingray settles on the bottom of a reef, the spots make it tricky to see its outline in the dappled sunlight. It waits patiently for something tasty to crawl by so it can smother the prey with its pancake-shaped body and eat it. But step on its stinging tail spine, and the pain will be excruciating!

EYE HORNS

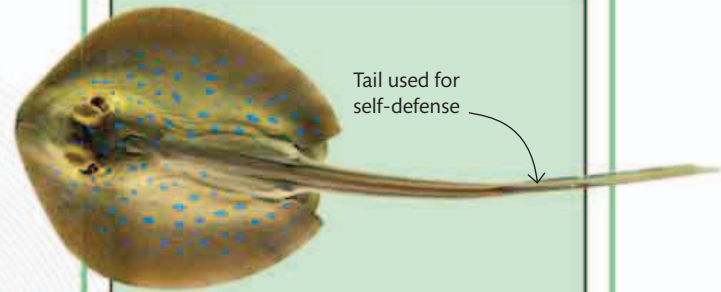
The eyes are prominent, sticking up from the ray's flat body. This allows the ray to keep watch over the sands for danger or food.



Winged wanderer

The stingray spends much of its time on the bottom, but it is also a graceful swimmer. Like other rays, its side fins are massively expanded to form "wings," which it can flap to "fly" through the water.

AT A GLANCE

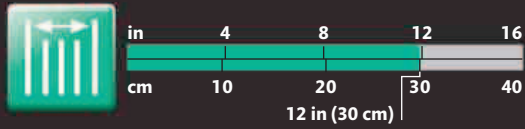


- **SIZE** 27½–35 in (70–90 cm)
- **HABITAT** Sandy patches and caves on coral reefs
- **LOCATION** Red Sea, Indian, and west Pacific Oceans
- **DIET** Snails, worms, shrimp, and crabs

Blue spots help camouflage ray

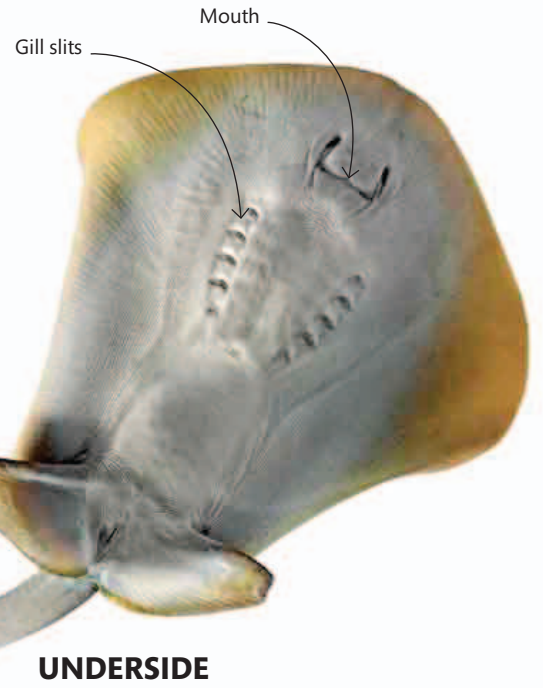
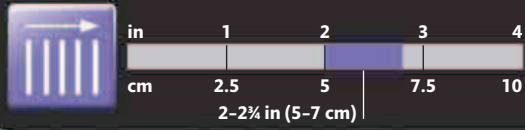
STATS AND FACTS

MAXIMUM WIDTH



The ray uses its tail to whip a predator, and sometimes the venomous spine's tip breaks off in the victim's skin.

SPINE LENGTH



UNDERSIDE

The ray's mouth is on its underside—perfect for grabbing food from the sand. Seawater taken in through the mouth leaves through gill slits underneath the body.



STINGING SPINES

The ray has one or two jagged spines along its tail that cause the sting. These are sharp enough to inject a painful venom.

Usually two venomous spines

Broad "wings" are hugely expanded pectoral fins

Paler underside lacks the dark pigment of the camouflaged upper surface

WALKING WONDER

RED-LIPPED BATFISH

No one knows for sure why the red-lipped batfish wears so much face paint, but there is no mistaking how it gets its dinner. The batfish has a stubby fishing pole hidden under the “horn” on its forehead. When this pokes out, its tip releases a perfume into the water to entice prey. Although it is capable of swimming, this fish spends much of its time “walking” on the sea floor with stiffened leglike fins.

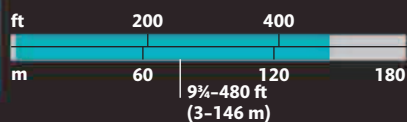


AT A GLANCE

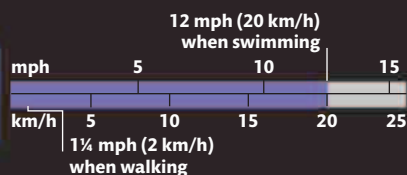
- **SIZE** 5½–8 in (14–20 cm) long
- **HABITAT** Tropical coastal waters on mud and sandy bottoms
- **LOCATION** Cocos and Galápagos Islands in the eastern Pacific Ocean
- **DIET** Small snails, clams, shrimp, worms, and fish

STATS AND FACTS

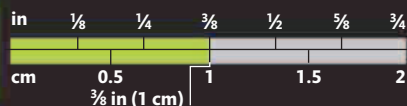
DEPTH



SPEED



SNOUT LENGTH



A batfish gets its name because its slow, crawling gait looks like that of a bat clambering over the ground. Batfish swim close to the ocean floor. Once settled on the seabed, their brown bodies are camouflaged as they clamber over sand and mud.



CLOWN FACE

Thick red lips, a bristly beard, and a horn make a very bizarre underwater portrait, but this might help attract a mate. The red-lipped batfish is too slow to chase its food so it waits for prey to come close.

DEADLY SUPERSTAR

STARFISH

Starfish look harmless but they hide a secret—they are slow-moving hunters. Motionless mussels are perfect for them. A starfish pulls the shells apart with its arms and inserts its stomach to digest the victim alive. The starfish is not even bothered if it loses an arm through injury: it can simply grow a new one.

Greedy guts

The starfish's mouth lies under its body. When feeding, it pushes its stomach out onto its prey and produces chemicals that start to digest the prey's body. The starfish then sucks up the juices.

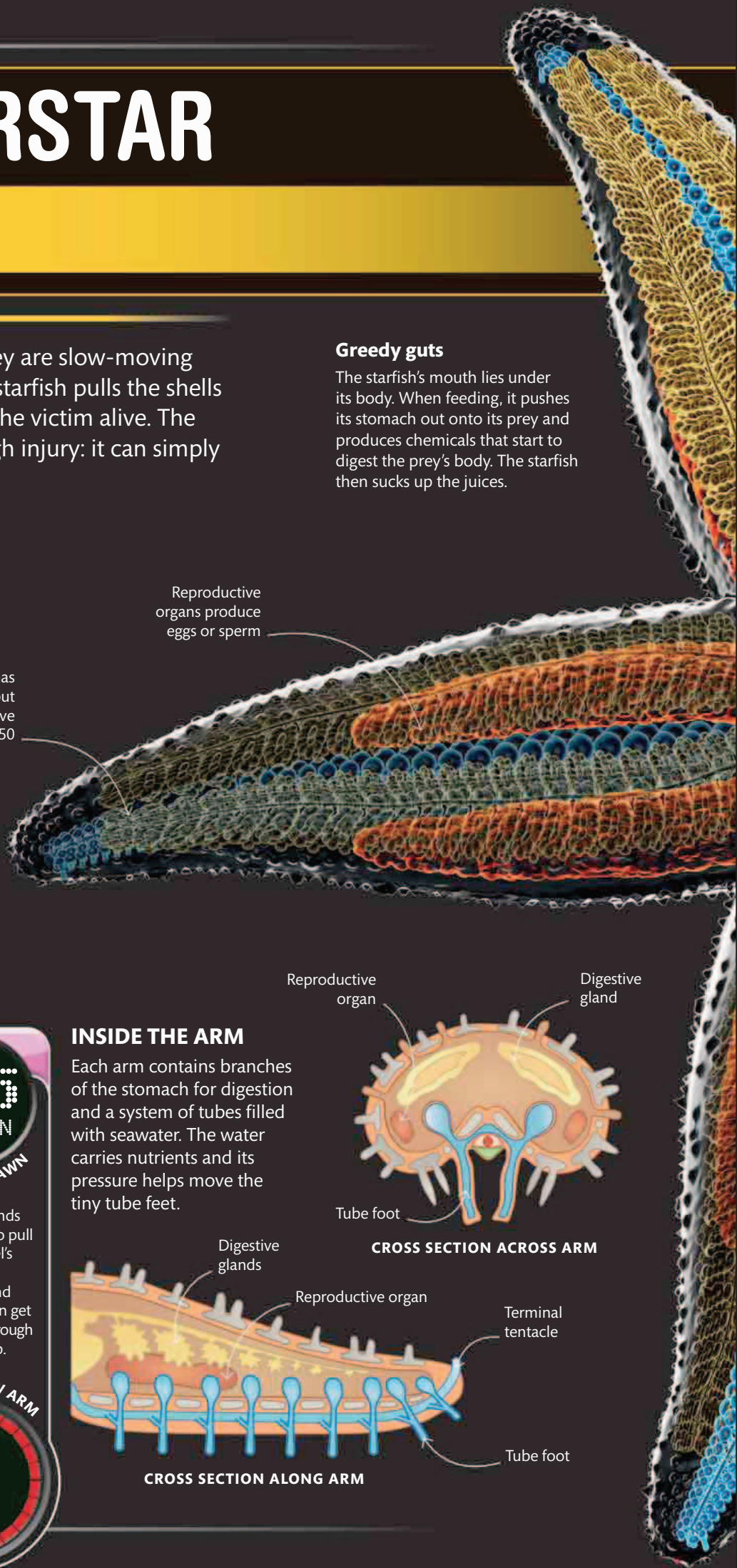
AT A GLANCE



- **SIZE** 4–20½ in (10–52 cm) in diameter
- **HABITAT** Coastal waters on gravel, rock, or sand
- **LOCATION** Northern Atlantic, including coastlines of North America and Europe, and the North Sea
- **DIET** Mussels, barnacles, snails, worms, and other small, slow-moving animals

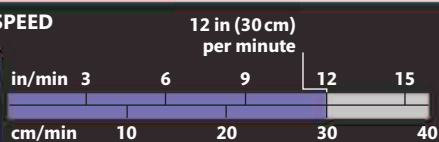
This species has five arms but others can have up to 50

Reproductive organs produce eggs or sperm



STATS AND FACTS

WALKING SPEED

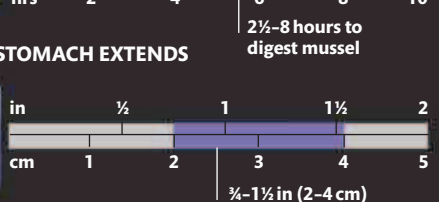


TIME



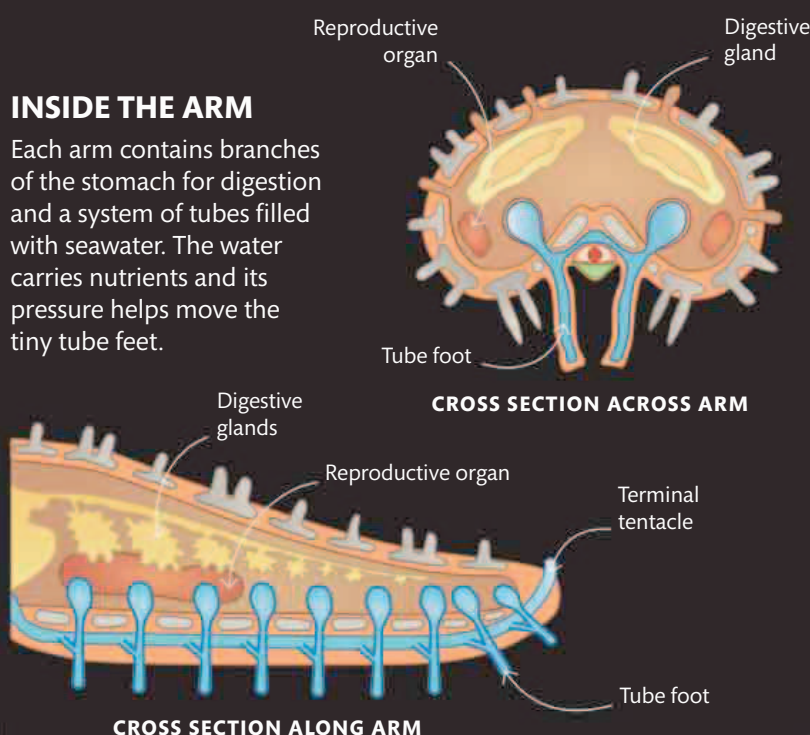
A starfish spends hours trying to pull open a mussel's shell until its victim tires and the starfish can get its stomach through the tiniest gap.

DISTANCE STOMACH EXTENDS



INSIDE THE ARM

Each arm contains branches of the stomach for digestion and a system of tubes filled with seawater. The water carries nutrients and its pressure helps move the tiny tube feet.



Each arm contains a complete set of reproductive organs, digestive glands, and a network of fluid-filled canals that move the tube feet

Rows of tube feet cover the underside of each foot

Tube feet are used for touching objects and walking

Stomach is a double-chambered sac in the middle of the animal that opens through the mouth on the lower surface and the anus on the upper surface

Madreporite is a tiny funnel that filters seawater into the body

WALKING TUBE FEET

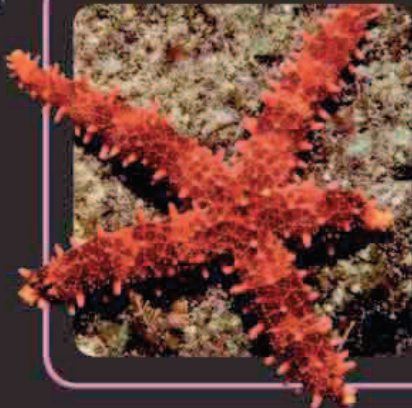
The underside of a starfish is covered in hundreds of tiny tube feet that work like miniature suckers. They help the animal crawl along and also provide a strong grip for pulling open mussels.

Digestive glands help break down food carried here from the stomach

Water-filled tube encircles the central stomach and branches through each arm

Tiny water-filled sacs squeeze water into the tube feet to make them move

Eyespots on the upper surface of each arm detect light



ARMLESS TRICK

Each arm of a starfish contains a full set of the animal's main organ systems so a starfish can easily survive if it loses one of them. In any case, its powers of regeneration are so good that it can grow back a lost arm within a year.

“A starfish can project its stomach through a 0.1 mm gap”

NEVER-ENDING TENTACLES

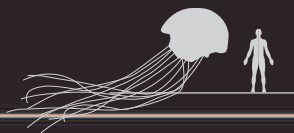
LION'S MANE JELLYFISH

With more than a thousand stinging tentacles—each growing longer than a bus—the lion's mane jellyfish is a giant of its kind. Its stingers leave whiplike scars on the skin and can even stop the heart. It swims by flapping its bell, while the deadly tentacles trail along behind, like a lion's mane. Those that get stranded on beaches are helpless—but their stings are still dangerous.



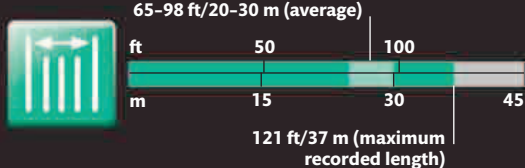
AT A GLANCE

- **SIZE** Bell: 1–6½ ft (0.3–2 m) in diameter; tentacles: up to 121 ft (37 m) long
- **HABITAT** Open ocean
- **LOCATION** Northern Hemisphere, including North Atlantic and North Pacific Oceans, and North Sea
- **DIET** Fish, ragworms, and other small swimming animals



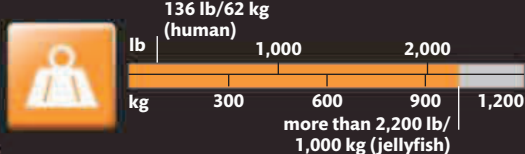
STATS AND FACTS

LENGTH



The tentacles of a lion's mane jellyfish are arranged in eight groups around a central mouth that hangs beneath the bell.

WEIGHT



ICE-COLD STINGER

The biggest lion's mane jellyfish live in the icy waters of the Arctic, where they usually swim near the surface. The bell varies in color, from blood-red to orange or yellow.



**BIGGEST
JELLYFISH**

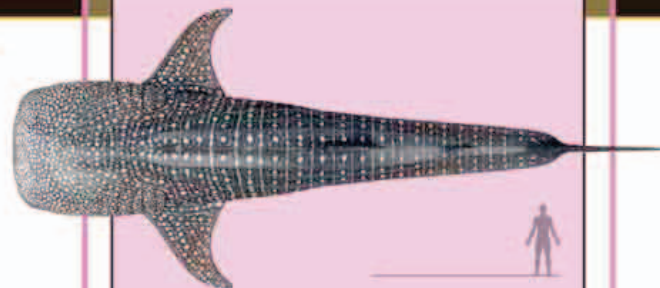
**“A swarm
of jellyfish
can contain
thousands
of individuals”**

MONSTER MOUTH

WHALE SHARK

The huge whale shark is really a gentle giant. It feeds on small fish and other animals floating in the plankton. Although it has a massive mouth, its throat is no wider than a man's arm. This prevents it from swallowing anything too big and ensures that the water sucked into its mouth passes out through its enormous gills instead. Anything edible is trapped by a special filter—so only food ends up going into its stomach.

AT A GLANCE



- **SIZE** 52–66 ft (16–20 m)
- **HABITAT** Surface waters of the open ocean
- **LOCATION** Warm and tropical oceans around the world
- **DIET** Plankton (including krill—tiny, shrimplike animals), small fish, and squid

STATS AND FACTS

OVER
300
LITTER SIZE

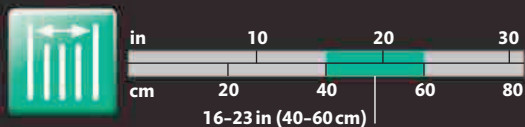
WEIGHT



MIGRATION DISTANCE



SIZE OF PUPS



The whale shark spends most of its time cruising near the surface of the open ocean, where the plankton is most concentrated.

GULPS PER MINUTE

UP TO
20

Pattern of white stripes and spots unlike any other shark

Supersized shark

There are billions of tiny organisms living among the plankton, but it takes many mouthfuls to fill up this fish—even with a mouth 5 ft (1.5 m) wide. The whale shark consumes 2.2–3.3 tons (2–3 tonnes) of plankton a day. Second only to a whale in size, this is not only the largest shark but is also the biggest fish.

Whale sharks have around 4,000 small teeth, but they no longer have any useful function

Small eye on either side of mouth

CAPTIVE SUPPER

Even with its capacity to filter gallons of seawater, a whale shark is not above grabbing an easy meal. A net full of fresh fish makes a tempting target and the shark sucks so hard that it pulls small fish straight through the holes.



First dorsal fin much larger than second dorsal fin

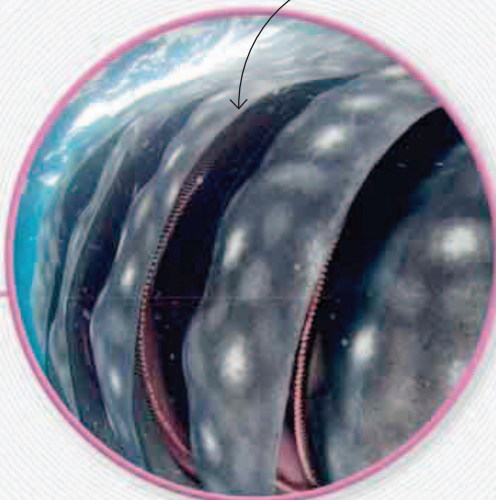
Rough skin is thicker than that of any other animal

Large upper lobe of tail fin powers shark as it swims

Ridge along side of body forms a "keel" that runs to the tail

BIGGEST FISH

Gill arches support pink gills inside



GIANT GILLS

Most sharks have five gill slits—and those of the whale shark are enormous. After the plankton is strained out of the seawater, the water flows out through the slits and the gills inside pick up oxygen.

Water leaves through gills
Filter pads remove plankton

Water and plankton enter through the mouth

Plankton funneled down throat

FILTER FEEDER

Before reaching the gills, each mouthful of water is passed over filter pads. These pads work like a sieve to strain out the plankton.

Giant pectoral fins are used for steering

SCHOOL SUCKER

Most of the ocean's filter-feeders get food by swimming forward with their mouth open, but the whale shark can strain food from seawater simply by gulping. When the shark opens its jaws wide, water rushes into its mouth at very high speed—pulling any small animals with it. In this way, hungry whale sharks can target entire schools of tiny fish, gobbling them down even when they're close to the surface.







**LONGEST TEETH
RELATIVE
TO HEAD SIZE**

FISHY FANGS

SLOANE'S VIPERFISH

The terrifying teeth of the deep-sea viperfish are so long that they stick out when its mouth is closed. Food is scarce in the deepest ocean waters, so a predator needs clever tactics to get its meal. The viperfish has a flashing light at the end of a long spine on its back. This attracts the attention of other fish, and when they come close, the viperfish lunges with its fang-filled jaws. The bones behind its head are even specially strengthened to take the shock of the attack. It may take many days to make a kill, but the viperfish is patient and can go for a long time without eating anything at all.

AT A GLANCE

- **SIZE** 8–14 in (20–35 cm) long
- **HABITAT** Deep sea
- **LOCATION** Tropical and subtropical oceans around the world
- **DIET** Any animal that can fit into its mouth—mainly shrimp, squid, crabs, and small fish



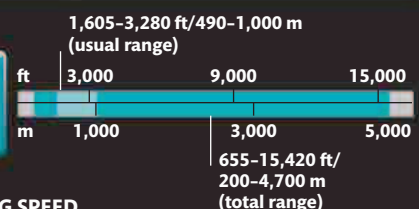
GIANT JAWS

The viperfish can open its mouth extra wide to swallow big prey but needs special jaws to do this. Its lower jaw extends forward to grab prey. At the same time, the top of its head rotates backward to create a 180-degree opening.

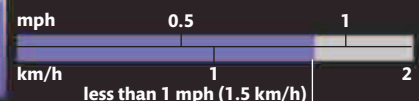
STATS AND FACTS

A viperfish moves slowly and spends a lot of time motionless in the water waiting for prey to come close enough for an attack.

DEPTH



SWIMMING SPEED





ANIMAL ATHLETES

Some of the greatest athletes of the animal kingdom live in the sea. Only a cheetah can match the speed of a sailfish in pursuit of a meal, while very little escapes the enormous suction power of a nurse shark's mouth. And sometimes fish just want to have fun—jumping, spinning, and even flying high above the waves.

OCEAN GLIDER

FLYING FISH

Oceans are filled with predators, and sometimes there is only one thing a small fish can do to dodge danger: jump right out of the water. Flying fish do even better. They have winglike fins that take them farther through the air. With the help of breezes, they glide just above the surface and land with a splash many feet away. Most have two “wings” to carry them, but some species of flying fish have four and go longer distances. For the takeoff, the fish darts upward through the water and vibrates its tail with amazing speed, before spreading its “wings” to soar through the air.

AT A GLANCE

- **SIZE** 7–20 in (18–50 cm) long
- **LOCATION** Worldwide; most abundant in the tropics
- **HABITAT** Surface waters of the open ocean
- **DIET** Plankton and small fish

Wings extend when gliding in air



STATS AND FACTS

SPEED



45
SEC

LONGEST FLIGHT

HEIGHT REACHED



70
PER SEC

MAXIMUM TAIL BEATS





SUPER GLIDER

The long pectoral fins of a flying fish are high on the sides of the body and work just like the wings of a plane. It cannot flap its fins and so relies on gliding.

**“Flying fish
sometimes
land on
boat decks”**

JUMPING SHARK

BLACKTIP SHARK

This lively shark preys on big schools of fish. It charges through them from below with such great speed that it jumps out of the water. Groups of blacktip sharks gather together to hunt and their excitement can build up into a feeding frenzy. As they attack, they twirl around in the water like a corkscrew, which continues into an acrobatic spin.



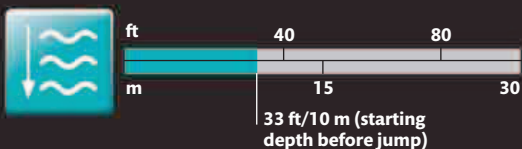
AT A GLANCE

- **SIZE** 4¼–6½ ft (1.3–2 m) long
- **HABITAT** Oceans near continents and islands, including bays, river mouths, and coral reefs
- **LOCATION** Worldwide in warm and tropical ocean waters
- **DIET** Mainly fish, but also some shrimp, crabs, and squid

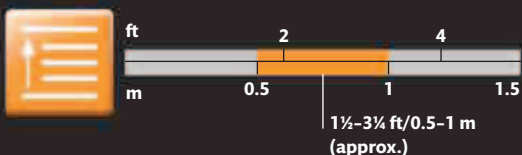


STATS AND FACTS

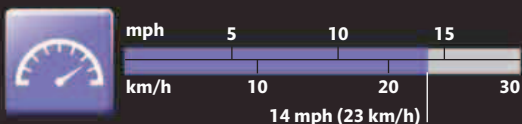
DEPTH



JUMP HEIGHT



JUMP SPEED



UP TO



PUPS PER LITTER

Some sharks jump from the water when they overshoot prey, but others do it to clear their body of parasites and other animals that might cling to their skin.

MAX. SPINS FROM WATER





OCEANS OF FOOD

Fish sometimes gather in schools to make it difficult for predators to focus on a single target, but that doesn't deter blacktip sharks. Instead, they dive speedily through the schools, snapping as they go.

SPEEDIEST SWIMMER

SAILFISH

Nothing in the ocean can match the speed of a sailfish. As it darts around the water, its body flashes blue or yellow, which helps confuse its prey of smaller schooling fish and squid. When it gets especially excited, the sailfish even raises its massive dorsal fin like a sail on its back.

Massive sail-like fin runs down most of body

Built for speed

The sailfish's streamlined body helps it cut through the water with ease. Its muscles are blood-red because they contain a red pigment that stores the oxygen needed to provide bursts of energy. These muscles generate heat, which also helps them work at peak performance.

“Its body can rapidly change color to show its mood”

Heat produced by the eye muscles keeps its eyes warm and may help it see in dim light

Long pointed bill used to jab and slash at schools of fish

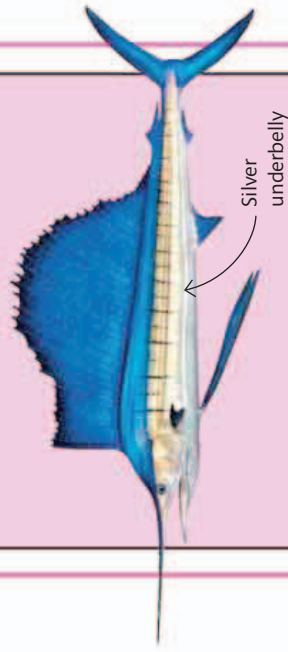


HERDING SCHOOLS

Sailfish usually keep their sails flat against the body when they are in mid-chase, but they can pull them up as a way of scaring schools of fish into tighter bunches, before attacking with their sharp bills.

Long, tapering pelvic fins lie in grooves along the body when the fish is swimming fast, making it more streamlined

AT A GLANCE



SIZE 7¼–11½ ft (2.4–3.5 m)

HABITAT Warm surface waters of the open ocean

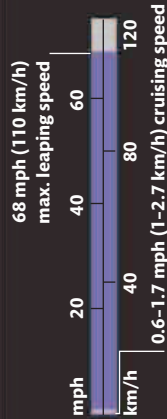
LOCATION Worldwide

DIET Smaller fish and squid

Tail quivers more than 10 times a second during an attack on prey

STATS AND FACTS

SPEED



TIME



82% of day spent near surface

93% of night spent near surface

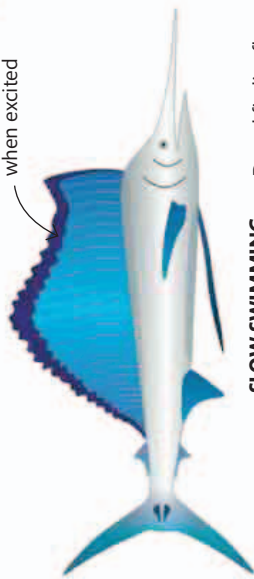
SCHOOL SIZE

UP TO



Bluish upper body and vertical stripes darken when sailfish attacks prey

Dorsal fin forms a sail when excited



SLOW SWIMMING

Dorsal fin lies flat along the back when swimming fast



FAST SWIMMING

RAISING THE SAIL

The sail is a dorsal fin that is supported by stiff rays, which can be raised by muscles controlled by the nervous system. At top speed the sailfish swims with its sail down, but at other times it will raise its sail to signal aggression, fear, or excitement.

Sickle-shaped lobes of tail fin





SUCKER FISH

This nurse shark carries a hitchhiking remora. This is a smaller fish that has a head-sucker so it can attach to the shark and enjoy a free ride. It might also get any scraps of food the shark drops.

“Nurse sharks can suck a conch snail right out of its shell”

FASTEST MOUTH

NURSE SHARK

The **gummy-looking mouth** of a nurse shark doesn't look very threatening, but this fish relies on suction rather than biting. It inflates its throat so much—and opens its mouth so quickly—that any little fish or crab in its path is sucked inside before it has a chance to get away. The loud sucking noise it makes sounds like a nursing baby, and may have given this shark its name. Its teeth are small but sharply pointed, so it can chomp through anything that reaches its jaws. Nurse sharks patrol shallow coastlines mainly at night. By day they like the safety of each other's company and spend their time resting together in dark caves, where they are often found piled one on top of another.

AT A GLANCE

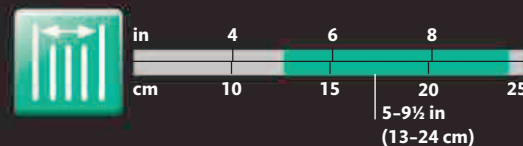
- **SIZE** 7¼–14 ft (2.25–4.3 m)
- **HABITAT** Coastal waters on rocky reefs, over sand flats, and near mangroves
- **LOCATION** Atlantic, Caribbean, and Eastern Pacific coastlines, especially near the equator
- **DIET** Bottom-living invertebrates (such as snails, squid, and crabs) and fish, hunted at night



STATS AND FACTS



MOUTH WIDTH



TIME TAKEN TO GRAB PREY





HUNGRY VACUUM

A nurse shark is not as ferocious as many biting sharks, but it has the right equipment to be a champion sucker. It has a small mouth that faces forward rather than downward. When it spots something, it lowers its head toward the prey. Then, in the blink of an eye, it drops its bottom jaw and purses its strong lips to form a round tube. With a sudden, sharp gulp, the prey is sucked up into the mouth.



LIVING POM-POMS

Many other crabs have chunky pincers, but the boxer crab has slender fingerlike pincers for holding its precious anemones. Should it lose one anemone, it will carefully tear the other in two to make a replacement.





PUT 'EM UP!

BOXER CRAB

Here is a crab that is no bigger than your thumbnail, but what it lacks in size it makes up for in nerve. It clasps a miniature stinging anemone in each pincer and holds them out like a pair of pom-poms or boxing gloves. Should any predator come too close, the boxer crab waves the anemones about, and the stings help keep the danger away. But carrying anemones also has its problems. The crab cannot use its pincers to break up food. Instead it nibbles on plankton that sticks to the anemone's tentacles. When two boxer crabs meet, each makes a show of waving their pom-poms in a pretend fight, but they rarely make physical contact.

AT A GLANCE

- **SIZE** $\frac{3}{8}$ -1 in (1-2.5 cm) shell width
- **HABITAT** Coral reefs
- **LOCATION** Tropical coastlines
- **DIET** Tiny animal plankton, collected with its anemone pom-poms



“Some boxer crabs use their anemones to brush food off rocks”

STATS AND FACTS

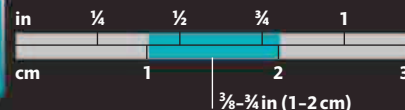
UNDER



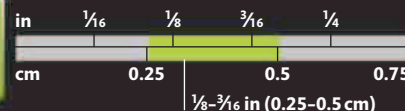
SEC

BOXING SWIPE TIME

LENGTH OF PINCER



DIAMETER OF POM-POM




MAX. TIME FIGHTING



MINUTE

A SHOCKING TAIL

The thresher shark hunts fish and hits them with its long tail. Some are killed by a direct hit, but others are left stunned by the shock of the whip.



“The force of the tail whip is so great that it boils the water at the tail’s tip”

**LONGEST
TAIL COMPARED
TO BODY SIZE**

LASHING OUT

THRESHER SHARK

No other shark hunts quite like the thresher shark. Its tail is as long as its entire body, and is used like a whip to stun prey. Thresher sharks chase around in the open ocean and, like their bigger cousin the great white shark, they can stay active because their blood is warmer than the surroundings. Once they find a school of fish, they circle it to bunch their prey closer together. Then they smack their tails so fast that the shock alone leaves prey floating and ready to eat.

AT A GLANCE

- **SIZE** 12½–25 ft (3.8–7.6 m) long
- **HABITAT** Open ocean waters, especially near continents
- **LOCATION** Worldwide
- **DIET** Mainly schooling fish, such as mackerel, but also squid



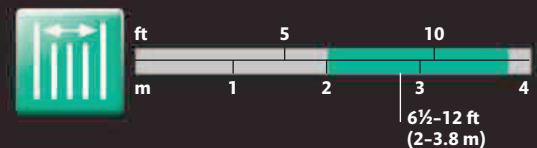
STATS AND FACTS

A thresher's tail is so long that it can reach forward and whip at prey over the top of the shark's head. Pairs or small groups may hunt together and, like some other kinds of energetic sharks, they often jump out of the water.

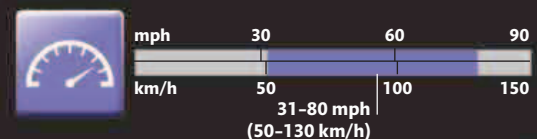
WEIGHT



TAIL LENGTH



SPEED OF TAIL WHIP



LIFESPAN





WHIRLING WONDER

SPINNER DOLPHIN

Dolphins and whales are famous for their playful acrobatics in the ocean. The spinner dolphin is one of the most agile and gets its name from its twisting leaps. It shoots up through the water like a corkscrew, so that when it breaks clear of the surface, it spins in the air. Some dolphins are so eager that they do this many times in succession.

AT A GLANCE

- **SIZE** 4¼-7½ ft (1.3-2.3 m) long
- **HABITAT** Warm ocean waters, usually near coastlines but sometimes on the high seas hundreds of miles from land
- **LOCATION** Throughout the tropical parts of the world's oceans
- **DIET** Fish, squid, and shrimp, mostly taken at night

Long, thin beak



Slender body

SPIN ON THE SEA

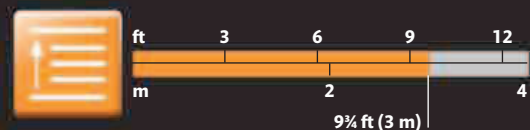
When spinner dolphins get together in groups they like nothing better than to show off. They make spinning leaps headfirst from the water and then land on their side with a big splash.

1.25
SEC

TIME SPENT IN AIR

STATS AND FACTS

LEAPING HEIGHT



DIVING DEPTH



WEIGHT



BUILT FOR SPEED

SHORTFIN MAKO

Meet the champion swimmer of the shark world. The shortfin mako is the fastest shark over long distances and is perfectly capable of catching fast-swimming prey, such as tuna and swordfish. When it's in mid-chase it can make sharp turns in the water, too. All this frantic activity generates a lot of heat in its muscles. Much of this heat is trapped within the body, so the shark is effectively warm-blooded. The shortfin mako lives in the open ocean, but it migrates to tropical waters during the winter months to help keep its body warm.

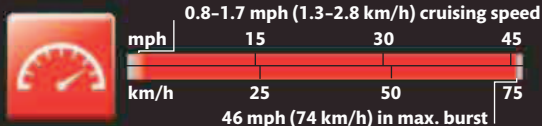
AT A GLANCE

- **SIZE** 10½–13 ft (3.2–4 m)
- **HABITAT** Warm and tropical coastal ocean waters, mainly deep water
- **LOCATION** Worldwide near coastlines
- **DIET** Mainly fish and squid, but sometimes sea turtles and dolphins



STATS AND FACTS

SPEED



DISTANCE TRAVELED



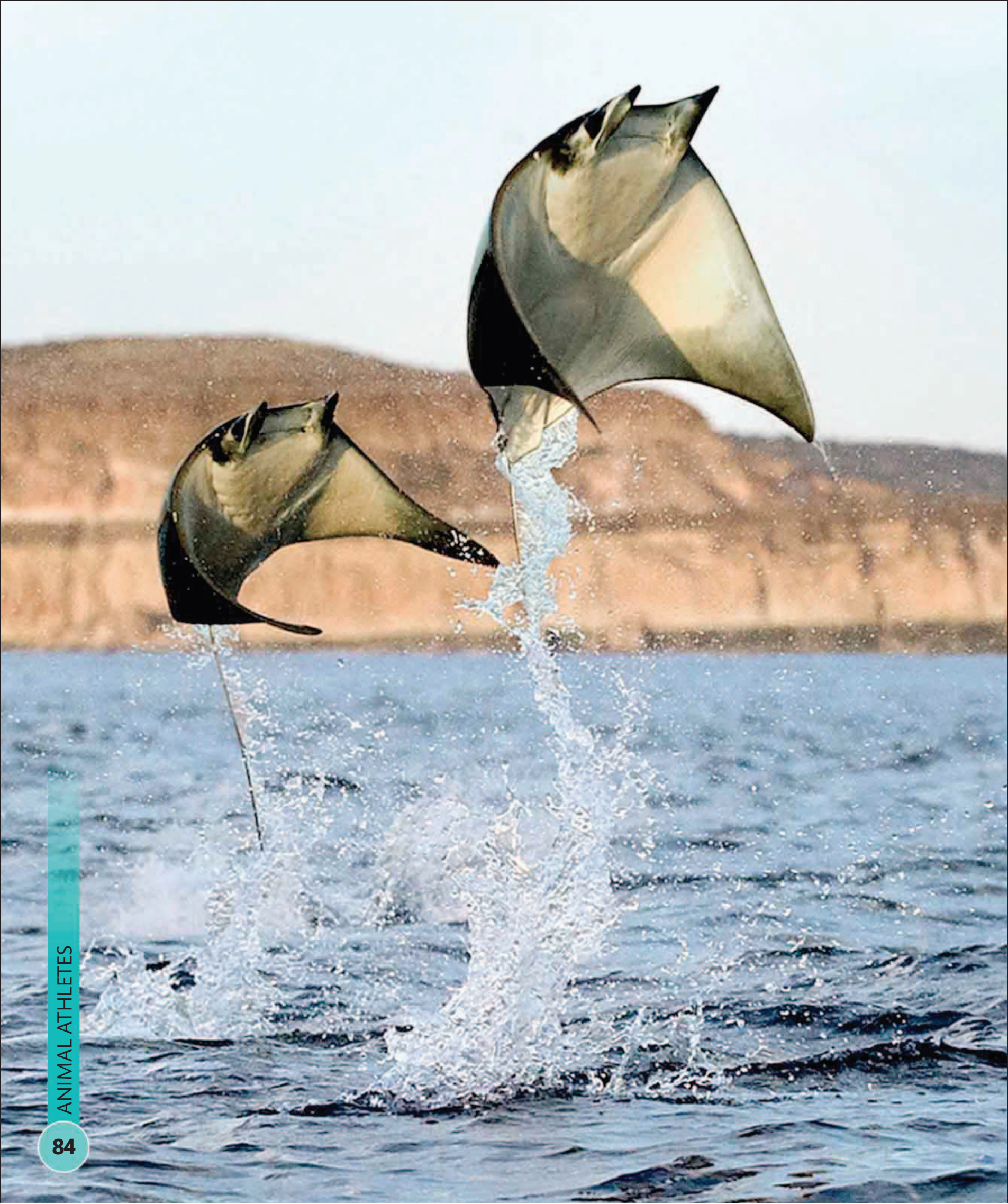
SUPER-FAST SWIMMER

The shortfin mako has the perfect shape for speed—its pointed snout and cylindrical body help it cut cleanly through the water. Its big, half-moon-shaped tail provides the power for rapid bursts of speed.





**FASTEST
SHARK**



“The horns on the ray’s head are fins that funnel food towards its mouth”

FANTASTIC FLYER

MOBULA RAY

When a school of mobula rays puts on a show it is one of the greatest natural wonders of the ocean. Hundreds can jump from the water, flapping their “wings” and doing somersaults. These acrobatics may be to show off to each other or a way to dislodge parasites. It is also possible that they are playing so quickly near the ocean surface that they become airborne by accident.

AT A GLANCE

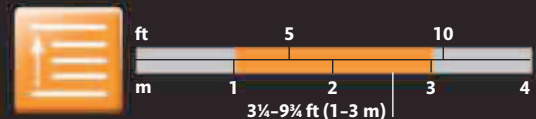
- **SIZE** 3–21 ft (0.9–6.5 m) length including tail; 17 ft (5.2 m) disk width
- **HABITAT** Warm and tropical ocean waters near coastlines
- **LOCATION** Worldwide
- **DIET** Plankton, small crustaceans, and small fish filtered from the water



STATS AND FACTS



LEAPING HEIGHT

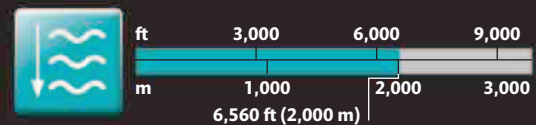


Mobula rays appear to be most active near the ocean surface, but they also dive very deep to feed on tiny planktonic animals.

SWIMMING SPEED



DIVING DEPTH



SPLASHING SPECTACLE

A display of leaping mobula rays is an energetic and noisy spectacle. A group of rays may jump several times in succession, landing in the water with a big splash each time.



SCHOOL CHASER

BRONZE WHALER

A giant school of little fish can sometimes satisfy the appetite of the biggest sharks. Bronze whalers get their name from their coppery color and the fact that they have been seen snacking on dead whales. These sharks cannot resist the annual migration of sardines that moves along the South African coast. Bronze whalers are the most common sharks to be drawn to the spectacle, and arrive in large numbers, with each shark diving deep into the school to feast on the tightly packed bundles of prey.

AT A GLANCE

- **SIZE** 7¾–9½ ft (2.4 m–2.9 m) long
- **HABITAT** Warm and subtropical ocean waters, mainly near coastlines; it also enters estuaries and lower reaches of some rivers
- **LOCATION** Warm coastlines of all oceans and the Mediterranean Sea
- **DIET** Fish, stingrays, spiny dogfish, squid, cuttlefish, and octopuses



FISHY FEAST

The bronze whaler snags mouthfuls of sardines with its sharply pointed teeth. There are so many of the little fish that even when large groups of sharks arrive, they make little impact on the schools.

STATS AND FACTS

ACTIVITY



Females and young most active (during sardine run in June–July)
Males active all year around
January December

DIET



Other prey 35%
Sardines 48%
Cuttlefish 17%

MATURITY AGE



13 years (male)
20 years (female)

Sardines follow currents of cool water when they migrate during the southern winter months of June and July. The migration entices many bronze whalers, including females and young that have been spending their time in shallower nursery waters.



A QUICK LANDING

Gentoo penguins swim so fast they shoot straight out of the water before coming in to land. Speed is not only important for catching prey but also for avoiding predators, such as leopard seals.

“Gentoo penguins can travel 16 miles (26 km) from land during their fishing expeditions”



FASTEST PENGUIN UNDERWATER

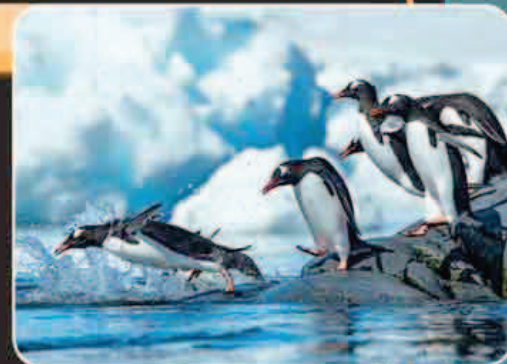
DAPPER DIVER

GENTOO PENGUIN

Short legs, big feet, and an upright body make penguins look comical on land. Even when they are in a hurry, a waddle or belly-slide is the best they can do. But in the water they turn into graceful swimmers and gentoo penguins are the fastest of the lot. They dive into the ocean hundreds of times every day, launching themselves from slippery packs of floating ice and slicing cleanly through the waves. Once underwater, their streamlined bodies and flipperlike wings help them reach speeds of up to 22 mph (36 km/h) to catch fish and other prey—faster than most other kinds of diving birds.

AT A GLANCE

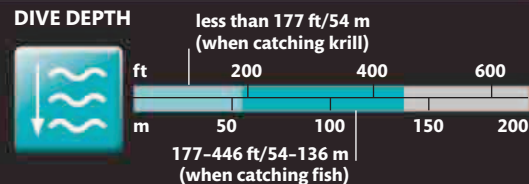
- **SIZE** 30–32 in (76–81 cm) body length
- **HABITAT** Rocky coastlines and adjoining seas
- **LOCATION** Islands around Antarctica
- **DIET** Krill, fish, worms, and squid



STATS AND FACTS



DIVE DEPTH



TIME SPENT





LIFE STORIES

Life in the ocean is tough—it can be cold, dark, and hard to find anything to eat or anywhere to hide. To improve its chances of survival, an animal needs to develop a special skill or way of living that makes the most of its environment and protects it from predators.

PORTABLE NURSERY

Male jawfishes have a bigger mouth than females because only males brood the eggs. There must be enough room inside their mouth to let water flow around the eggs and give them enough oxygen.



MALE MOUTHBROODER

JAWFISH

It looks like a tight squeeze but what better place for baby jawfishes to hide from danger than in their dad's mouth? He scoops up a hundred or so of his partner's eggs in his mouth and cares for them as they develop. Once hatched, he will spit them into the ocean current and his work is done. Then he will return to using his big mouth for shifting sand and stones. In this way he can keep his burrow in order and make sure that it does not cave in. He selects stones and pieces of rock that are just right for reinforcing the sides of his burrow.

AT A GLANCE

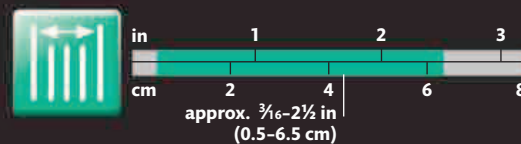
- **SIZE** 1½–20 in (4–50 cm) long
- **HABITAT** Shallow marine coastal waters, where they burrow in sand or silt
- **LOCATION** Western Atlantic, Indian, and Pacific Oceans
- **DIET** Small animals caught on the sea floor or from the plankton



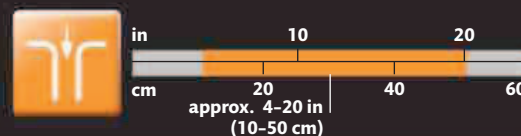
STATS AND FACTS

Jawfish use their big mouths to dig burrows. Some even prop a stone "door" at the entrance for extra protection.

GAPE OF MOUTH



DEPTH OF BURROW



TIME FOR EGGS TO HATCH

7–10
DAYS

COY CURLER

SHY SHARK

There are certain advantages to being a small shark—it is easier to reach tasty worms and fish among the rocks and coral along coastal shallows. However, it makes you a target for fiercer predators, so it helps if you have a strategy for keeping out of their way. Shy sharks certainly live up to their name. They hide to avoid being grabbed by sea lions diving from the shore or bigger sharks coming up from the deep. As a last resort, shy sharks curl themselves into a ring when a danger threatens. A ring shape makes a tricky mouthful for a hungry predator to gulp down.

TIMID RINGMASTER

When a shy shark faces danger it curls its body into a ring and covers its eyes with its tail, so a predator has trouble swallowing it whole.

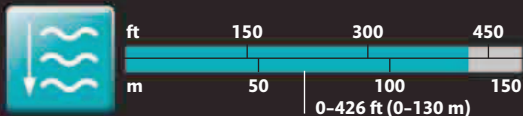
AT A GLANCE

- **SIZE** 19½–29 in (50–73 cm) long
- **HABITAT** Mainly shallow ocean waters with rocky and sandy bottoms or over beds of kelp
- **LOCATION** Southern Africa
- **DIET** Small fish, worms, shrimp, crabs, and squid



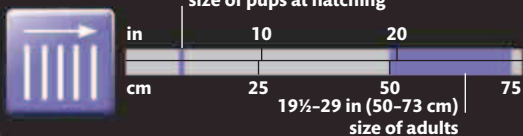
STATS AND FACTS

SWIMMING DEPTH



Unlike most other sharks, shy sharks do not give birth to live young. The pups hatch from egg cases that are laid in shallow waters.

LENGTH



TIME FOR EGGS TO HATCH







**“The biggest
sardine schools
are so large
they are visible
by satellite”**

SUPER-SIZED SCHOOL

SARDINE

Some kinds of fish love to get together, and when sardines assemble they make some of the biggest schools of all. Each year, billions of them follow the cool ocean currents that stream up the east coast of Africa, making such a spectacle that the event is called the sardine run. The total weight of moving animals might be the heaviest migration on the planet. Sardines are small fish of the herring family that find safety in numbers. A big school might look like easy pickings, but a predator will find it difficult to focus on a single moving target among the silver, shimmering mass of fish.

AT A GLANCE

- **SIZE** 6-12 in (15-30 cm) long
- **HABITAT** Open ocean waters, but especially near continents with an abundance of plankton
- **LOCATION** Worldwide
- **DIET** Small planktonic animals



SCHOOLING TOGETHER

A massive school of sardines moves about like a single gigantic living thing. A single fish is safer mixed among lots of others, and by streaming together it might take less effort to swim, too.

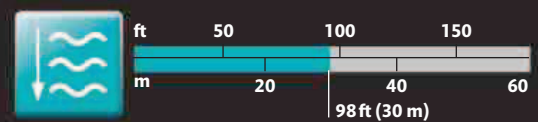
STATS AND FACTS

LENGTH OF A GIANT SCHOOL

No one is sure why a giant sardine run comes together to school, but some think it is triggered by yearly changes in the ocean currents.



DEPTH OF A GIANT SCHOOL



EST. SCHOOL SIZE



REPTILE ON THE ROCKS

MARINE IGUANA

Lizards usually keep their feet firmly on dry land, but here is one that is not afraid of getting them wet. On the rocky shores of the Galápagos Islands, off South America, the marine iguana eats nothing but seaweed. Some of this grows above the shoreline, but a large iguana must take a dip into the ocean to really satisfy its appetite.

SEAWEED SNACK

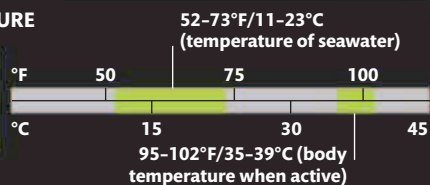
The marine iguana has a blunt snout so it can get its sharp teeth really close to the rocks where seaweed grows. It will nibble green seaweed, but prefers a red type that mainly grows under water.



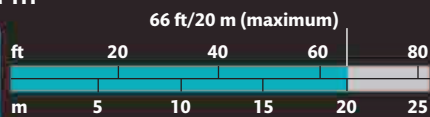
STATS AND FACTS

Like all reptiles, a marine iguana relies on sunshine to warm its body and stay active. When it dives into the cold ocean, its body temperature falls, so it cannot stay there for long. Only big iguanas make dives because smaller ones lose heat too quickly.

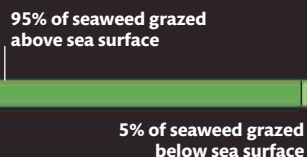
TEMPERATURE



DIVING DEPTH



DIET



MAX. DIVE DURATION



Skin is largely gray or black, but in the breeding season it develops pink or green patches, which may flush a deeper color

Ragged "fin" running along the back and tail helps control position while swimming

Long, side-flattened tail helps provide propulsion when swimming

Iguanas use their stocky heads to butt rivals and may even deliberately sneeze over one another

Super sunbather

The dark skin of a marine iguana soaks up the Sun's rays and helps warm it up. The color, pattern, and size of iguanas varies from island to island. Males are more brightly colored than females.

AT A GLANCE



● **SIZE** 3¼–5½ ft (1–1.7 m) long

● **HABITAT** Rocky shores

● **LOCATION** Galápagos Islands

● **DIET** Seaweed

Strong jaws contain sharp, three-pronged teeth for pulling on seaweed

Salt gland above eye drains into nostril



Face is often encrusted with white patches of salt sneezed out through the nostrils



SALT SNEEZER

Seaweed is so salty the iguana needs special glands in its head to remove extra salt from its blood and stop it from building up. The iguana snorts to clear the salty snot out of its nose.

Sharp claws help grip rocks, especially when the lizard is battered by waves

A HOME WITH A STING

CLOWNFISH

Some animals do strange things to stay safe on an ocean reef filled with predators. For a clownfish family this means snuggling down among the tentacles of an anemone. The tentacles have stingers, but a clownfish is not bothered by them and never swims very far from their reach. In fact, both anemone and clownfish benefit from living together. The clownfish is protected from bigger predators that stay away because they can get stung, and the anemone gets the odd morsel of food dropped when the clownfish grabs a meal from the floating plankton.

AT A GLANCE

- **SIZE** 2–5 in (5–13 cm)
- **HABITAT** On tropical coral reefs, in and around sea anemones
- **LOCATION** Coastal waters of eastern Indian Ocean and western Pacific Ocean
- **DIET** Plankton and dead scraps



STATS AND FACTS

SLIME THICKNESS



up to $1\frac{1}{4},000$ mm (on fish found with anemones)

up to $\frac{1}{4},000$ mm
(on fish not found with anemones)

Clownfish skin is slimmer than the skin of other fish—which may stop the anemone from firing its stings.

DISTANCE TRAVELED



ft 4 8 12
m 2
 $9\frac{3}{4}$ ft/3 m (max. from sea anemone)

TIME SPENT AS LARVAE

8–12
DAYS

AN ODD FAMILY

The home life of a clownfish is centered in an anemone, and involves some very odd ground rules. When a leading female dies, a male turns into a female to take her place.





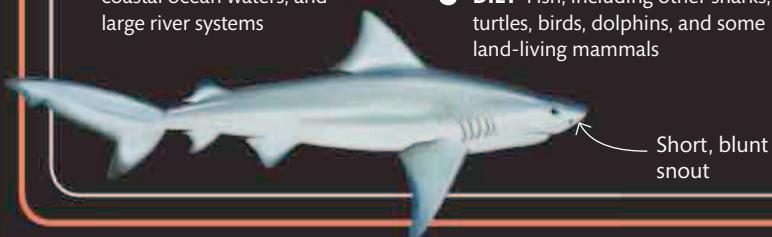
UPSTREAM MARAUDER

BULL SHARK

Almost all sharks need salty ocean water to survive, but the bull shark is just as happy in fresh water. Bull sharks regularly swim up rivers, sometimes for thousands of miles. In some parts of the world they even cross rocky rapids in their river journeys. Coming so far inland can bring them close to popular bathing spots, where they have been known to attack humans.

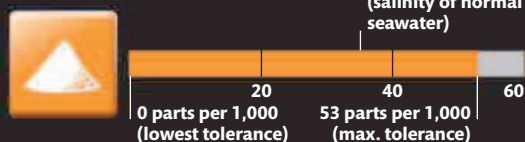
AT A GLANCE

- **SIZE** 7½–11½ ft (2.3–3.5 m) long
- **HABITAT** Warm and tropical coastal ocean waters, and large river systems
- **LOCATION** Near coastlines in tropical regions
- **DIET** Fish, including other sharks, turtles, birds, dolphins, and some land-living mammals

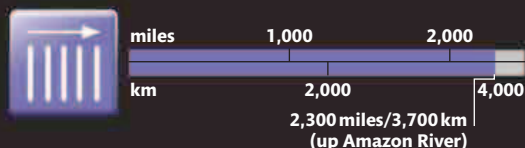


STATS AND FACTS

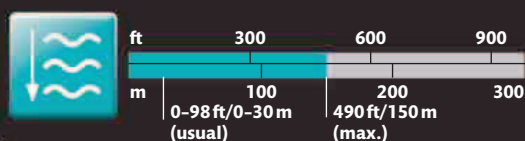
SALINITY TOLERANCE



FARTHEST DISTANCE TRAVELED



SWIMMING DEPTH



Many sharks enter river estuaries, but only bull sharks routinely go inland. Farther upstream, the salinity, or saltiness, of the ocean drops as salty water is replaced by fresh water. Most sharks die without salt in the water, but the bull shark does just as well in rivers as in the ocean.

BEACH CRUISER


There is plenty of prey close to shorelines, and even more in estuaries and rivers. Bull sharks catch fish wherever they go, but big ones may even attack land animals that venture into the water.



ANGLING FOR TROUBLE

Bull sharks are perfectly at home in the cloudy waters of river estuaries. Tides, waves, and bad weather stir up the mud at the mouths of rivers. Despite this, bull sharks can still sense their prey through the murky water. They are drawn to activity along the river, often inspecting fishing boats or even anglers on the shore. By cruising into the shallows they hope to make a grab for anything that ventures into the water.



An underwater photograph showing two sharks in a sandy environment. One shark is in the foreground, partially visible on the left, and another is in the center, facing left. The water is clear and blue. A circular graphic with concentric lines is overlaid on the upper part of the image, containing text.

**“A bull shark
head-butts its
prey to disorient
it before taking
a bite”**





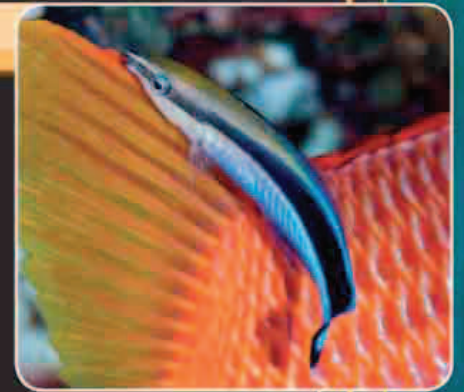
UNDERWATER VALET

BLUE-STREAK CLEANER WRASSE

It can be difficult for a fish to stay clean and healthy on a busy ocean reef. The reef has tiny animals called parasites that cling to fish to eat their skin and blood. The blue-streak cleaner wrasse is nature's answer to this problem. It patrols a spot on the reef that other fish know well. When one of them visits, the wrasse greets its "customer" with a little dance, before nibbling away to remove its parasites and giving the fish a thorough grooming.

AT A GLANCE

- **SIZE** 5½-8½ in (14-22 cm) long
- **HABITAT** Coral reefs and lagoons, staying close to "cleaning stations"
- **LOCATION** Red Sea and near coastlines of Indian Ocean and western Pacific Ocean
- **DIET** Parasites and slime from the bodies of other fish



CLEANING THE GILLS

The tiny cleaner wrasse gets food by eating parasites. Its client stays still while the wrasse sets to work over its body, sometimes going right inside the gills for a really deep clean.

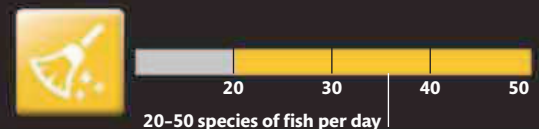
STATS AND FACTS



NUMBER OF PARASITES EATEN PER DAY



CUSTOMERS AT CLEANING STATION



TIDEPOL CRAWLER

BROWN-BANDED BAMBOO SHARK

Being a small shark has its advantages. The slim-bodied bamboo shark has no trouble living in shallow pools around tropical coastlines, where it can get plenty of food by reaching between rocks for prey. It is so at home that it is not even bothered by the tides. Other fish must scurry into deeper water when the tide goes out, but the bamboo shark is happy to find a moist spot and wait for the water to return.

AT A GLANCE

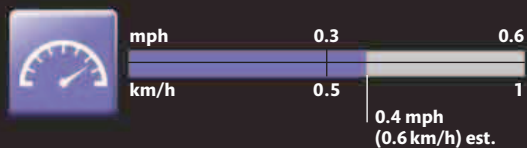
- **SIZE** 3–4 ft (0.9–1.2 m) long
- **HABITAT** Coral reefs and tidal pools
- **LOCATION** Coastlines of northern Indian Ocean and western Pacific, including India, Philippines, Japan, and Australia
- **DIET** Small bottom-living fish, worms, and crabs

Bands hardly visible on adult shark



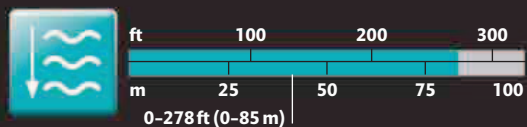
STATS AND FACTS

WALKING SPEED



In shallow pools, bamboo sharks can use their strong pectoral fins for “walking” over rocks, sometimes emerging from the water.

DEPTH





BANDED BABY

Most sharks lack distinct markings, but young bamboo sharks have bold dark bands around their body. As the babies grow to adult size these bands fade until only the plain color remains.

STUPENDOUS SWARM

ANTARCTIC KRILL

Try to imagine a crowd of animals with a thousand times more individuals than there are people in the whole world. Shrimplike krill swim in the open ocean and get together in colossal swarms that are the biggest on the planet. Each krill catches tiny morsels of food with its feathery legs. The huge weight of a tightly packed swarm of krill is, in turn, food for many bigger animals including fish, whales, seals, and penguins.

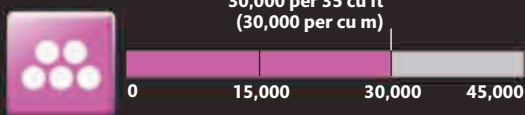
AT A GLANCE

- **SIZE** Up to 2½ in (6.5 cm) long
- **HABITAT** Cold open ocean
- **LOCATION** Southern Ocean; most abundant around the Antarctic continent and islands
- **DIET** Green plankton, such as microscopic algae



STATS AND FACTS

KRILL IN A SWARM

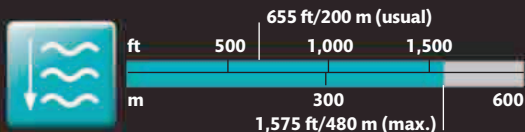


The biggest and densest swarms of krill are made up of younger, more buoyant individuals. Mature krill need more room and live in scattered swarms that are one-tenth as large.

TOTAL WEIGHT



SWIMMING DEPTH



EGGS LAID AT A TIME

10,000



**“Krill can flash
like little
headlights to
confuse predators”**

FEEDING SWARM

Every day billions of krill move up from the depths to feed on algae growing on the underside of the ice sheets. The huge swarms cause a feeding frenzy among fish and birds waiting near the surface.

“The big blunt head of the megamouth has led to it being mistaken for an orca”



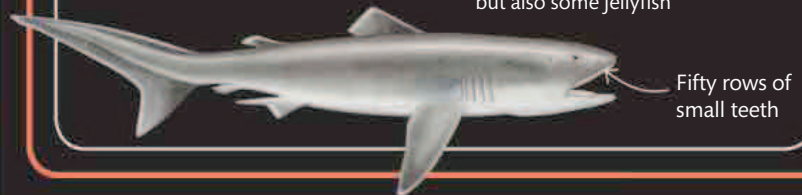
MYSTERIOUS GIANT

MEGAMOUTH SHARK

The ocean is big enough to hide its secrets for a long time, even something as big as the megamouth shark. This deep-sea giant wasn't discovered until 1976, when one was caught off Hawaii, and hasn't been seen much since. It feeds on swimming shrimplike animals called krill by gulping in seawater and filtering out the tiny prey using its gills.

AT A GLANCE

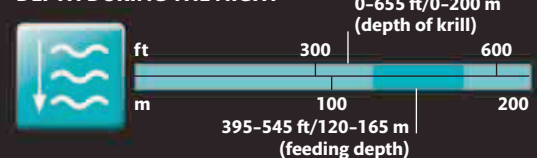
- **SIZE** 13-18 ft (4-5.5 m) long
- **HABITAT** Mainly open ocean in warm regions, but also seen near the shore
- **LOCATION** Widespread in the subtropics and tropics; recorded from California, Brazil, Africa, Japan, SE Asia, Australia, and Hawaii
- **DIET** Mainly krill and small shrimp, but also some jellyfish



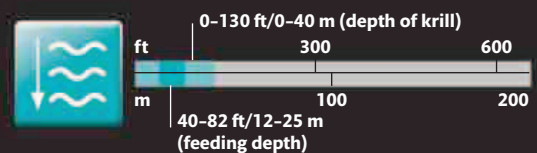
STATS AND FACTS

The megamouth has fewer prey-detecting sensory pores on its short snout than longer-nosed sharks, but they are still effective for detecting food. It tracks krill at the surface by day and to deeper water at night.

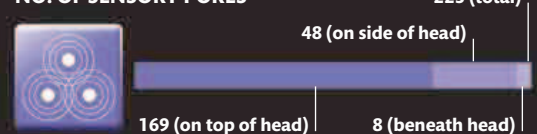
DEPTH DURING THE NIGHT



DEPTH DURING THE DAY



NO. OF SENSORY PORES



SECRET SUCKER

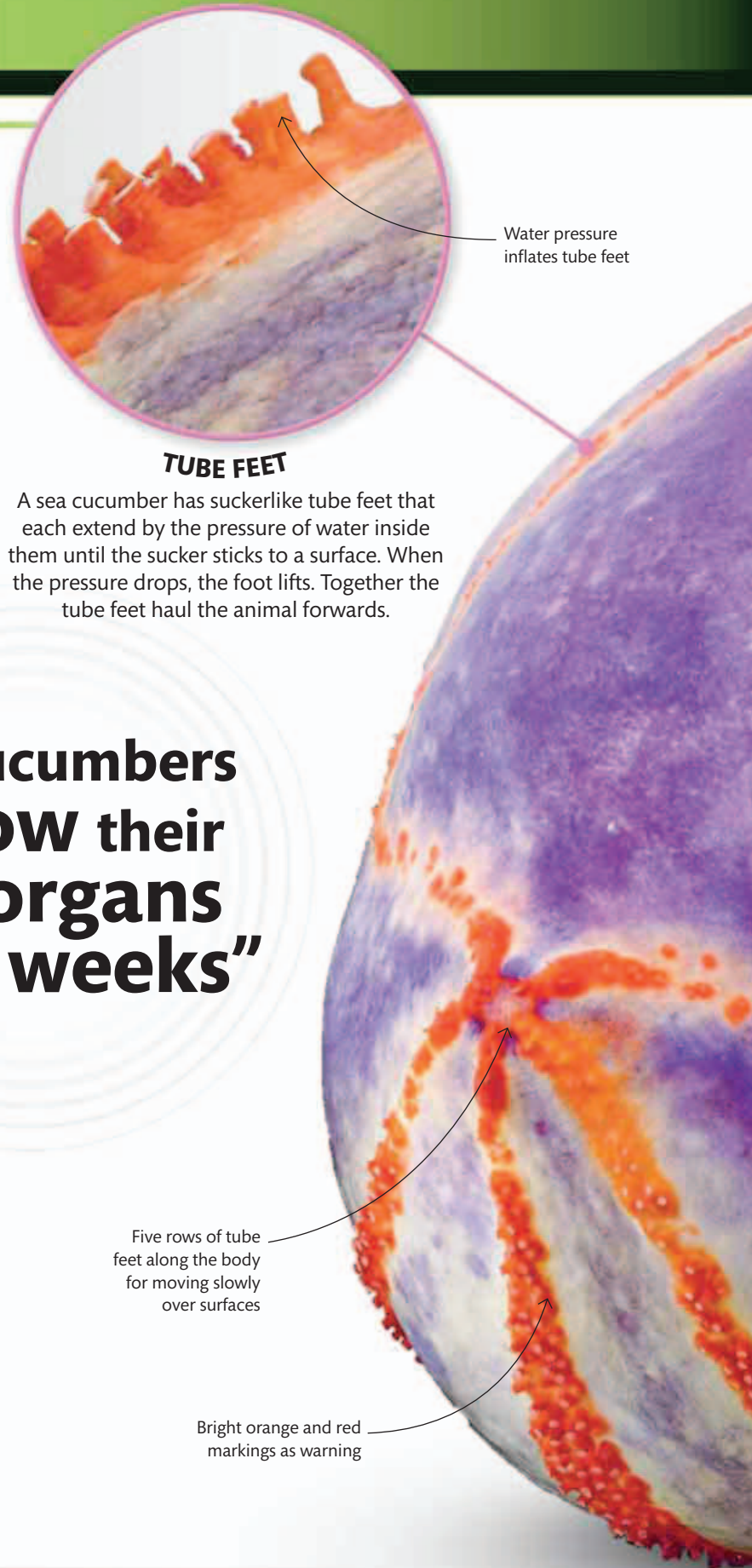
Although no one has seen a megamouth feeding, scientists think that it sticks out its huge jaws to suck in water. Tiny swimming animals, such as krill, are then trapped by bristlelike rakers on the gills.



INSIDE-OUT TRICKSTER

SEA CUCUMBER

An animal that looks like a juicy sausage is sure to attract the attentions of a predator, but a sea cucumber may not be such a tasty feast. This flabby-bodied, slow-moving animal lives on the sea floor and seems quite helpless. Some types of sea cucumbers have bright colors as a warning that they contain poisons in their flesh. If that doesn't work, they resort to drastic measures: they squirt out their innards in a sticky mess—usually enough to send the hungriest prowler on its way.



Water pressure inflates tube feet

TUBE FEET

A sea cucumber has suckerlike tube feet that each extend by the pressure of water inside them until the sucker sticks to a surface. When the pressure drops, the foot lifts. Together the tube feet haul the animal forwards.

Five rows of tube feet along the body for moving slowly over surfaces

Bright orange and red markings as warning

AT A GLANCE

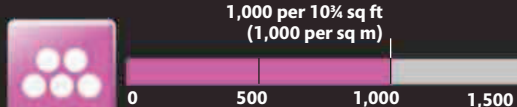


- **SIZE** 4 in–11 ft (0.1–3.3 m) long
- **HABITAT** On the seabed, from deep sea to shallow coastlines
- **LOCATION** Worldwide
- **DIET** Plankton and decaying material

“Sea cucumbers regrow their body organs in two weeks”

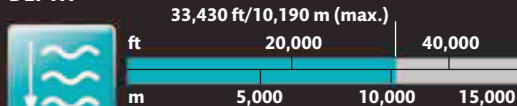
STATS AND FACTS

DENSEST POPULATION



Some species of deep ocean sea cucumbers are so abundant they are the most common animal for miles around.

DEPTH



MAXIMUM LIFESPAN





Bristly tips of feeding tentacles move around to trap food particles in surrounding seawater



TENTACLE EXTENSION

The bristly tentacles around the mouth of a sea cucumber are extra-long tube feet (see left). They are used like sticky fingers to trap any food particles floating by and feed them into the body.

INNARDS OUT

It is difficult to tell if a sea cucumber is startled until it suddenly does its nasty inside-out trick. This is a sea cucumber's secret weapon to defend itself. By using muscles to squeeze its body wall, the sea cucumber's gut shoots straight out of its bottom. Sometimes this is mixed with special tacky threads too—as seen here—and they will stick to the face of any predatory fish that comes too close. Amazingly, sea cucumbers have no trouble completely rebuilding their insides after this has happened.



Sea apple swallows water to swell up when alarmed

Colorful oddity

The sea apple is an especially brightly colored species of sea cucumber but it is not as delicious as its fruity name suggests—it releases a foul soapy substance when alarmed.

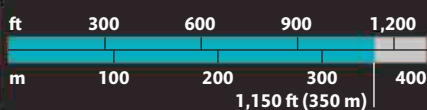
CRAB KILLER

STARRY SMOOTH-HOUND

Strong jaws are more important than cutting teeth when you spend your life munching on crabs. The starry smooth-hound, named for the small, white, star-shaped markings on its body, eats little else and has done away with biting blades altogether. Instead, its mouth has rows of tiny overlapping teeth that act as a rough grinding surface, perfect for taking a firm hold on a crab's shell. Then it is up to the powerful jaw muscles to crunch through to the meat.

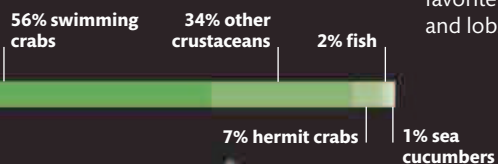
STATS AND FACTS

MAXIMUM DEPTH



The starry smooth-hound swims close to the bottom, where it is most likely to find its favorite prey: crabs and lobsters.

DIET



AT A GLANCE

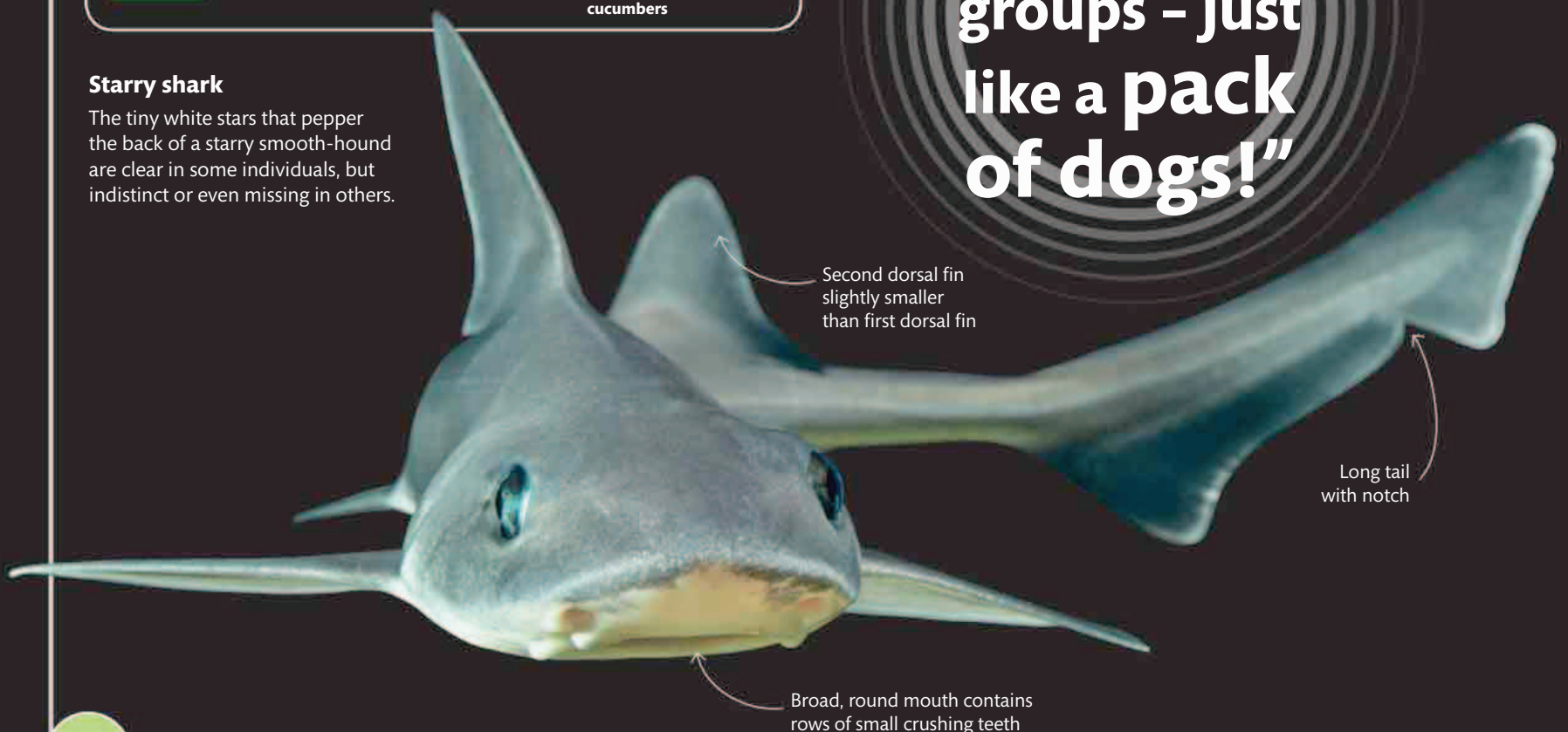


- **SIZE** 4½–5 ft (1.4–1.5 m)
- **HABITAT** Coastal marine waters with sandy and gravelly bottoms
- **LOCATION** Northeastern Atlantic Ocean, North Sea, and Mediterranean Sea
- **DIET** Mainly crabs, hermit crabs, and lobsters

“Smooth-hounds feed in groups – just like a pack of dogs!”

Starry shark

The tiny white stars that pepper the back of a starry smooth-hound are clear in some individuals, but indistinct or even missing in others.



LONG-LIVED HUNTER

SPINY DOGFISH

The **spiny dogfish** might be one of the smallest sharks in the ocean, but what it lacks in size it makes up for in ferocity. It hunts in packs and does not hesitate to attack big prey. Its jaws and teeth work like shears to cut flesh. Although it is an active predator, it lives its life at a slow pace, and lives longer than many larger sharks.

“Spiny dogfish often bite through nets to eat a fisherman’s catch”



Large eyes help it hunt in deep, dark water

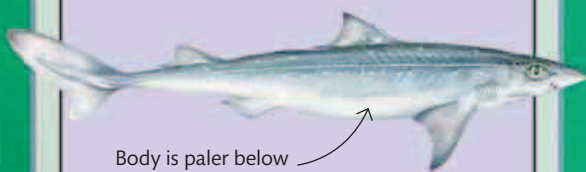
White venomous spine on front of each dorsal fin

White spots along the back

Sting in the fin

The spiny dogfish gets its name from the short spines in front of its dorsal fins. They are mildly venomous, but the dogfish has to arch its back to stab attackers.

AT A GLANCE



Body is paler below than on the back

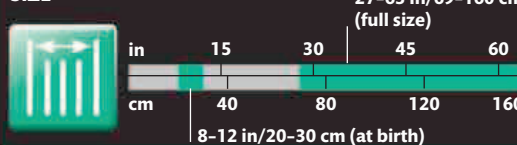
- **SIZE** 2¼–5¼ ft (0.7–1.6 m) long
- **HABITAT** Deep ocean waters near the coast
- **LOCATION** North Atlantic, North Pacific, and close to southern coastlines of South America, South Africa, Australia, and New Zealand
- **DIET** Fish, squid, octopuses, crabs, and jellyfish

STATS AND FACTS

AGE TO BECOME MATURE



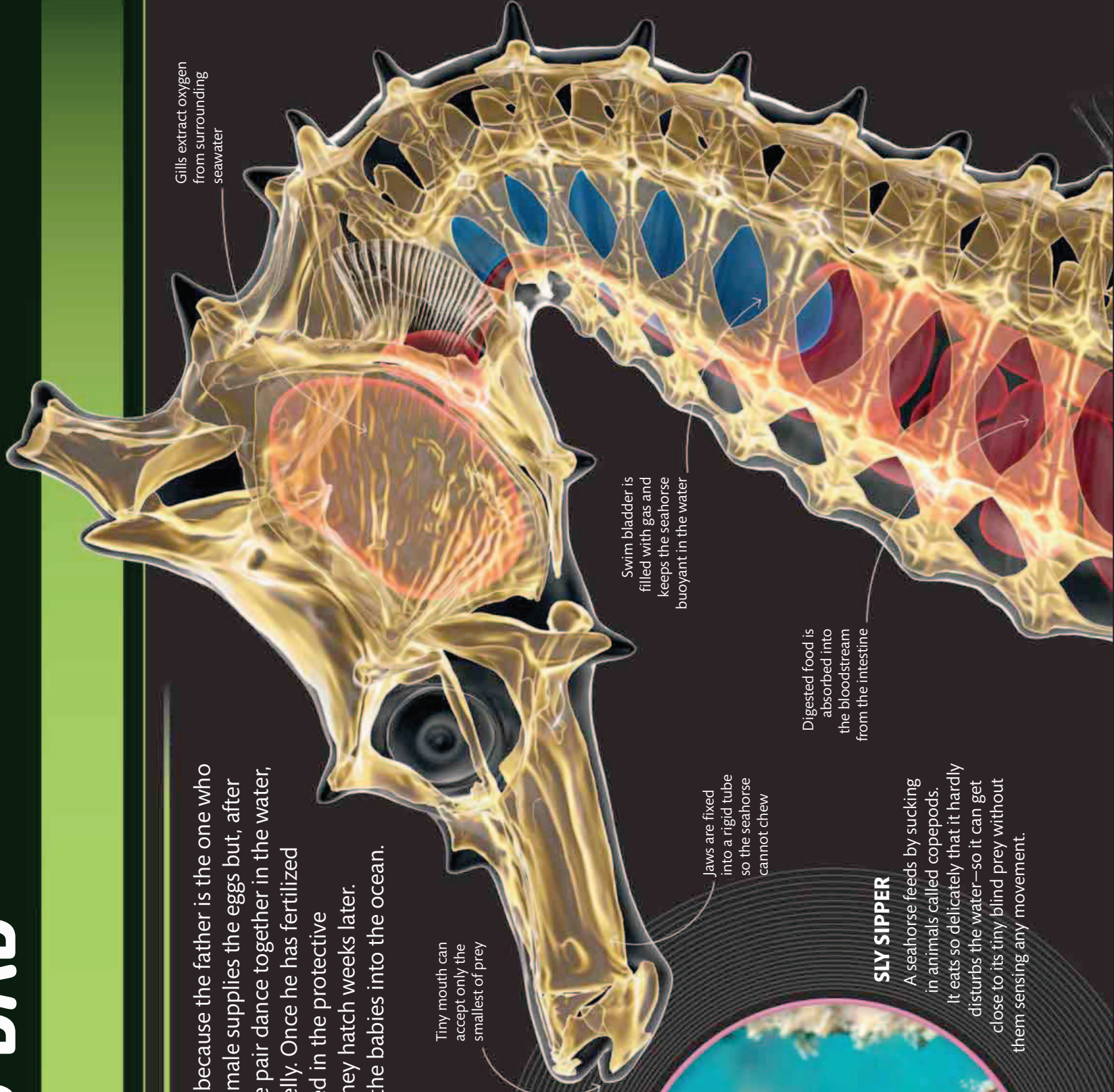
SIZE



DEVOTED DAD

SEAHORSE

Seahorse family life is unusual because the father is the one who gives birth. Like all animals, the female supplies the eggs but, after a long courtship during which the pair dance together in the water, she lays them in a pouch in his belly. Once he has fertilized them, the eggs become embedded in the protective spongy lining of his pouch until they hatch weeks later. Then the male seahorse releases the babies into the ocean.



Gills extract oxygen from surrounding seawater

Swim bladder is filled with gas and keeps the seahorse buoyant in the water

Digested food is absorbed into the bloodstream from the intestine

Tiny mouth can accept only the smallest of prey

Jaws are fixed into a rigid tube so the seahorse cannot chew

Eyes can move independently of each other and in all directions, like a chameleon



SLY SIPPER

A seahorse feeds by sucking in animals called copepods. It eats so delicately that it hardly disturbs the water—so it can get close to its tiny blind prey without them sensing any movement.

AT A GLANCE

- **SIZE** 1¼–14 in (3–35 cm) long
- **HABITAT** Shallow coastal ocean waters
- **LOCATION** Worldwide
- **DIET** Tiny swimming animals, such as copepods and plankton



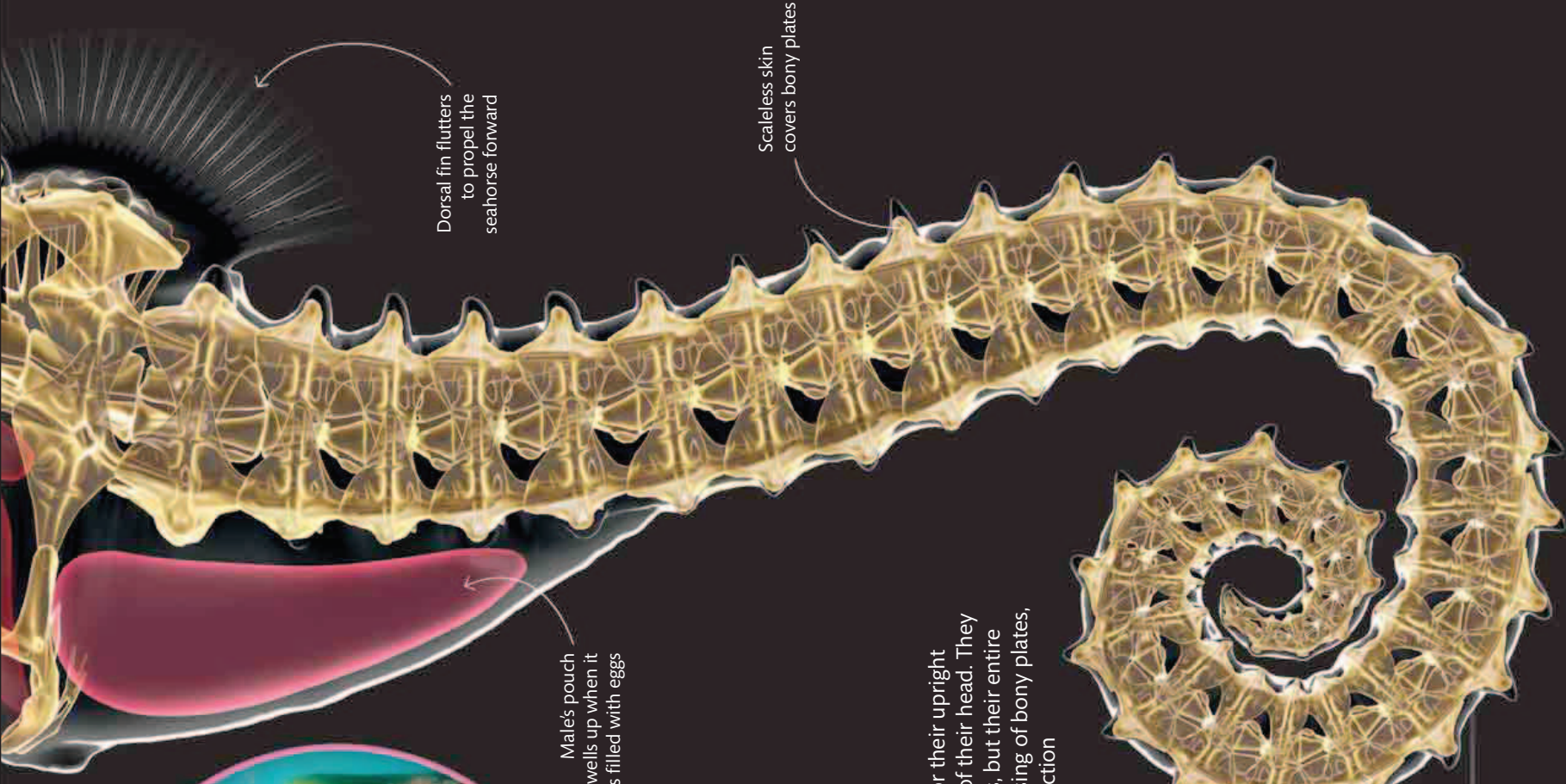
Head fins used for steering



A LONG BIRTH

Seahorse babies get food and oxygen in their dad's pouch—just like in a real pregnancy. When the time comes he may even suffer hours of contractions to release them into the water.

Male's pouch swells up when it is filled with eggs

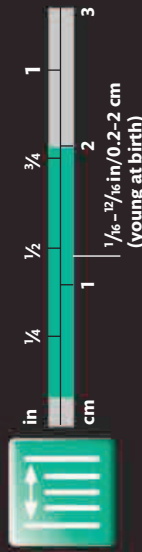


Dorsal fin flutters to propel the seahorse forward

Scaleless skin covers bony plates

STATS AND FACTS

LENGTH



There are more than 50 species of seahorses. The largest ones usually live longer, have longer pregnancies, and produce more babies per brood.

DURATION OF PREGNANCY



AGE



YOUNG PER BROOD



Armor plating

Seahorses are named for their upright posture and the shape of their head. They are very slow swimmers, but their entire body is encased in a casing of bony plates, which gives some protection from predators.

Long tail is prehensile, meaning it can be used to grip objects

SPOTTED SUCKER

Zebra sharks spend their time cruising slowly around coral reefs. They catch their prey by sucking animals that live on the ocean floor out of the sand and into their mouth.



COSTUME CHANGER

ZEBRA SHARK

The first scientists to describe this shark had only a zebra-striped youngster to go on, which is how the species got its name. As the shark grows bigger, it changes its skin pattern and the stripes are replaced with leopardlike spots. Newborn zebra sharks are especially striking, with a distinct black body and thin white bands. It is possible that this protects them from danger because predators think they are banded sea snakes, which are highly venomous. If true, this may be the only case where a shark mimics the appearance of another kind of animal.

AT A GLANCE

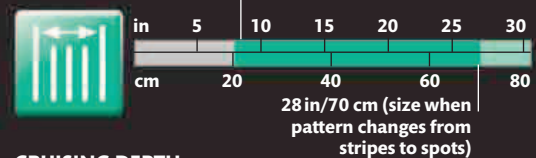
- **SIZE** 4¾–7¾ ft (1.45–2.35 m) long
- **HABITAT** Shallow tropical waters near the ocean floor—especially on coral reefs and sandy banks; sometimes enters brackish waters
- **LOCATION** Red Sea and coastal areas of the Indian and western Pacific Oceans
- **DIET** Snails, small fish, crabs, shrimp, and sea snakes



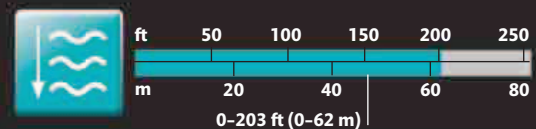
STATS AND FACTS

Baby zebra sharks must grow to more than twice their hatching size before their stripes start changing to spots.

SIZE



CRUISING DEPTH



DEMON STINGER

SPINY DEVILFISH

The **spiny devilfish** is almost impossible to spot on a brightly colored bed of a tropical reef. Sometimes it is even half buried in the sand. The devilfish crawls along the ocean floor using its fins like legs. Then it waits very still for prey to come close before lunging with its enormous mouth. It has little to fear: with venomous spines sticking up from its back, it will give a nasty shock to any shark unwise enough to make a grab. These dangerous spines have even been known to kill a human.

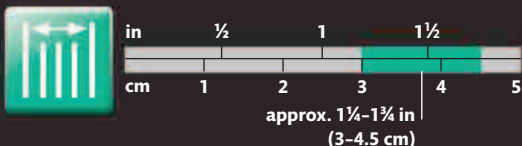


AT A GLANCE

- **SIZE** 7–10 in (18–25 cm)
- **HABITAT** Coral reefs, lagoons, and sometimes around estuaries—usually over sand or mud, and often buried so it cannot be seen
- **LOCATION** Eastern Indian Ocean and western Pacific from China south to Australia
- **DIET** Small fish, shrimp, and crabs

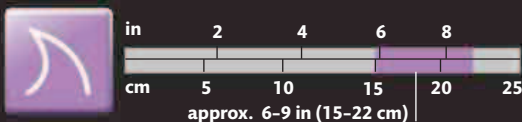
STATS AND FACTS

SPINE LENGTH



The venomous spines of the devilfish form part of the fin that runs along its back. They stick up when danger threatens.

SPAN OF PECTORAL FINS





STINGING AMBUSH

The devilfish's skin is covered in wrinkles and warts to help it blend in with the surrounding coral and seaweed. It is a slow swimmer and cannot catch a meal simply by chasing it, so it needs to take prey by surprise.

**“The frilled
shark’s ancestry
dates back to
150 million
years ago”**





LIVING FOSSIL

FRILLED SHARK

Looking more like a mythical sea snake than a shark, this deep-sea monster belongs to a group of sharks whose beginnings stretch far back to the time of the dinosaurs. The frilled shark is strange in many ways. Its spine is incomplete, so its back is supported by a rubbery rod, and it has six gill slits, whereas most sharks have five. Its head looks as though it should belong to a lizard, and inside its wide jaws there are hundreds of three-pronged needle-sharp teeth that can bite slippery squid.

AT A GLANCE

- **SIZE** 4¼–6½ ft (1.3–2 m) long
- **HABITAT** Deep ocean waters, usually near continents
- **LOCATION** Worldwide
- **DIET** Fish (including other sharks) and squid



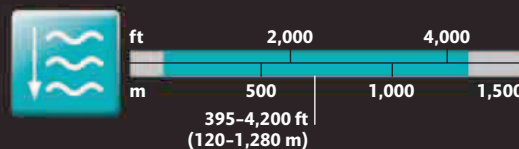
FRILLY FACE

The frilled shark gets its name from the ruffled gill edges that connect underneath its head to form a collar. This strange shark is rarely seen, preferring to keep to deep ocean waters, so is little studied.

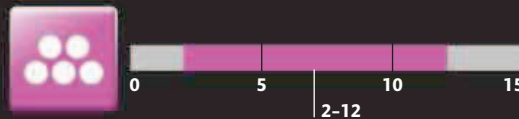
STATS AND FACTS

SWIMMING DEPTH

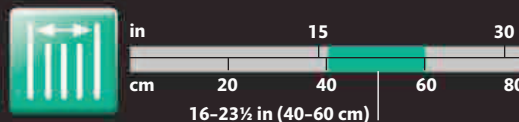
Like most other kinds of sharks, frilled sharks give birth to live young. However, their pregnancy is one of the longest of any kind of animal.



PUPS PER LITTER



SIZE OF PUPS AT BIRTH



GESTATION PERIOD



MOST DEVOTED MOTHER

COMMON OCTOPUS

It's a short life for an octopus—sometimes not much more than a year—but up to two months of that can be taken up with raising a huge family. An octopus mother produces around a quarter of a million eggs, which she hangs in strings from rocks. She gives up hunting to concentrate on looking after her brood and protecting them from predators. By the time they hatch she is usually so weak from starvation that she dies.

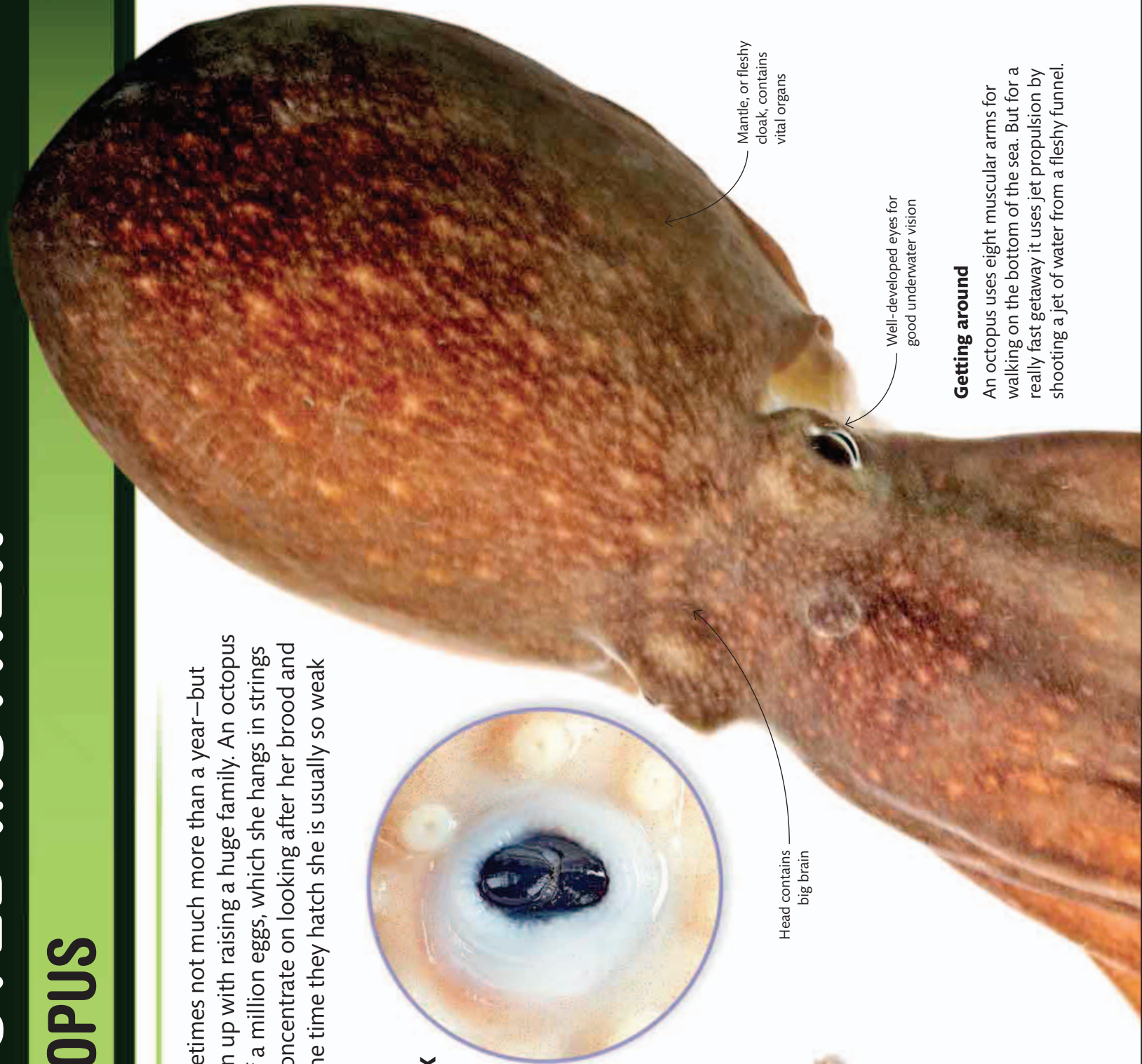
BITING BEAK

The beak is the only hard part of an octopus's body. It lies in the center of the body and is strong enough to crunch up most prey, including tough-shelled crabs and lobsters.

AT A GLANCE



- **SIZE** 5–9½ ft (1.5–3 m) tentacle span
- **HABITAT** Rocky coastal waters
- **LOCATION** Atlantic, Indian, and west Pacific Oceans, Mediterranean Sea
- **DIET** Crabs, crayfish, cockles, and other shelled animals



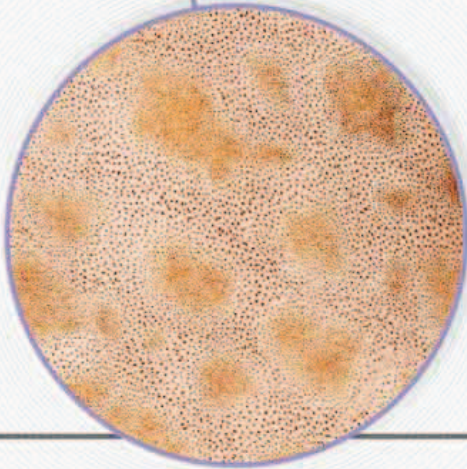
Mantle, or fleshy cloak, contains vital organs

Well-developed eyes for good underwater vision

Head contains big brain

Getting around

An octopus uses eight muscular arms for walking on the bottom of the sea. But for a really fast getaway it uses jet propulsion by shooting a jet of water from a fleshy funnel.



SKIN COLOR

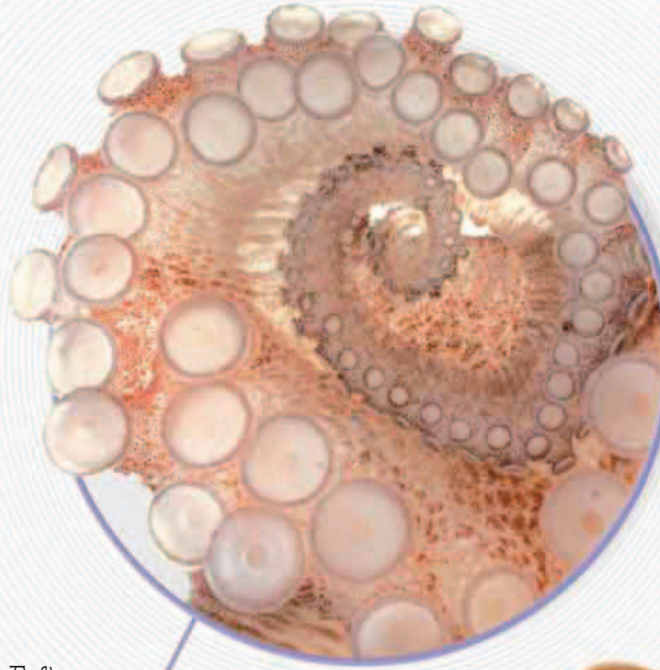
When an octopus changes its mood, tiny droplets of pigment in its skin expand and make it change color. This helps it blend in with its surroundings.



CARE OF EGGS

Nothing will drag a mother octopus away from her precious eggs—not even an empty stomach. She keeps them clean by gently tending them with the tips of her arms and blowing fresh water over them from her funnel. It takes many weeks for them to hatch, during which time the mother can lose a third of her body weight.

Eight long arms surround mouth at base



SENSING SUCKERS

Each arm has two rows of cuplike suckers that can grip objects or prey. They are very sensitive to touch and taste and can sense if something is worth eating.

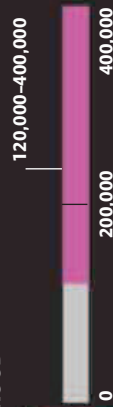
STATS AND FACTS

Thousands of baby octopuses start life floating in the sea but many won't survive its dangers. In two months they sink to the bottom and must then grow up quickly.

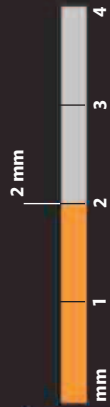
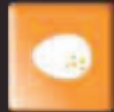
LIFESPAN



EGGS PER BROOD



SIZE OF EGG





STRANDING SURVIVOR

BLIND SHARK

This shark shuns the open ocean and instead spends its life right beside the warm Australian coastline. It is rarely seen during the day because it hides in caves and under rocky ledges. At night it emerges to hunt for small animals on the coral reef. Despite its name, it has reasonably good vision, but if it finds itself exposed to danger, it can pull its vulnerable eyeballs inward and close them with thick eyelids. It can also survive for many hours out of water if it is stranded among rocks when the tide is low.

AT A GLANCE

- **SIZE** 3¼–4 ft (1–1.2 m) long
- **HABITAT** Rocky shorelines, coral reefs, and beds of seagrass
- **LOCATION** Eastern coast of Australia
- **DIET** Small fish, cuttlefish, crabs, and sea anemones



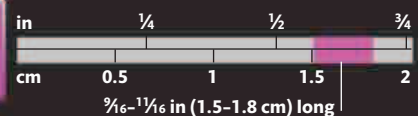
SENSING PREY

Although it has normal vision, the blind shark also uses sensory feelers on the front of its head to sense small animal prey among tangles of seaweed and within the coral reef.

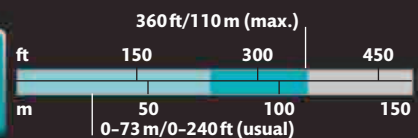
STATS AND FACTS

EYE SIZE

By squinting when out of water, the blind shark can prevent its eyeballs from drying out, and protect them from danger.



DEPTH





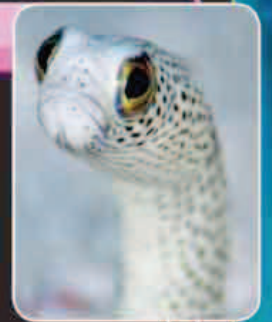
BURROW BOLTER

GARDEN EEL

In the shallows of the ocean a colony of eels pokes out from a patch of sand, looking more like a sprouting reedy garden than a group of fish. They snap at tiny animals floating by in the water, but keep a firm hold on their burrows. If any danger threatens they can dart straight back into the sand, tail first. A long body allows garden eels to get almost everything they need within reach of their burrows, so they rarely venture out for a swim.

AT A GLANCE

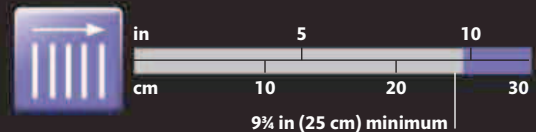
- **SIZE** 12-47 in (30-121 cm) long
- **HABITAT** Marine coastal waters, in colonies in coral sand
- **LOCATION** Worldwide, but with greatest number of species in eastern Indian Ocean and western Pacific Ocean
- **DIET** Small planktonic animals



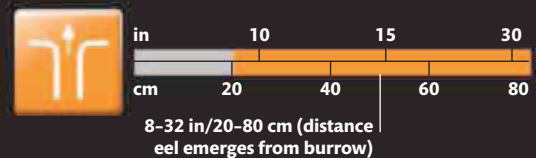
STATS AND FACTS

DISTANCE BETWEEN NEIGHBORS

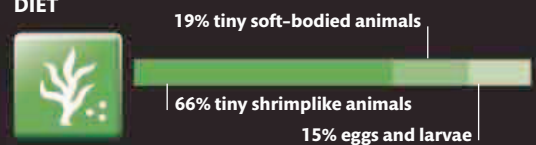
Garden eels stretch out of their burrows leaving a quarter of their body length inside. Neighboring burrows are far enough away to avoid squabbles over food.



DISTANCE EEL EMERGES



DIET



ON THE LOOKOUT

Dozens of garden eels face into a stream of plankton carried on the ocean current. If a pair of eyes spots danger, an eel retreats into the burrow, and all the others do the same.

BIGGEST COLONY



REEF ROVER

Named for the markings on its dorsal fins and tail, the whitetip reef shark is one of the main predators of tropical reefs, but it is often docile toward humans.



CAVE CRUISER

WHITETIP REEF SHARK

There are plenty of places to hide on a rocky coral reef, but some hungry sharks will do their best to search all the crevices. The whitetip reef shark has especially tough skin and a slender body for reaching deep between rocks. Ridges over its eyes, giving it a permanently angry look, provide extra protection. This fish prowls around at night, exploring caves in search of prey, specializing in hunting animals that live on the bottom.

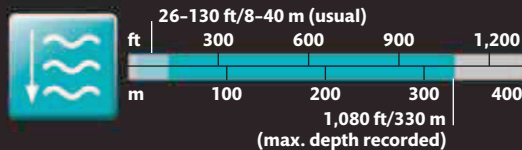
AT A GLANCE

- **SIZE** 5¼–6½ ft (1.6–2 m)
- **HABITAT** Clear coastal waters around coral reefs, often resting in caves
- **LOCATION** Widespread in the tropics and subtropics
- **DIET** Bottom-living animals, including fish, octopuses, crabs, and lobsters



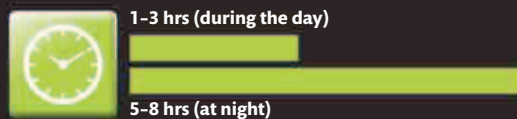
STATS AND FACTS

CRUISING DEPTH

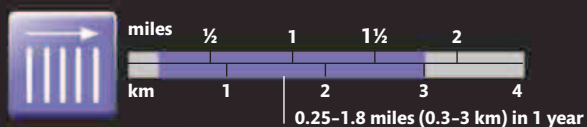


The whitetip reef shark has a very small home range and rarely travels far from its favorite hunting spots. It sleeps during the day in underwater caves.

TIME SPENT SWIMMING



DISTANCE TRAVELED FROM HOME



SHELLFISH SMASHER

SEA OTTER

It can be tricky to break the hard shell of a mussel or a crab. For a hungry sea otter, a small rock is the perfect tool for smashing through to reach the meat. When it finds a shellfish, a sea otter lies on its back with its dinner on its belly. Then, grasping the rock in its front paws, it bangs hard until the shell cracks. This works so well that some otters even carry a rock around with them under a special flap of skin in their armpit. A life spent fishing for seafood is a cold one and the sea otter keeps warm with a thick coat—the densest coat of any mammal.

FLOATING FEAST

It is tough dealing with a crab lunch when you are lying on your back in the water. But sea otters are nicely buoyant—and can even wrap themselves in seaweed to stop themselves from floating off too far.

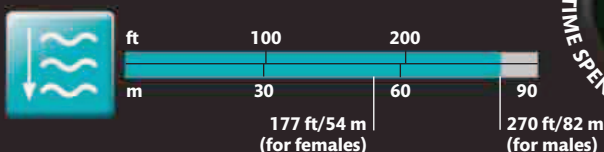


AT A GLANCE

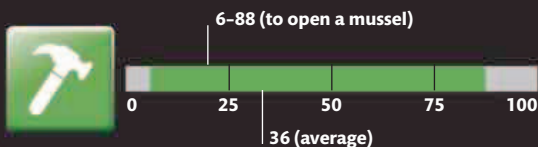
- **SIZE** Head and body 3¼–4 ft (1–1.2 m) long; tail 10–14½ in (25–37 cm) long
- **HABITAT** Shoreline and shallow ocean waters within 0.6 miles (1 km) of coast
- **LOCATION** Northeastern Russia and western coastal North America
- **DIET** Slow-swimming fish, sea urchins, crabs, and mollusks

STATS AND FACTS

MAXIMUM FORAGING DEPTH



NO. OF BLOWS



“Some sea otters even have a favorite rock”



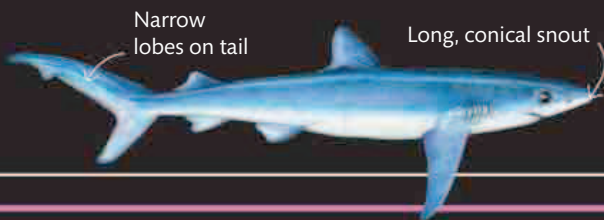
WOLF OF THE SEA

BLUE SHARK

When sharks come together and work as a pack they can make a terrifying hunting team. Blue sharks live in the open ocean. To catch their favorite prey—schools of fish and squid—they use the same tactics as a wolf. Groups of blue sharks swim around a school so that the prey bunch closer together. They then sweep in to grab a mouthful. Blue sharks prefer lower temperatures than other reef sharks, but are found in oceans around the world. When they reach the tropics, they swim deeper to stay in cooler water.

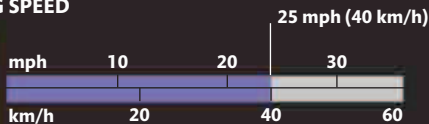
AT A GLANCE

- **SIZE** 7½–12 ft (2.2–3.8 m) long
- **HABITAT** Mainly in the open ocean, but occasionally coming near to coastlines; younger sharks live in more coastal waters
- **LOCATION** Worldwide except in the coldest polar waters; one of the most widespread of all sharks
- **DIET** Mainly fish and squid of the open ocean



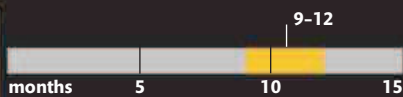
STATS AND FACTS

SWIMMING SPEED



Blue sharks give birth to live young and have some of the biggest litters among sharks.

GESTATION PERIOD




RECORD LITTER SIZE



BLUE IN THE SEA

The blue color of this shark is a perfect disguise as it circles a school of krill. Like many sharks, it has a white underside, a feature that hides it from anything looking up into the sunlight from below.

A large blue shark is swimming in a school of smaller fish near a coral reef. The water is clear and blue, and the coral reef is visible in the background. The shark is the central focus of the image, swimming towards the left. The school of fish is dense and surrounds the shark. The coral reef is on the left side of the image, with various colors of coral and rocks.

“The blue shark is highly migratory, traveling distances of up to 5,720 miles (9,200 km)”

SUPER CLUTCH

LOGGERHEAD TURTLE

Turtles live in fresh and salty waters—but marine turtles grow much bigger than their cousins on land. Instead of legs they have huge, paddlelike flippers that are ideal for swimming, so they spend most of their lives in the ocean. All turtles produce shelled eggs, so even ocean species have to visit the shore to lay them—producing more than a hundred at a time.

Baby turtles hatch from round, leathery eggs



Upper shell is slightly heart-shaped and made up of horny plates

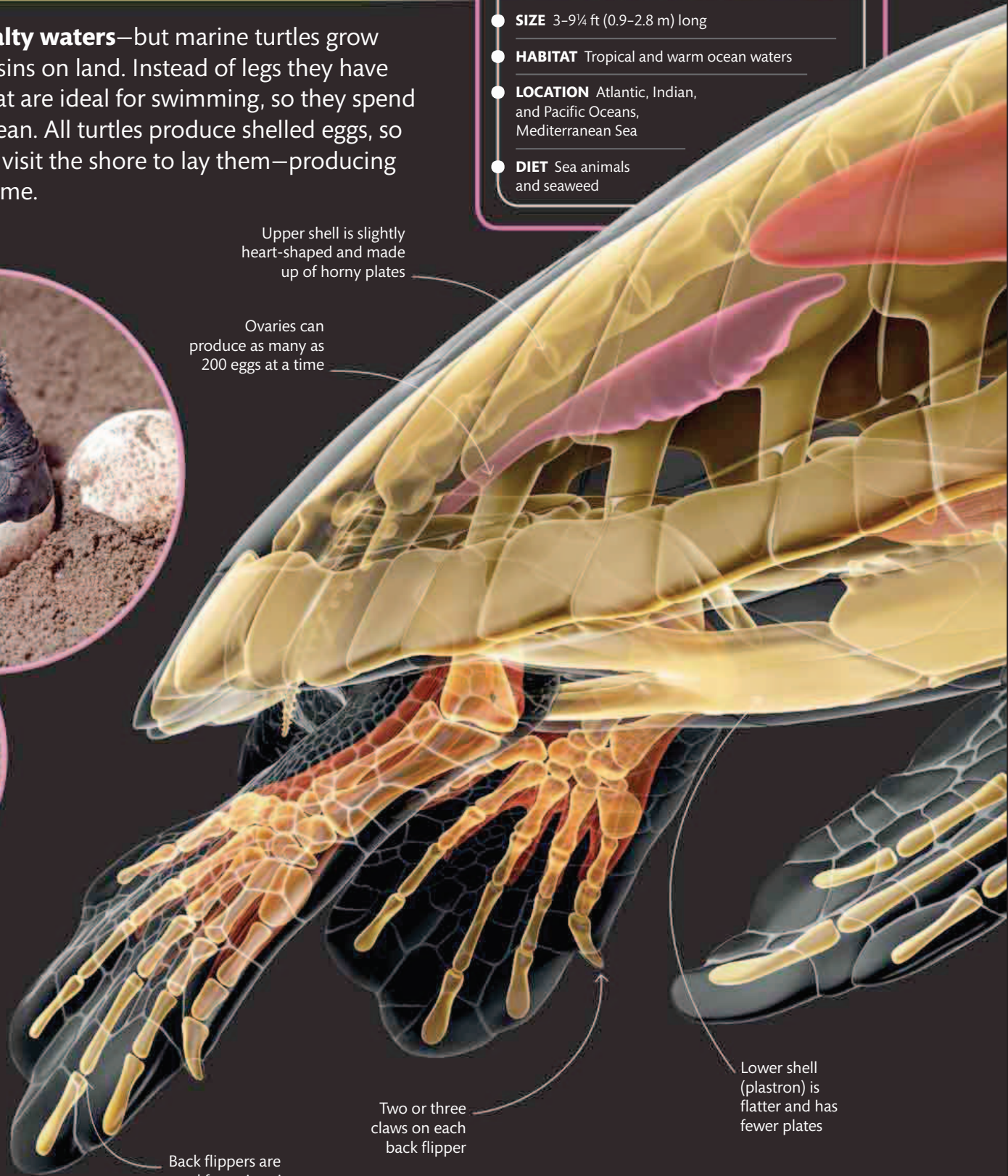
Ovaries can produce as many as 200 eggs at a time



RACE TO THE SEA

Loggerhead turtles bury their eggs on sandy beaches, well out of reach of the tide. When they hatch, the babies have to dig their way out—before waddling as fast as they can to the ocean.

Back flippers are used for swimming and digging nests



Two or three claws on each back flipper

Lower shell (plastron) is flatter and has fewer plates

AT A GLANCE



- **SIZE** 3–9¼ ft (0.9–2.8 m) long
- **HABITAT** Tropical and warm ocean waters
- **LOCATION** Atlantic, Indian, and Pacific Oceans, Mediterranean Sea
- **DIET** Sea animals and seaweed

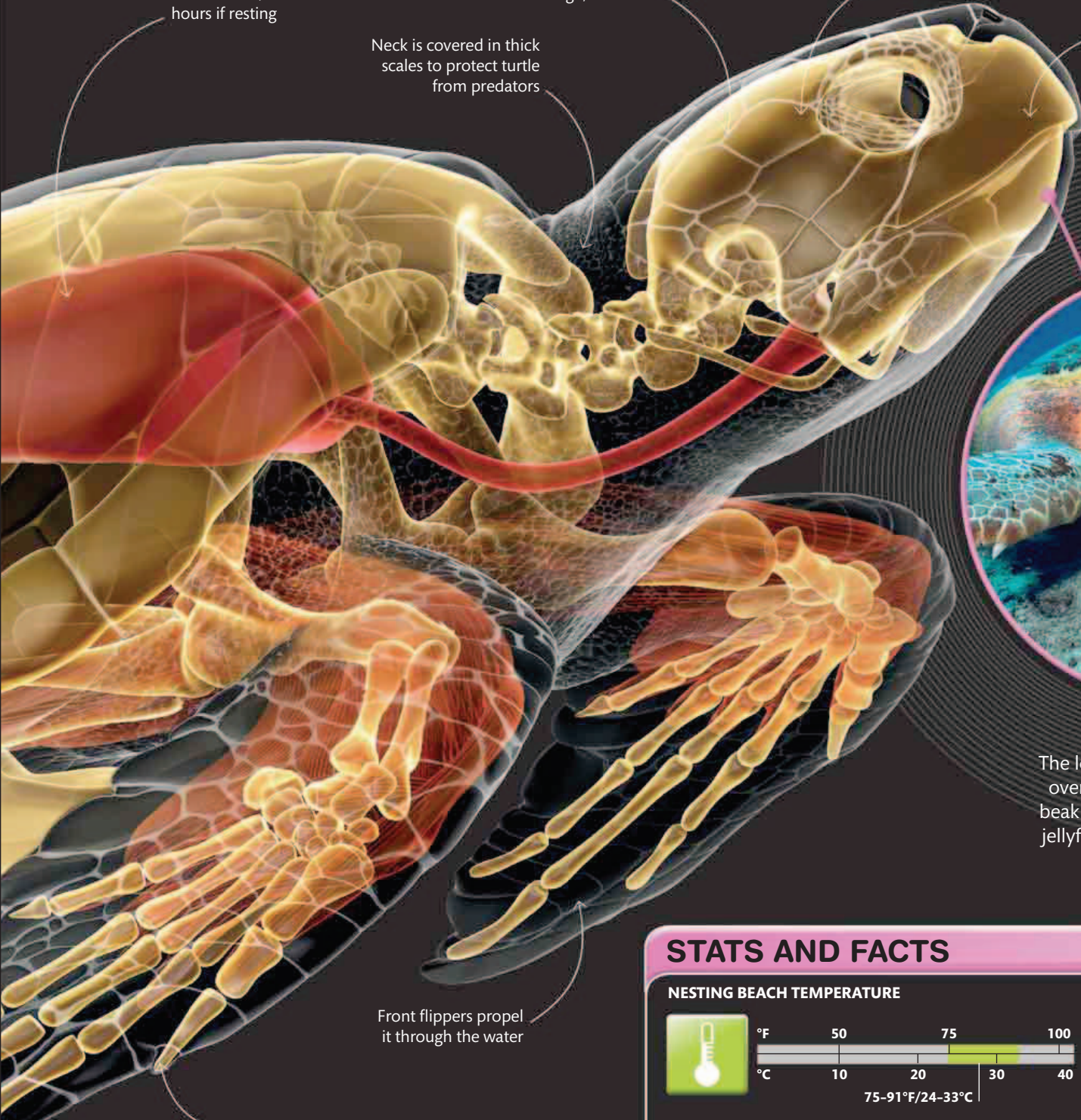
Diving turtles can hold air in their lungs for 4-5 minutes, or several hours if resting

Loggerhead gets its name from its large, wide skull

Glands near the eyes remove excess salt

Hard, horny beak has a sharp cutting edge—turtles do not have teeth

Neck is covered in thick scales to protect turtle from predators



BEAKY BITE

The loggerhead turtle is not fussy over its food and uses its sharp beak to tackle anything from soft jellyfish to hard-shelled lobsters.

Front flippers propel it through the water

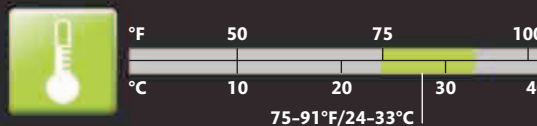
Claws on front flippers may help it to walk on land

Long-distance traveler

The loggerhead is the most widespread ocean-going turtle and uses its flippers to swim long distances. Helped by currents, loggerheads sometimes cross the Pacific, the world's biggest ocean.

STATS AND FACTS

NESTING BEACH TEMPERATURE

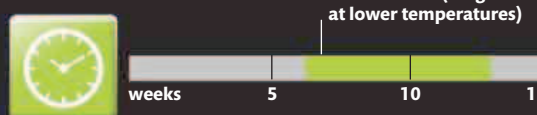


Loggerheads lay up to six clutches of eggs during the breeding season. The temperature of the sand determines whether the baby turtles are male or female. Cooler temperatures result in more males; if it's hotter, more females.

DEPTH OF NEST



INCUBATION PERIOD



“Pregnant lemon sharks return to the same lagoon to give birth every two years”



HOMING SHARK

LEMON SHARK

The lemon shark finds safety and comfort in a tropical lagoon. Dozens of pregnant lemon sharks gather to give birth at the Bimini Lagoon in the Bahamas, having returned to where they themselves were born years before. The babies have been nourished in the bodies of their mothers and after they are born they will stay in the warm shallows of the lagoon, using it as a nursery. Only when they are old enough will they join the grown-ups in deeper coastal waters.

AT A GLANCE

- **SIZE** 8¼–9¾ ft (2.5–3 m) long
- **HABITAT** Shallow ocean waters, including coral reefs, mangrove fringes, and river mouths; may enter deeper ocean waters
- **LOCATION** Warm and tropical coastlines of America, the Caribbean, and western Africa
- **DIET** Mainly fish, including other sharks; young sharks also feed on crabs, shrimp, and octopuses

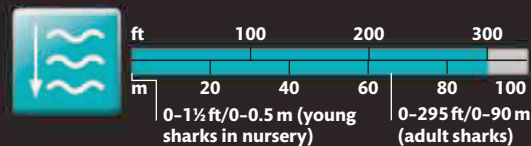


Yellowish body with no markings

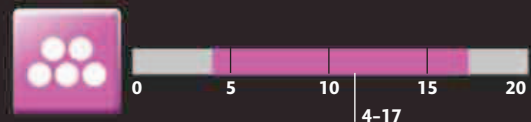
STATS AND FACTS

The young lemon sharks stay in the shallows of their nursery for up to eight years before they venture into deeper water.

SWIMMING DEPTH



PUPS PER LITTER



LIFE IN A LAGOON

Warm shallow lagoons carpeted in white coral sand are a comfortable home for lemon sharks. Here there is plenty of food—in the form of fish straying from the nearby reef—and safety from danger.

THE OCEAN GANG

Lemon sharks are very social creatures. In their first year, the young sharks grow up in the safety of a nursery. By the time they are two or three years old, they prefer to stay with same-sex groups of similar ages and spend much of their time in these gangs. Living in groups provides protection from bigger predators but it may also help sharks find food and a mate. These gangs often hang around fishing piers at night.





ON THE OCEAN FLOOR

The common tope prefers to hunt close to the bottom of its habitat. Pregnant females move to the shallower waters of estuaries and coastal bays to give birth.



SHARK ON THE MOVE

COMMON TOPE SHARK

You will probably find a tope shark in any ocean you care to visit: they are among the most wide ranging of all sharks and are happy in coastal shallows as well as the open ocean. They prefer low temperatures and move away from warm waters in hot summers—either toward the icy poles or down to cooler depths. They are strong swimmers and can cover great distances in a day. Some individuals can clock up journeys of thousands of miles during one of their migrations.

AT A GLANCE

- **SIZE** 4½–6½ ft (1.35–2 m) long
- **HABITAT** Shallow coastal ocean waters, usually near the bottom
- **LOCATION** Cooler oceans outside the tropics, mainly near coastlines of continents and islands
- **DIET** Fish, squid, and octopus; young sharks also prey on shrimp, worms, and snails

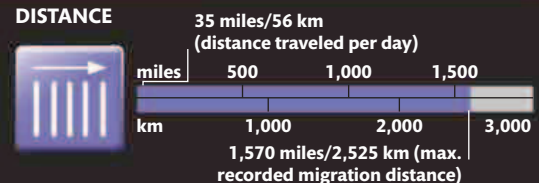


“Tope sharks move toward the poles in summer and the equator in winter”

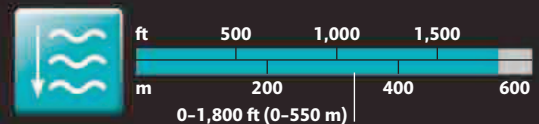
STATS AND FACTS

Some tope sharks live permanently near the equator, but move into deeper, cooler waters when it gets really hot.

DISTANCE



SWIMMING DEPTH





OCEAN SHUT-EYE

Short underwater naps keep a walrus going at sea. The tusks are canine teeth and are used for showing off to other walruses or for cutting air holes in ice.

“Walrus
can take
five-minute
naps when
under water”

TUSKY DOZER

WALRUS

The walrus has one of the strangest sleep patterns of any animal. In the frozen Arctic, on the top of the world, walrus live in icy water and can spend more than a week at a time on fishing expeditions. It means they have to doze whenever they get a chance, hanging off ice floes with their tusks or even when they are completely submerged. When they are especially busy, walrus can go for more than three days without any sleep at all. They make up for it when they return to land, when hundreds will snooze packed together on a favorite beach.

AT A GLANCE

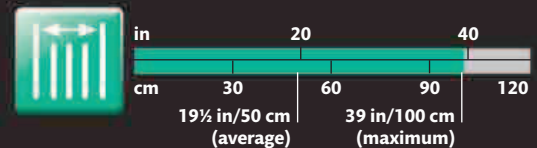
- **SIZE** 9½–12 ft (3–3.6 m) long
- **HABITAT** Cold Arctic coastlines and on ice floes, diving in shallow marine waters
- **LOCATION** Region around the North Pole, southward as far as North Pacific islands and Greenland in the Atlantic
- **DIET** Mostly clams, but also worms, snails, shrimp, crabs, sea cucumbers, and slow-moving fish



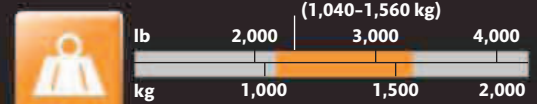
STATS AND FACTS



TUSK LENGTH



BODY WEIGHT



SEAFARING SERPENT

SEA SNAKE

Lots of the animals in the ocean look like snakes, but real sea snakes are venomous reptiles that breathe air. This usually keeps them near the surface, although they can close their nostrils to dive deeper. They have a paddlelike tail to help them swim and most give birth to live young underwater—unlike other sea reptiles, they do not have to go to land to lay eggs. This makes them the only reptiles that spend their entire lives at sea.

BANDS FOR DANGER

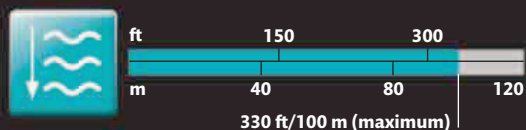
The striking banded pattern of a sea snake warns predators to keep away. Although many species are not aggressive, they all have strong venom, and some could kill a human.

AT A GLANCE

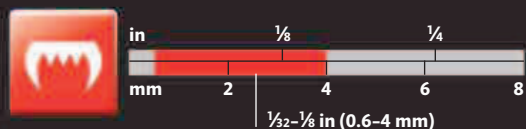
- 
- **SIZE** 2½–5 ft (0.75–1.5 m); a few species may grow bigger
 - **HABITAT** Warm, shallow coastal ocean waters
 - **LOCATION** Coastlines of the tropical Indian and Pacific Oceans, with greatest diversity around Australia
 - **DIET** Mainly fish; some feed on specific types of fish, but only one species of sea snake is specialized for eating crustaceans and mollusks

STATS AND FACTS

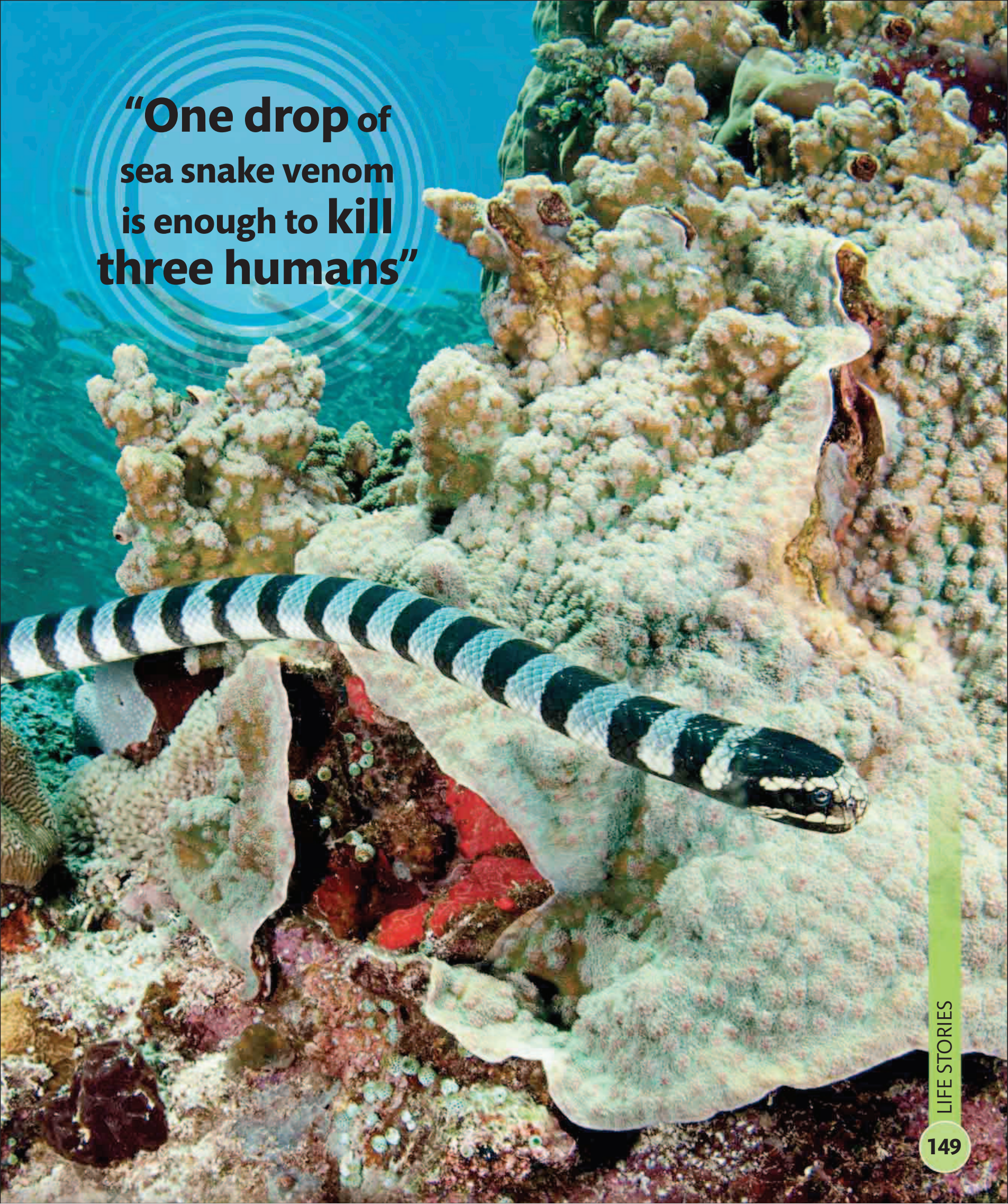
SWIMMING DEPTH



FANG LENGTH



**“One drop of
sea snake venom
is enough to kill
three humans”**





MOBILE NURSERY

BARREL SHRIMP

Here is a shrimp with a taste for flesh and a very gruesome family life. Most animal mothers in the open ocean scatter their eggs and leave it to chance whether their babies survive. But the mother barrel shrimp turns her prey into a stroller for her brood. First she catches a plump little jelly called a salp. She chomps away at its innards until the only thing left is its barrel-shaped skin. Then she lays her eggs inside this empty barrel and pushes it around wherever she goes until they hatch.

AT A GLANCE

- **SIZE** $\frac{3}{16}$ - $1\frac{1}{2}$ in (5-42 mm)
- **HABITAT** Deep sea
- **LOCATION** Worldwide
- **DIET** Salps (floating jellylike animals) and other soft-bodied animal plankton



STATS AND FACTS

Barrel shrimp lay their eggs in prey soft enough to scrape out. Salps are favorite targets, but sometimes they attack tiny jellyfish and similar animals.

TIME TAKEN



5 min to enter prey
10-60 min to eat insides of prey

BARREL LENGTH

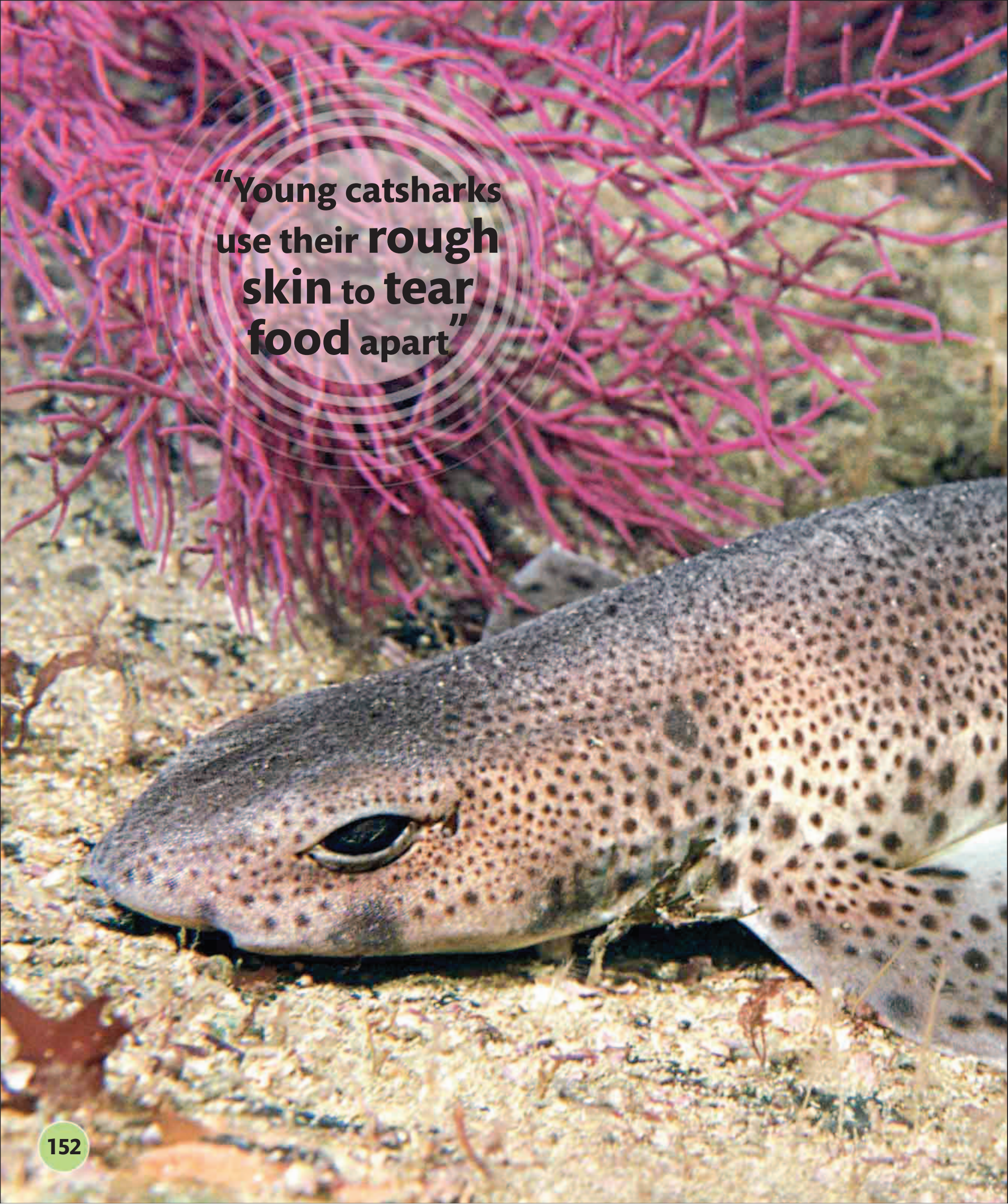


in $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ 1
cm 1 2 3
1 in/2.4 cm (average)

PUSHING ALONG

A mother barrel shrimp keeps a firm grip on the dead salp in which she has laid her eggs. She propels her encased brood around the ocean waters by kicking with her strong back legs.



A young catshark is shown resting on a sandy seabed. The shark's skin is dark grey with numerous small, light-colored spots, giving it a rough, textured appearance. In the background, there is a large, branching piece of red coral. The text is overlaid on a circular graphic in the upper left quadrant.

“Young catsharks
use their **rough
skin to tear
food apart**”

CAT-EYED NIGHT PROWLER

SMALL SPOTTED CATSHARK

Hunting in the dark is no problem for this little shark. Its sensitive eyes help it prowl the seas of Europe, where it snaps at small animals that live close to the sandy and muddy bottoms of coastal waters. It is one of the most abundant sharks in European waters and eats whatever its jaws can tackle—including fish, crabs, and squid. The small spotted catshark is active mostly at night and spends the day resting motionless under craggy rocks or elsewhere on the sea floor.

AT A GLANCE

- **SIZE** 31–39 in (80–100 cm) long
- **LOCATION** Northeast Atlantic Ocean and Mediterranean Sea
- **HABITAT** Coastal ocean waters
- **DIET** Fish, worms, shrimp, and snails



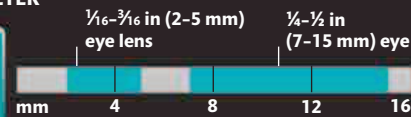
SLEEK HUNTER

Most types of catsharks have a slender body and skin that is patterned with spots or other markings. They are named for their oval catlike eyes that are positioned high on their head.

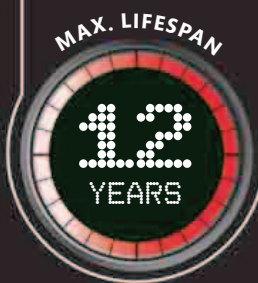
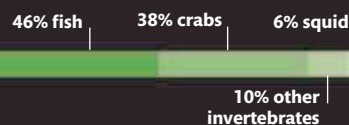
STATS AND FACTS


Although the eyes of a catshark are not especially big, they are good for nighttime hunting.

EYE DIAMETER



DIET



A close-up, low-angle shot of a shark's head and upper body as it swims through clear, blue water. The shark's skin is dark and textured. In the background, there are large, white ice floes. A circular graphic with concentric white lines is overlaid on the upper left portion of the image, containing a quote.

“They are **too slow to catch swimming seals, so they take **sleeping ones** instead”**



SLOW MOVER

GREENLAND SHARK

Life slows down in the ice-cold waters of the Arctic, and the Greenland shark is probably the slowest giant fish in the ocean. It can manage only half the cruising speed of a seal and it takes a full seven seconds just to sweep its tail from one side to the other. As a result, the Greenland shark cannot chase down its prey. Instead, it relies on creeping up on its victims and taking them by surprise. Amazingly, this is good enough to grab an unsuspecting seal—or even a seabird.

AT A GLANCE

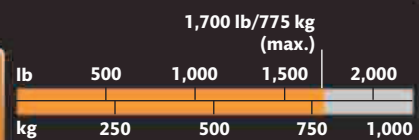
- **SIZE** 8¼–24 ft (2.5–7.3 m)
- **HABITAT** Cold coastal ocean waters, moving to greater depths in warmer months
- **LOCATION** Arctic and North Atlantic Oceans
- **DIET** Fish (including other sharks), seals, squid, crabs, jellyfish, and small dolphins



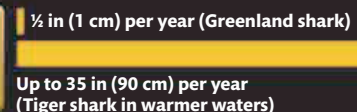
STATS AND FACTS

Sharks develop slowly when they remain in cold waters. The Greenland shark grows nearly a hundred times slower than certain speedy sharks that live in the tropics.

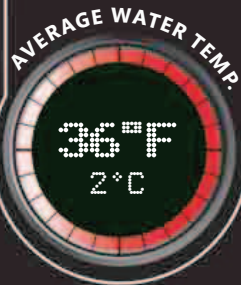
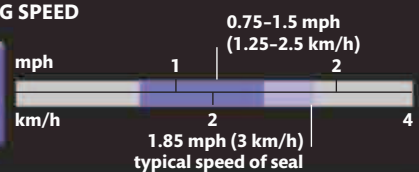
WEIGHT



GROWTH RATE



SWIMMING SPEED



GIANT SCAVENGER

The Greenland shark gets meat where it can, and sometimes it scavenges dead animals it finds in shallow waters. Some sharks have even been found with the remains of reindeer in their stomach.

SLIMY COCOON CRAFTER

PARROTFISH

The parrotfish makes the most of the coral reef—getting not just food from this ocean habitat but shelter too. It gnaws away at the coral with a sharp parrotlike beak. The soft living parts of the coral are nutritious, but the rocky parts pass out of its body as sand. At night the parrotfish sleeps in a safe crevice. Here, some species release a special kind of slime from their mouth and use it for making their bed. They spread it out like a blanket until it covers their entire body in an underwater cocoon as extra protection against predators.



AT A GLANCE

- **SIZE** 1–4¼ ft (0.3–1.3 m) long, depending on the species
- **HABITAT** Shallow ocean waters and coral reefs
- **LOCATION** Worldwide, but especially in the tropics
- **DIET** Coral and algae

STATS AND FACTS

WEIGHT OF CORAL CONSUMED



The crumbled coral eaten by parrotfish contains nutritious algae, but the hard rock passes through their bodies.

BITES OF CORAL PER MINUTE





SLIMY SCREEN

A cocoon made from slime hides a parrotfish from predators. It also protects a sleeping fish from ocean bugs, such as fish lice, that could infect its body at night.

HOME LOVER

BLACKTIP REEF SHARK

A tropical coral reef is so packed with life that a hungry shark does not have to go far in its search for a meal. The blacktip reef shark is a common predator on the reefs of tropical Asia and Australasia—but it sticks to hunting on a patch that is sometimes only twice the area of a soccer field. It can stay near its favorite reef for years on end. Only pregnant females move away from the reef when they are about to give birth.

BLACK-MARKED SHARK

The bold, black markings on the tip of its tail and fins make this shark one of the most distinctive reef sharks. Its dorsal fin is often seen sticking up out of the water.

AT A GLANCE

- **SIZE** 3¼–6½ ft (1–2 m) long
- **HABITAT** Shallow tropical ocean waters, especially on coral reefs
- **LOCATION** Indian Ocean and western Pacific Ocean
- **DIET** Fish, squid, shrimp, and snails

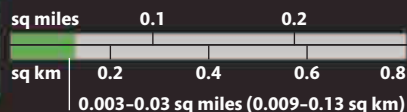


STATS AND FACTS

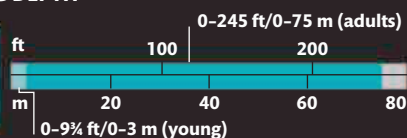
AVERAGE HOME RANGE



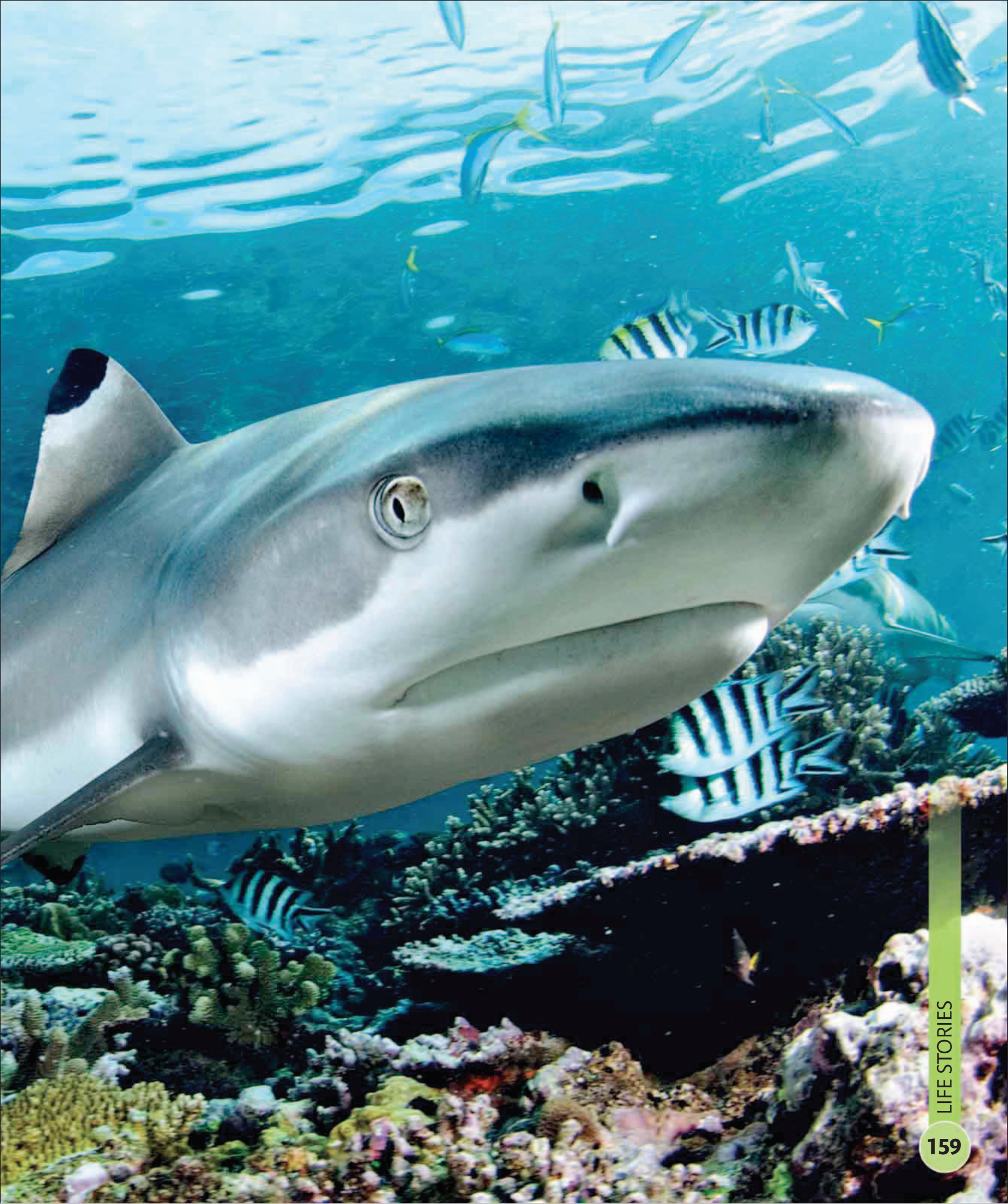
AREA OF HUNTING PATCH



SWIMMING DEPTH




Young blacktip reef sharks stay in shallow lagoons but move into deeper waters as they grow older. Even as adults, they spend most of their time patrolling a territory that is a hundred times smaller than the entire reef, following their prey from one tiny hunting patch to another.



LAGOON RAIDERS

In warm lagoons, hungry blacktip reef sharks are drawn to dense schools of fish. Typically, only young sharks are found in such shallow waters but here adult sharks are working together to herd the schools. The sharks push the schools ever closer to the shoreline where the fish bunch into tighter groups. When they think the prey is crowded enough for a good mouthful, the sharks lunge in for a bite.

An underwater photograph showing several blacktip reef sharks swimming in clear, shallow blue water. A large, dense school of small fish is visible in the background. The water is bright and clear, with sunlight filtering through, creating shimmering patterns on the seabed. The sharks are positioned at various depths and angles, some swimming towards the camera and others away. The overall scene is dynamic and captures a natural marine environment.

**“Blacktip reef sharks
often swim
in water that is
only 1 ft (30 cm)
deep”**



SUPERNATURAL SENSES

Competition is fierce in the ocean, so it helps if you have a little extra something that gives you an advantage over another species.

Whether it is extraordinary eyesight, a nose for trouble, or downright sneaky behavior, the tactics some marine animals deploy are truly amazing.

WIDE-EYED SENSATION

HAMMERHEAD

It is hard to imagine what the world looks like when you have as wide a view of it as a hammerhead shark. However, excellent vision is only one part of the hammerhead's story. Its extraordinary head is also packed with sensors and sweeping it from side to side helps the shark find prey. It may even be useful in helping the shark stay buoyant while swimming.

Large olfactory sac is excellent at picking up smells

AT A GLANCE



- **SIZE** 11¼–20 ft (3.6–6.1 m)
- **HABITAT** Oceans near land, but especially over coral reefs
- **LOCATION** Worldwide in tropical and warm waters
- **DIET** Many fish, but especially stingrays, groupers, and catfish

Long optic nerve carries information about vision from the eye to the brain

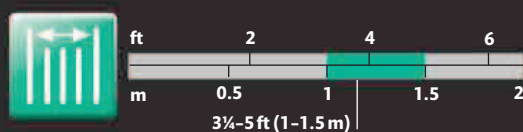
Shark makes a grab for prey

FINDING BURIED FOOD

The shark sweeps its head from side to side like a metal detector so that the front edge of its hammer picks up signals coming from its favorite buried prey—stingrays.

STATS AND FACTS

HEAD WIDTH



MIGRATION DISTANCE



Nearly a dozen species of hammerheads, all with different hammer shapes and sizes, are found around the world. Some travel long distances on their migrations.



Multipurpose hammer

The shape of a hammerhead may help it swim. Hammerheads are less buoyant than other sharks, but the hammer helps provide lift, just like an aircraft wing, in the water.

A HEAD FOR SENSE

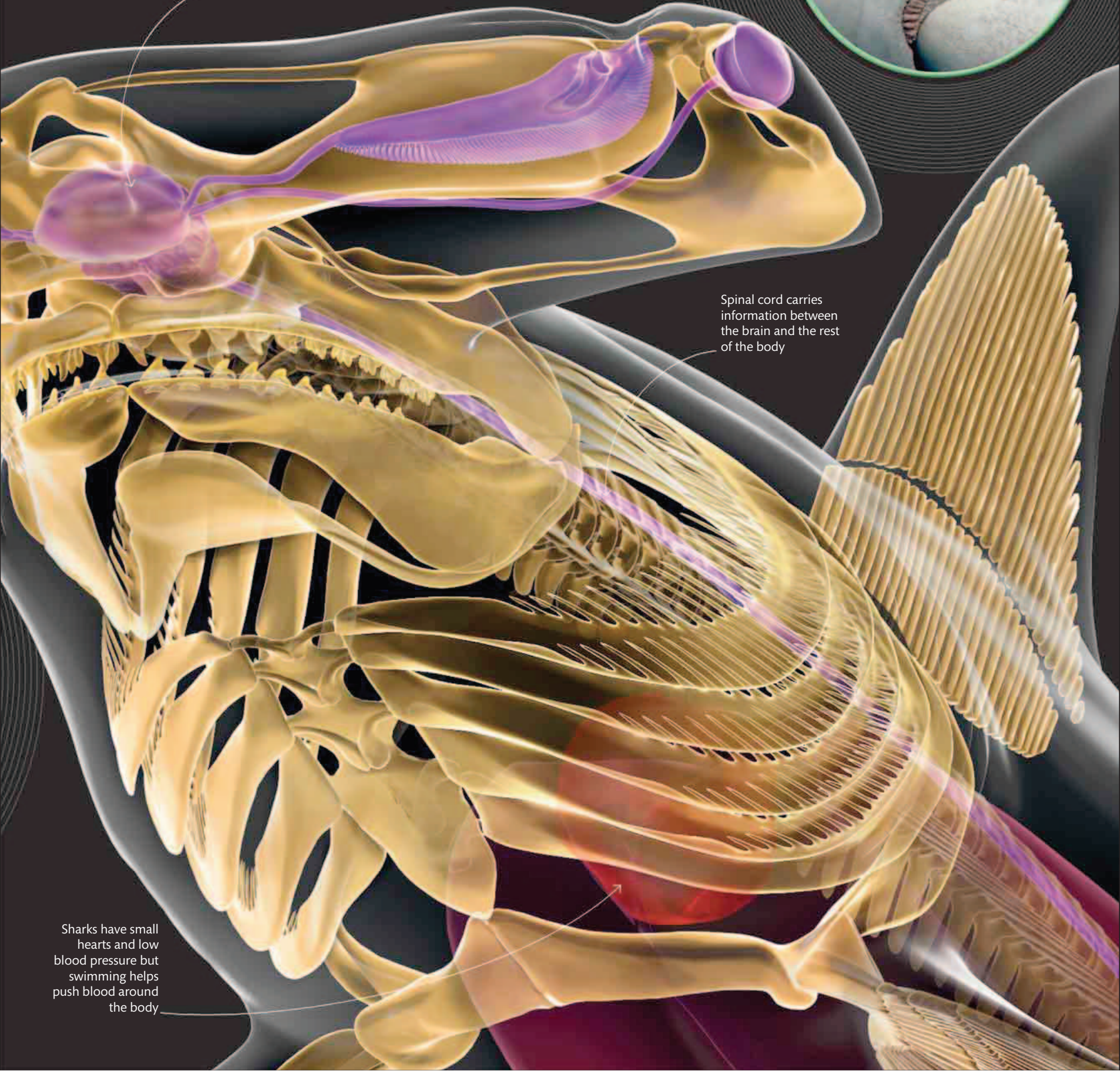
All sharks have sensors in their head, but the hammerhead has more than most. Each blade of the hammer contains a large organ for smelling prey, and the skin is dotted with jelly-filled pores for detecting movement.

Brain receives information from all the sensors, including eyes and smell detectors

Sensory pores cover the underside of the head

Spinal cord carries information between the brain and the rest of the body

Sharks have small hearts and low blood pressure but swimming helps push blood around the body



A large school of scalloped hammerhead sharks swimming in clear blue water. The sharks are seen from various angles, some swimming towards the camera and others away. The water is a deep, clear blue, and the sharks' bodies are a dark greyish-blue. The lighting is bright, suggesting a shallow depth.

KNOCKING HAMMERHEADS

Scalloped hammerheads form some of the biggest schools, or “shivers,” of sharks anywhere in the ocean, often with hundreds of fish gathered together in one place. These schools swim close to shore during the day, but move into deeper water to hunt at night. The biggest ones are made up of younger males or females. Individuals sometimes knock one another with their snouts—perhaps as signals of aggression or courtship.



SENSORY WEAPON

SAWSHARK

An effective hunter needs to have an advantage over its prey, such as excellent predatory senses or a vicious weapon. The sawshark has both. Its snout is drawn out into a long, sawlike beak, equipped with sensitive skin and feelers for probing its surroundings. When the sawshark senses a small fish or crab on the muddy ocean floor, it slashes from side to side until the teeth on its beak cripple the prey.

AT A GLANCE

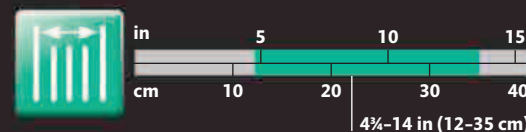


- **SIZE** 24–67 in (62–170 cm) long
- **HABITAT** Coastal ocean waters, usually near the sea floor
- **LOCATION** Bahamas, southern Africa, and western Pacific from Japan to Australia
- **DIET** Small fish, crabs, squid, and shrimp

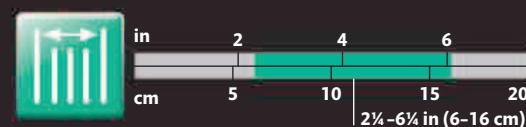
STATS AND FACTS

The “saw” of a sawshark is actually an extension of its snout. The skin is covered with the same kinds of sensory pores that are found on the snouts of other types of sharks.

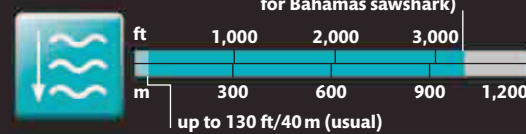
LENGTH OF “SAW”



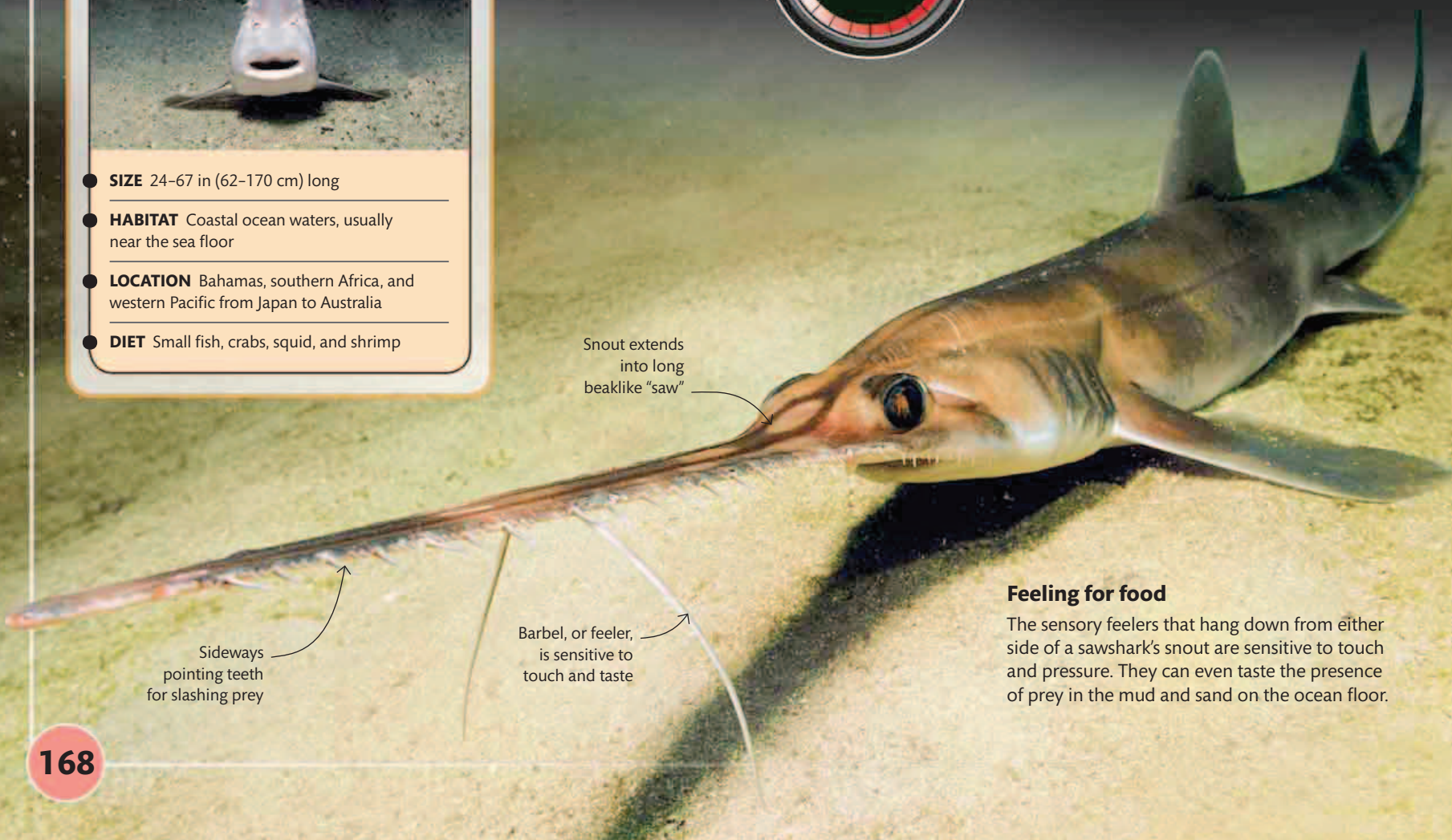
LENGTH OF FEELERS



SWIMMING DEPTH



MAX. TEETH ON SAW



Snout extends into long beaklike “saw”

Sideways pointing teeth for slashing prey

Barbel, or feeler, is sensitive to touch and taste

Feeling for food

The sensory feelers that hang down from either side of a sawshark’s snout are sensitive to touch and pressure. They can even taste the presence of prey in the mud and sand on the ocean floor.

BRAINIEST MOLLUSK

BROADCLUB CUTTLIFISH

The cuttlefish is a distant relation of snails and slugs, but it may have best brainpower of any animal without a backbone. Its closest cousins are the squid and octopus and, like them, it has arms for grabbing food, and eyes that work as well as our own. The cuttlefish's brain is especially big—possibly to help it control color changes in its skin that signal its fear, excitement, or temper.

Ocean chameleon

The cuttlefish's body contains a hard, air-packed cuttlebone for support and buoyancy. Its skin is dotted with tiny sacs of pigment that expand to make its surface change color.

STATS AND FACTS

SACS OF SKIN PIGMENT



PROPORTION OF BRAIN USED FOR LEARNING



Large eyes have unusual W-shaped pupil

Suckers on arms and tentacles for grasping prey

Siphon squirts dark ink into water to distract predators

Flapping "skirt" along body works like a fin to help the cuttlefish swim

AT A GLANCE



- **SIZE** 6–20 in (15–50 cm) in body length
- **HABITAT** Ocean waters near coastlines, swimming mainly near the bottom over rocks or sand, or among seaweed
- **LOCATION** Worldwide
- **DIET** A wide range of invertebrates and fish



SUPERNATURAL SENSES

170

**BIGGEST
BRAIN OF
ANY ANIMAL**

BRAINY COLOSSUS

SPERM WHALE

The sperm whale is the world's largest predator. Its jaw is longer than a car and each tooth is bigger than an ice cream cone. Sperm whales dive very deep in the ocean to prey on giant squid. Like all hunters, a sperm whale needs to be clever to catch its prey. Not even the blue whale—the biggest animal of all—has a larger brain.

AT A GLANCE

- **SIZE** 36–66 ft (11–20 m) long; mature males can be twice as long as females
- **LOCATION** Worldwide, in deep ocean waters, except those covered by ice
- **HABITAT** Open sea
- **DIET** Mainly squid (including giant and colossal squid), but sometimes deep-sea octopuses and fish

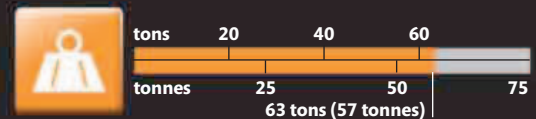


STATS AND FACTS

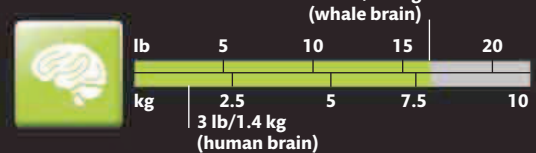


Few air-breathing animals can hold their breath for as long as a sperm whale. By diving deeper and longer, sperm whales can find more prey.

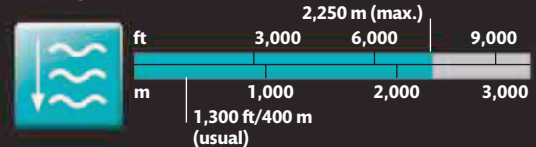
MAXIMUM WEIGHT



AVERAGE BRAIN WEIGHT



DIVING DEPTH



A HEAD FOR SOUND

The massive head of a sperm whale is packed with waxy oil, which carries sound really well. This helps the sperm whale make clicking noises, which it uses for communication as well as for locating prey.

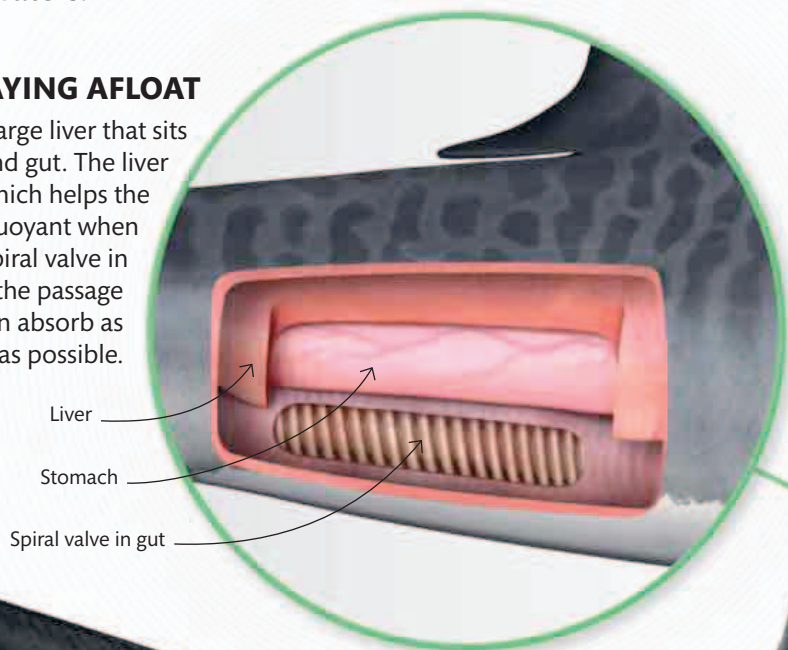
HUNTER IN THE DARK

TIGER SHARK

Few animals can match the tiger shark's appetite. Turtles, birds, other sharks, and even human beings, injured whales, and old tin cans all get gobbled down if it gets the chance. This fierce predator prowls around shorelines at night, often venturing into estuaries and harbors in search of food. It is usually alone and is perfectly at home hunting in dark and murky waters.

STAYING AFLOAT

A tiger shark has a large liver that sits on top of its stomach and gut. The liver contains a lot of oil, which helps the shark float and stay buoyant when swimming. It also has a spiral valve in its gut that slows down the passage of food so that it can absorb as many nutrients as possible.



Liver

Stomach

Spiral valve in gut

AT A GLANCE



- **SIZE** 9¾–20 ft (3–6 m)
- **HABITAT** Usually in cloudy waters near coastlines, especially around estuaries, lagoons, and harbors
- **LOCATION** Worldwide in warm and tropical oceans
- **DIET** Fish, including other sharks, turtles, seals, seabirds, dolphins, sea snakes, squid, crabs, lobsters, snails, jellyfish, and human rubbish

Young tigers have vertical stripes and spots that run down the length of the body and fade as the shark grows

Upper lobe of tail fin is bigger than lower lobe

Guzzle guts

The tiger shark has a reputation of eating anything it comes across. This strategy is useful when there is not much food around, but it does mean that it sometimes swallows objects that it cannot digest. Like most sharks, it has a short gut, so bones and other hard materials have to stay in the stomach much longer or be vomited back up.

Anal fin keeps fish stable while swimming

Pelvic fins help fish move up and down and stop quickly

SEEING IN THE DARK

The tiger shark has a sensitive layer at the back of its eyes that detects even the faintest amount of light. This enables it to snatch prey at night, even if the water is very cloudy.

**LEAST FUSSY
EATER**

Large eyes help it see in dark waters

Snout is blunter than in most other kinds of shark

Big teeth at front of wide mouth help it grab large prey

CUTTING-EDGE EQUIPMENT

The tiger shark has especially large teeth. They curve slightly backward and each one has a sharp, serrated edge—like that of a saw—for cutting through skin and flesh.

White belly contrasts with gray upper body

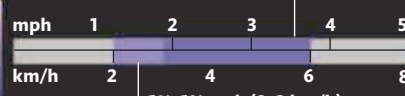
Pectoral fins are used to provide lift, like a bird's wing

STATS AND FACTS

59
YEARS
MAXIMUM LIFESPAN

SPEED

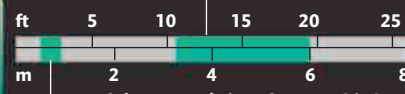
1½–3¼ mph (3–6 km/h)
bursts when chasing prey



1¼–1½ mph (2–3 km/h)
cruising speed when hunting

SIZE

10½–19½ ft (3.25–6 m)
size of adult



1¼–3 ft (0.5–0.9 m) size of pups at birth



Tiger sharks are strong swimmers. Although they generally move slowly, they are capable of sudden bursts of speed to catch prey.


**“Tiger sharks eat
more humans
than great
white sharks”**





SAFETY FIRST

Many sharks rely on vision for hunting, so they need to protect their eyes when attacking prey—even a little fish can inflict a painful slap. At the moment this tiger shark attacks, it automatically blinks a protective membrane over its eyes to prevent the flailing prey from causing damage. Many other species of sharks lack this membrane. Instead, they roll their eyes backward in their sockets when they lunge for their prey.



EYE BANDS

The bands across a mantis shrimp's eye are actually rows of sensors. Different types of sensors are able to detect color and movement and different colors—as well as some kinds of light that are invisible to us.

“The two eyes of the mantis shrimp move independently of one another”

EXTRAORDINARY EYES

MANTIS SHRIMP

Mantis shrimp need good eyesight. They smash or spear their prey with lightning-fast claws so they have to be a good judge of distance to get a direct hit and make a kill. Things could easily become confusing in the bright and shimmering world of a tropical reef filled with color and shining surfaces. Some creatures even have transparent shells, making them more difficult to spot. But the mantis shrimp's eyes have so many different kinds of sensors to cope with these challenges that it can see everything clearly.

AT A GLANCE

- **SIZE** Up to 14 in (35 cm) long, depending on the species
- **HABITAT** Muddy, sandy, and gravelly ocean floors and coral reefs, in shallow coastal waters
- **LOCATION** Worldwide, with more species in the tropics
- **DIET** Snails, fish, crabs, and shrimp



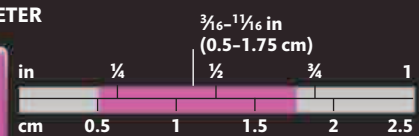
STATS AND FACTS

Different kinds of eye sensors can detect different colors. Mantis shrimps have four times as many sensors as humans.

VISION



EYE DIAMETER



SNEAKY KILLER

BROADNOSE SEVENGILL SHARK

In coastal ocean waters close to where muddy rivers run into the sea, conditions can get very murky. This makes it difficult for many ocean-going predators to hunt their prey—but not this one. The broadnose sevengill shark loves this habitat: it is just right for sneaking up on prey without being seen. This shark hunts large prey, including dolphins and other sharks. It does not have the stamina for long chases, so it gets as close to its victim as it can before attacking from behind with a quick burst of speed. Sometimes several sharks work together during a hunt to take their prey by surprise.

“This shark pokes its head out of the water to find prey near the surface”

AT A GLANCE

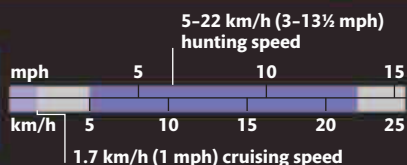


- **SIZE** 7¼–9¾ ft (2.2–3 m) long
- **HABITAT** Coastal ocean waters, bays, and estuaries, often in cloudy water
- **LOCATION** Coastlines of western North America, South America, South Africa, and the western Pacific Ocean
- **DIET** Fish, including other sharks, seals, dolphins, and carrion



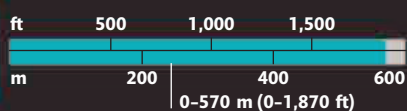
STATS AND FACTS

SPEED



This shark spends much of its time cruising slowly, but it can move fast to attack its prey.

SWIMMING DEPTH



EST. MAXIMUM LIFESPAN





BLENDING IN

The gray upper body of the broadnose sevengill shark helps it blend into the cloudy waters of its favorite hunting grounds. Unlike most other sharks, which have five gill slits, this shark has seven.

SHOCK TACTICS

TORPEDO RAY

The torpedo ray looks like a harmless flatfish but it has a stunning secret weapon. Its fleshy body is packed with a pair of fat electrical organs that can fire a shock through the surrounding seawater. The ray uses its organs to electrocute its fishy prey—but, if provoked, it is more than willing to use them when danger threatens.

AT A GLANCE

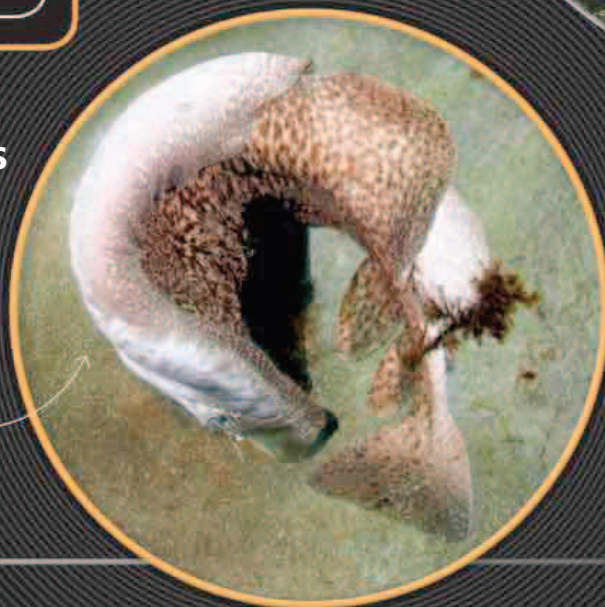


- **SIZE** 20–70 in (50–180 cm) long; 12–39¼ in (30–100 cm) in diameter
- **HABITAT** Open ocean waters or near coastlines. Young rays live in shallower waters on sand, mud, or coral reefs
- **LOCATION** Worldwide in warm and tropical oceans
- **DIET** Small fish

ELECTROCUTING ENEMIES

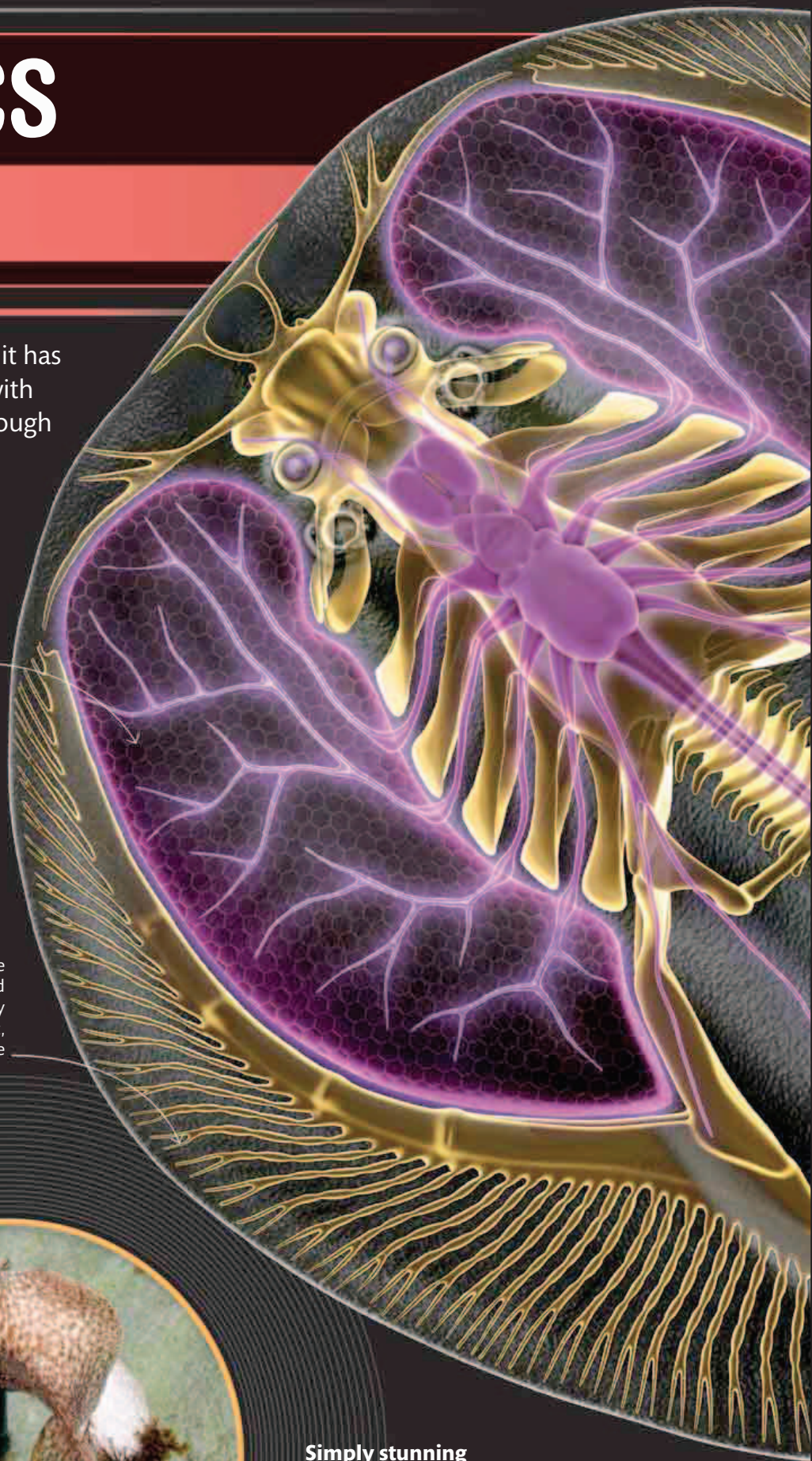
If something grabs its tail, the torpedo ray arches its back and curls its white belly outward toward its attacker. The shock will then hit the attacker in the face.

Curling its body enables the ray to produce an outward rather than a downward shock



Kidney-shaped electrical organ

Pectoral fins are winglike and surround the body to form a flat, disklike shape



Simply stunning

The electric organs of the torpedo ray are under the direct control of the ray's brain. When the ray spots an unsuspecting fish, it gently hovers over it before zapping it with an electric shock. As it delivers the shock, the ray wraps itself around its victim. The stunned fish is then swallowed whole.

Electrical organ contains more than 500 jelly-filled "batteries" that can deliver an electric shock into the water

Nerves carry signals from the brain to the electrical organs

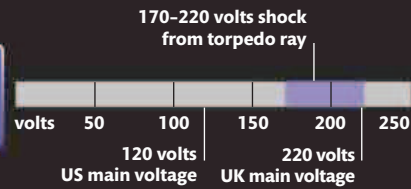
WATER WINGS

Like all rays, the torpedo ray has massive pectoral fins that are used like wings to "fly" under water. Strong muscles flap the fins to help propel the ray forward.



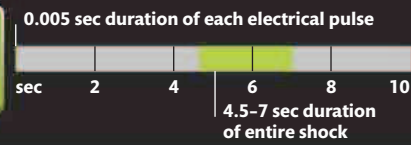
STATS AND FACTS

VOLTAGE



A quick burst of electrical charge from a torpedo ray is enough to kill a small fish, and produce a painful shock in humans.

SHOCK TIME



ELECTRICAL PULSES



Tail is shorter than body disk and provides some propulsion for swimming

Pelvic fins are much smaller than pectoral fins but can still flap to help with swimming

First of two small dorsal fins

WAITING FOR A KILL

Sandtiger sharks not only cooperate to make their hunting more effective, but can hover motionless in the water. They do this by gulping air at the surface to make their bodies more buoyant.



DEADLY SCHOOL

SANDTIGER SHARK

Sharks gather whenever there is the prospect of food, but sandtiger sharks often work together to make the most of a feeding opportunity. A number of sandtigers swim around a school of fish until it is surrounded. Then they move in closer so that the prey bunches together. By the time the sharks dive in for a kill, they are sure to grab a good mouthful of fish. They also snack on other sharks and rays that come too close.

AT A GLANCE

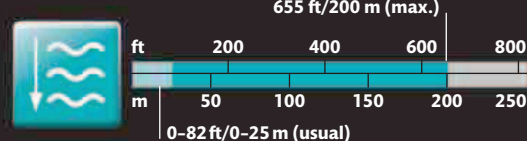
- **SIZE** 9–10½ ft (2.75–3.2 m) long
- **HABITAT** Warm and tropical coastal ocean waters, including coral reefs and shallow bays
- **LOCATION** Near coastlines around the world, except for the eastern Pacific Ocean
- **DIET** Fish, including smaller sharks and rays, squid, crabs, and lobsters



STATS AND FACTS

Sandtigers hunt in warmer coastal waters, and spend the cooler winter months closer to the equator.

SWIMMING DEPTH



LIFESPAN



MAX. SCHOOL SIZE



A large sand tiger shark is shown from a side profile, swimming towards the right. The shark's body is a mottled grey and white, with a prominent dorsal fin and a long, pointed tail. The background is a clear, deep blue ocean. In the lower portion of the frame, a dark, rocky reef structure is visible, covered in green algae and some red coral. The overall scene is captured in a cinematic, underwater style.

**“Although they
look fierce,
sandtigers prefer
to stay away
from humans”**



SCARY SMILER

The sandtiger shark has one of the toothiest grins of any shark and a distinctly menacing look. Its teeth project forward and the shark swims with its mouth slightly open. Some sandtiger sharks have tiny animals called hydroids growing on their teeth. This probably happens when they have gone for a long period of time without feeding. Some scientists think that female sandtigers stop hunting while they are pregnant.

WIRED FOR SOUND

SILKY SHARK

It can be difficult to find a decent meal in the wide expanse of the open ocean. However, silky sharks can pick up low-pitched sounds and are especially good at detecting rumbles that are deeper than a bass drum. In the ocean these may signal that a feeding frenzy is nearby: rumbling sounds are made when lots of sharks gather at a kill and frantically chase and snap at their prey. Many sharks sense blood in the water—but silky sharks are also drawn to the sounds of other sharks eating, so they can get a share of the meal.

AT A GLANCE

- **SIZE** 7½–11 ft (2.3–3.3 m) long
- **HABITAT** Warm waters, mainly of the open ocean, often near islands; younger sharks occur in more coastal waters
- **LOCATION** Worldwide in tropical oceans
- **DIET** Fish and squid



STATS AND FACTS

HEARING RANGE 10–1,000 Hz (silky shark)



Silky sharks can hear lower pitched (deeper) sounds than humans, which is why they are so good at using sound to hunt in the ocean.

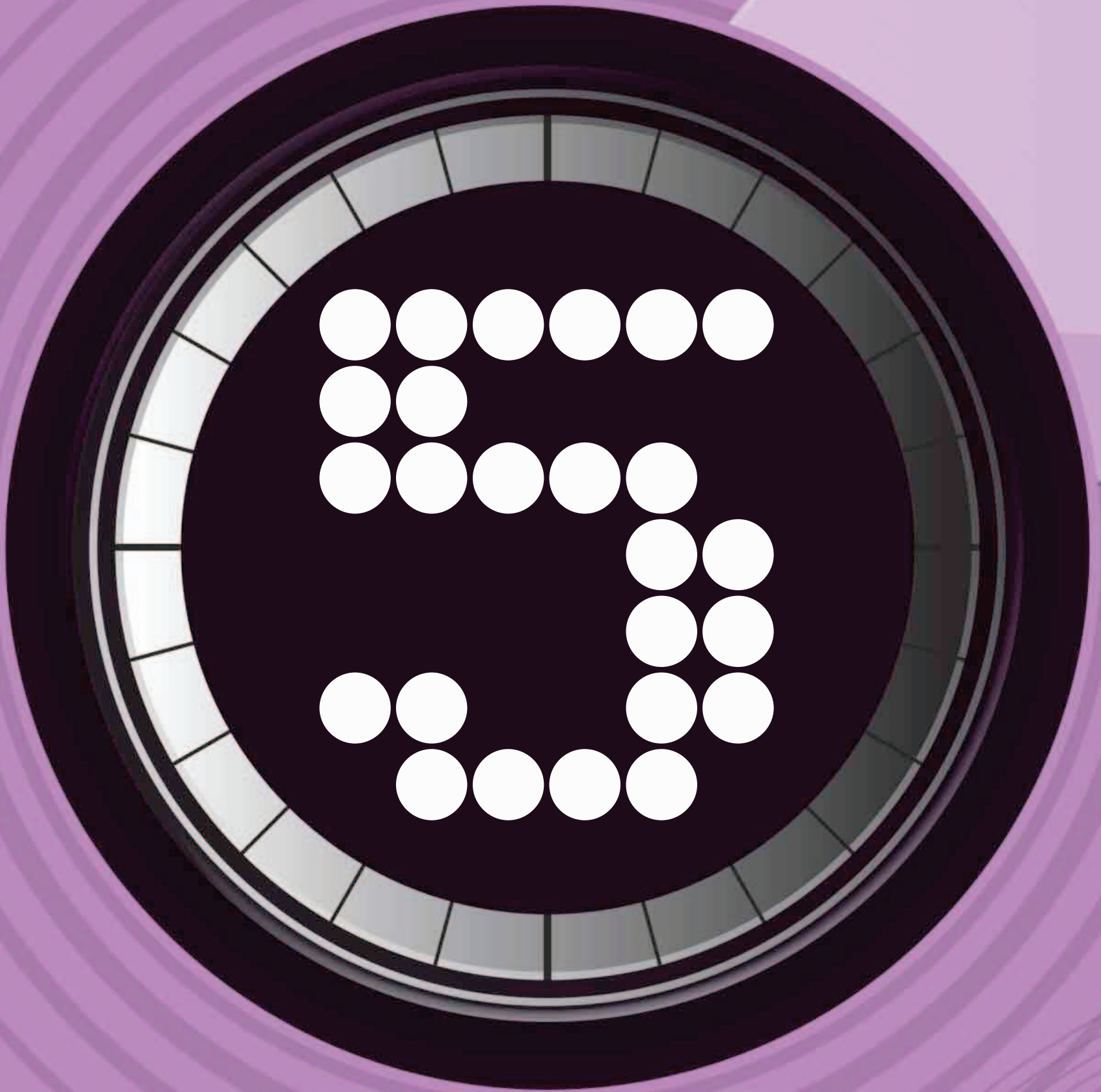
SOUND DETECTION DISTANCE





SMOOTH SWIMMER

Silky sharks get their name from their smooth skin. The prickles that make the skin of other sharks so rough are tinier and more closely packed on the skin of a silky shark.



EXPLORING THE DEEP

The ocean is the last great unexplored part of our planet. We have little idea of what lies beneath the waves, let alone how many species there are or how they live. The only way to find out is to go down there and get up close—even if some of the animals that live there are really scary.

OCEAN DEPTHS

The **Earth's continents** are rimmed by stretches of rocky shelf but then plunge straight down into the deep sea. As the water gets deeper, it gets darker and the pressure increases. At the surface, it is icy near the poles and warmer near the equator, but deeper down it is always cold. Many ocean animals live at certain depths, but some swim from zone to zone.



VERTICAL MIGRATION

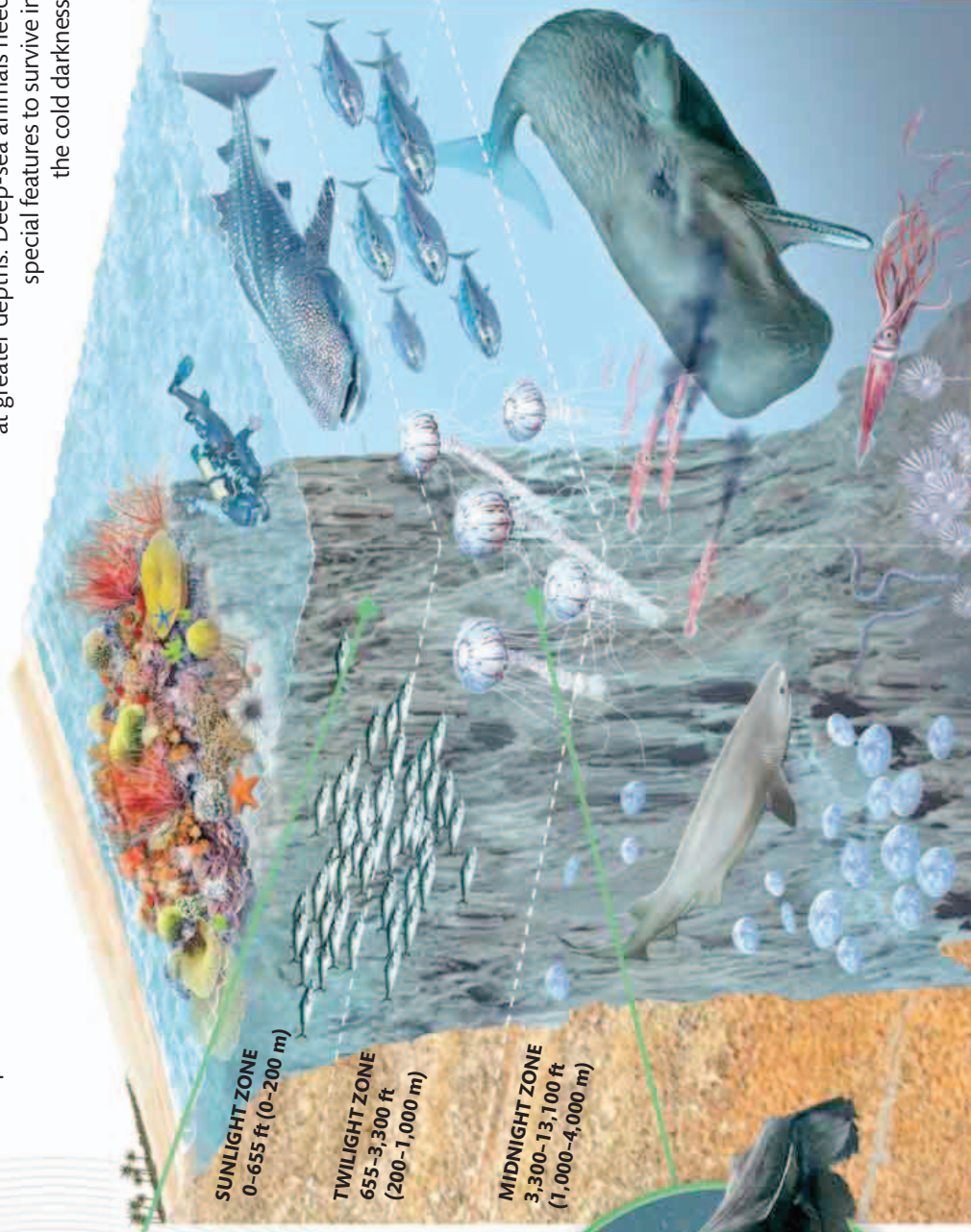
Tiny floating animals that live as part of the plankton gather at different depths in the water. Many of them avoid bright light, coming to the surface at night and then sinking deeper during the day. Predators who feed on these animals, such as the giant filter-feeding basking shark, have to move up and down in the water as they follow their food.



Caribbean reef sharks cruise over eelgrass

THE SUNLIGHT ZONE

Speedy predators with good vision hunt near the brightly lit ocean surface. Some live near coasts on reefs or among eelgrass, but others prefer to wander the open seas.



SUNLIGHT ZONE
0-655 ft (0-200 m)

TWILIGHT ZONE
655-3,300 ft
(200-1,000 m)

MIDNIGHT ZONE
3,300-13,100 ft
(1,000-4,000 m)

Frilled sharks prey on squid in the gloom of the twilight zone



THE TWILIGHT ZONE

The light here is too dim for algae to grow, but is just good enough for animals to see. The rarely seen frilled shark prowls these depths, alongside fish who can make their own light.

In the zone
The ocean's sunlit surface is packed with rich and colorful life, but fewer and stranger animals live at greater depths. Deep-sea animals need special features to survive in the cold darkness.



This deep-sea octopus uses its webbed arms to envelop prey

THE MIDNIGHT ZONE

At greater depths it is perpetual darkness. Black-skinned fish, big-mouthed predators, and many bizarre creatures live here—such as this small orange octopus with earlike fins and webbing between its arms.

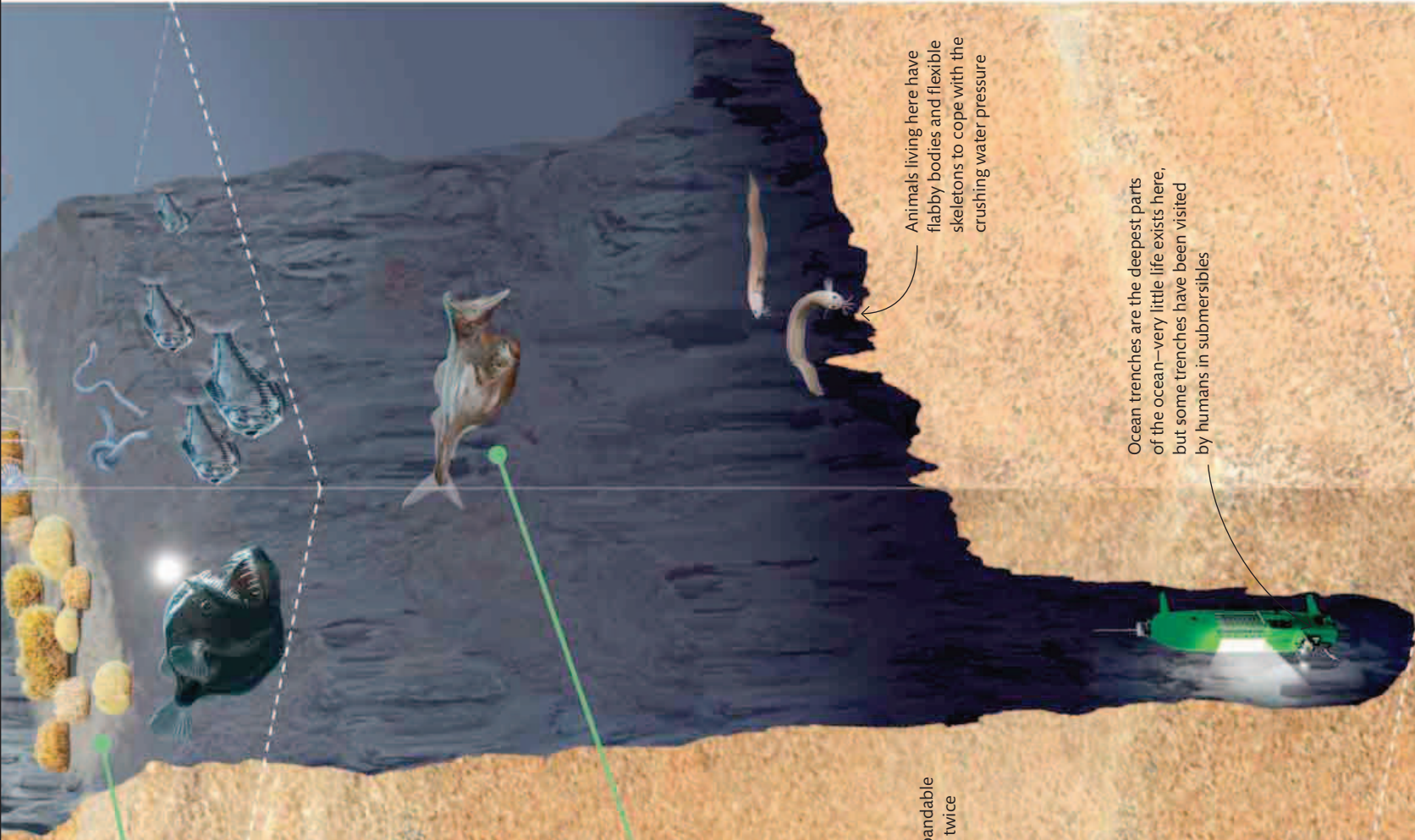


A black swallower's expandable stomach can hold prey twice as long as the fish itself

THE ABYSS

Many animals that live in the deepest parts of the ocean eat bits of dead animals sinking down from above, but the black swallower catches live prey. It slowly gulps its victim down whole, coiling it tightly inside its sacklike stomach. It can survive without another meal for a long time.

ABYSSAL ZONE
13,100-19,700 ft
(4,000-6,000 m)

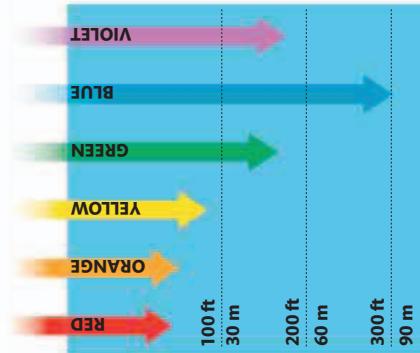


Animals living here have flabby bodies and flexible skeletons to cope with the crushing water pressure

Ocean trenches are the deepest parts of the ocean—very little life exists here, but some trenches have been visited by humans in submersibles

FROM LIGHT TO DARK

Huge amounts of tiny green algae in the water provide a feast for the ocean's vegetarians. To make food, algae need sunlight, which is made up of different colors. Most algae prefer the energy of red light, but this cannot reach very far, so algae and almost all other ocean life live near the surface. Blue light can penetrate farther, giving the ocean its color, but no light reaches deeper than 3,300 ft (1,000 m).



LIVING IN THE COMMUNITY

CORAL REEF

Coral reefs are richer with life than anywhere else in the ocean. Here, basking in the tropical sunshine, hundreds of different species of corals grow and provide a habitat for thousands of snails, fish, and other animals. Some creatures graze on the coral, whereas others are hungry predators. Other animals even form partnerships and help each other survive.

WORKING TOGETHER

Some animals work together to make their lives easier. This shrimp plucks scraps of food from a moray eel's mouth, giving the eel a teeth-cleaning and getting itself a meal.

Eels provide easy pickings for hungry shrimp



HUNTING GROUND

Reef sharks are surrounded by so much prey that they don't have to move far to satisfy their big appetite. Many can squeeze between rocks to grab fish that are hiding there.



UNDERWATER GARDEN

A tropical reef can be as vibrant and colorful as any garden. The sea floor is carpeted with an astonishing variety of corals, seaweeds, and sponges. Teeming with life, coral reefs are called rain forests of the sea.

STATS AND FACTS

SIZE 232,000 sq miles (600,000 sq km) total area of all coral reefs on the planet



GREAT BARRIER REEF

138,220 sq miles (358,000 sq km) Great Barrier Reef



The Great Barrier Reef off northern Australia is the biggest reef in the world. It is even visible from space. New species of fish are found there each year.







SHINING A LIGHT

Modern submersibles are operated by a three-man crew and are agile enough to explore many parts of the ocean. Big windows and a source of light help make the view as clear as possible.

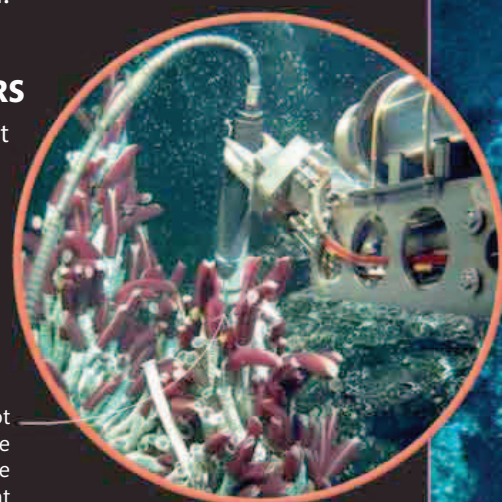
DIVE, DIVE, DIVE!

SUBMERSIBLES

In 1960 a diving vehicle called a submersible took a two-man team nearly 7 miles (11 km) down into an underwater trench at the bottom of the Pacific Ocean. To this day, no one has gone as deep, but different submersibles around the world have completed hundreds of deep-sea explorations. Submersibles are reinforced to withstand the high pressures, enabling humans to explore life in the deep ocean.

DEEP-SEA SMOKERS

Scientists diving in *Alvin*—the best known of all the submersibles in use—were the first to see the strange animals that live around hot, underwater volcanic vents known as black smokers.



Alvin's robot arm takes the temperature of a vent



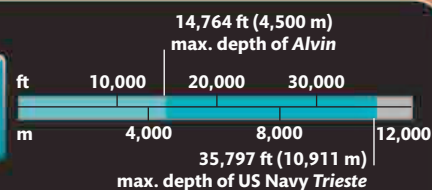
OUTSIDE THE SUB

Modern suits made from lightweight aluminum help divers go deeper for longer, but they are not strong enough to go as deep as a crew-carrying submersible.

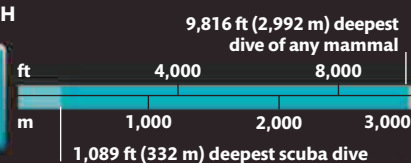
STATS AND FACTS

Submersibles have taken humans to the bottom of the ocean. They can dive far deeper than whales, the deepest-diving mammals.

DEPTH



DIVE DEPTH



DIVES MADE BY ALVIN

175
PER YEAR



GETTING UP CLOSE

DIVING

Trained human freedivers can hold their breath for minutes underwater, but with the right equipment this can stretch to over an hour. Scuba divers use a tank filled with compressed air that is fed to the diver through a mouthpiece. Scuba gear enables many people to dive for fun, and allows scientists to spend enough time in the water to study the ocean and the life that lives there.

BEHIND BARS

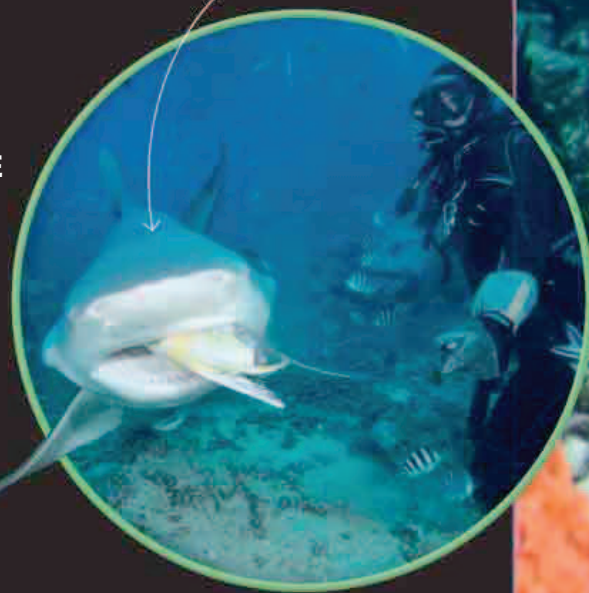
Protection in a cage is the only safe way to get close to great white sharks. The bars are strong enough to withstand the force of sharks crashing into them.



Bull shark accepts a tasty morsel from a metal-gloved diver.

FEEDING TIME

Some predatory sharks are approachable enough for divers to get up close and even feed them with scraps of food. Divers are always careful and treat these animals with respect.



SWIMMING WITH GIANTS

The world's biggest shark, the whale shark, is a harmless filter feeder and stays so close to the surface that snorkelers can swim alongside this gentle giant.



LIGHTS, CAMERA, ACTION!

Underwater filming isn't easy. Cameras have to be waterproof and you may need extra light to film in deep water. The really tricky part is getting your stars to cooperate so that you can get the perfect shot.

HIDDEN IN THE DEPTHS

SHIPWRECKS

There are around three million shipwrecks lying on the ocean bed and the oldest have been there for more than three thousand years. Ships sink as a result of accidents at sea and the cold, salty water helps prevent decay. Marine life soon takes over as corals grow on the wrecks and fish arrive. Over time, many other species make shipwrecks their home until this new habitat is crowded with all sorts of ocean life.

Sharks look for easy meals

RICH PICKINGS

The wide variety of life found on a wreck attracts big predators that make the most of available prey. Reef sharks patrol older shipwrecks that are home to smaller animals.



SAFE HAVEN

A shipwreck provides shelter for ocean animals, hiding them from bigger predators. Animals use them the same way they would use natural caves and rocky crevices.



An old bottle makes a safe home

UNDER INVESTIGATION

Marine biologists are interested in understanding how life can colonize wrecks. Archaeologists use shipwrecks to study how humans lived and used the oceans many years ago.





TAKING OVER
Anemones, barnacles, and sea urchins are among the first animals to set up home on a sunken ship. About a year or two later, corals start building up, turning the shipwreck into an artificial reef.

DESCENT INTO DARKNESS

BOTTOM OF THE SEA

The surface of the ocean is bright with sunshine, wild with waves and, in the tropics, it is warm. Deeper down, the Sun's rays cannot reach: it is always dark and colder than inside a refrigerator. The deepest part of the ocean is home to some of the strangest animals on the planet. There is so little food down there that fish swim slowly to save their energy. Anything that comes within range is a potential meal—even if it's bigger than you are.

GLOWING IN THE DARK

Many deep-sea animals have special light-producing organs or patches in their skin. They flash their lights to signal to mates, or use them as a lure for attracting prey.

Giant tube worms, crabs, and fish live around hot water vents on the sea floor



HOT-BED OF LIFE

In places the ocean floor has volcanic ridges that spew out super-hot water. The animals here survive the high temperatures and feed on chemicals dissolved in the water.

Mouthlike hood snaps shut when food drifts inside



UNDER PRESSURE

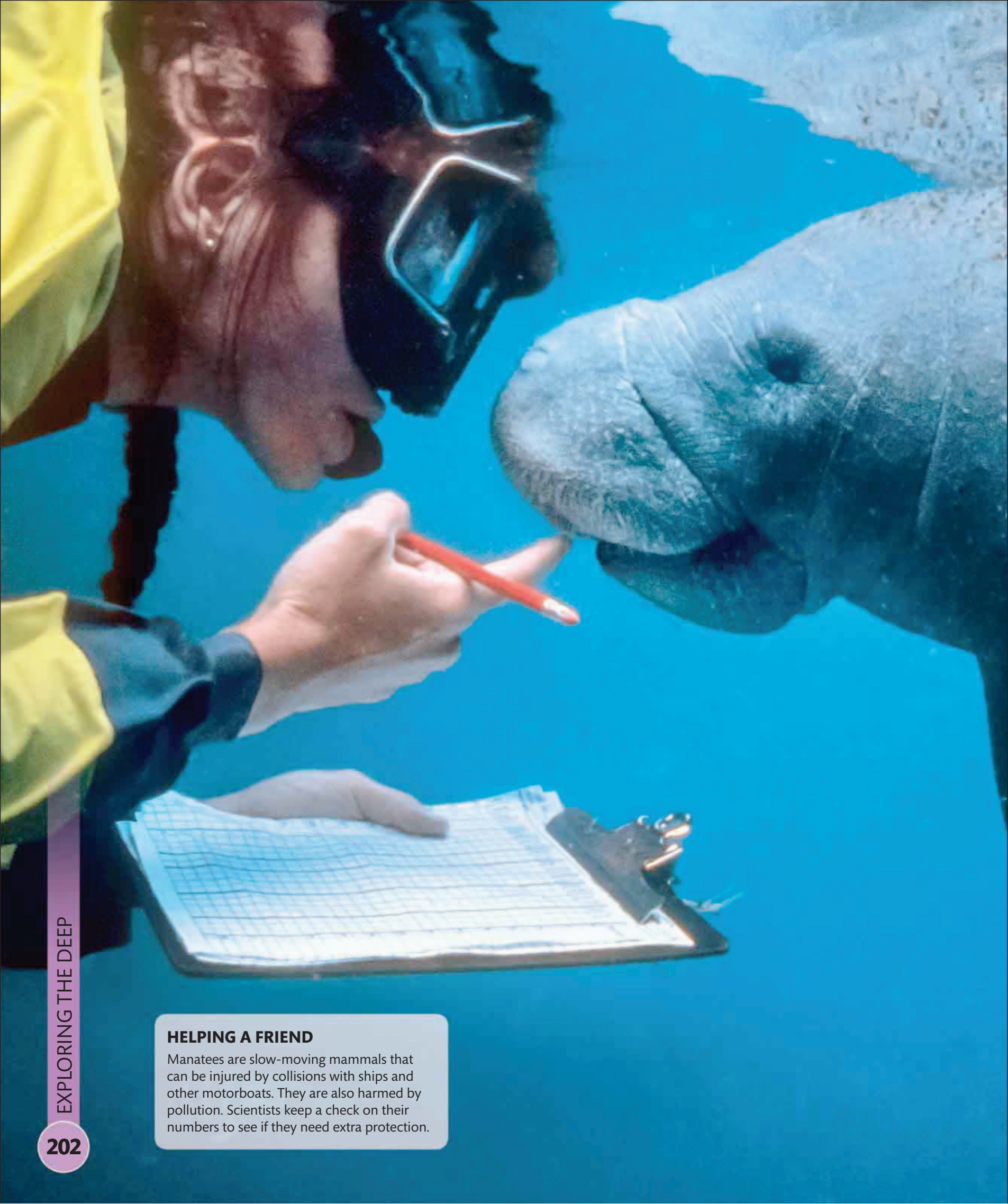
Some animals, such as this predatory tunicate, live attached to the ocean floor. It catches tiny floating animals in its "jaws" and, like other deep-sea animals, has a flabby body that can withstand the high water pressure.



A ghost shark, characterized by its pale, spotted body and translucent skin, is shown swimming horizontally over a diverse seabed. The seabed is covered with various marine life, including several prominent red sea urchins, two white sponges, and patches of green and brown algae. The water is dark and slightly murky, creating a gloomy atmosphere.

GHOST OF THE DEEP

This ghost shark is happiest in coastal seas but sometimes descends to deeper, darker waters where it spends most of its time swimming slowly along the bottom looking for equally slow prey. Its strong sense of smell and ability to detect electric fields help it search in the gloom.



HELPING A FRIEND

Manatees are slow-moving mammals that can be injured by collisions with ships and other motorboats. They are also harmed by pollution. Scientists keep a check on their numbers to see if they need extra protection.

KEEPING TRACK

PROTECTING THE SEAS

The ocean looks so vast that it seems endless and everlasting. In fact, many animals are fished so much that their numbers are dropping. Garbage from land pollutes the water, while ocean life is harmed by climate changes. All around the world people are studying the ocean and doing what they can to protect the animals that live there and prevent them from being driven to extinction.

Radio tracker fixed to turtle's shell

TRACKING MOVEMENTS

By fitting animals with trackers that send out detectable signals, scientists can keep track of where they go. This helps them protect species that rely on certain habitats to survive.



REPLANTING REEFS

In places where reefs have been destroyed, special frames are used to replace them. These have been "seeded" with fragments of coral, encouraging the growth of new reefs as habitats for animals.

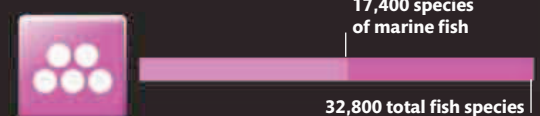
STATS AND FACTS

Scientists are still discovering new types of marine life. There could be as many as one million species living in the ocean.

NUMBER OF SPECIES DESCRIBED PER YEAR



NUMBER OF FISH SPECIES



GLOSSARY



ABYSS

The abyss, or abyssal zone, is the deepest part of the ocean, stretching 13,100 to 19,700 ft (4,000–6,000 m). It is intensely dark and cold and few animals are able to live there.

ALGAE

A group of simple plants that include microscopic green plankton and enormous multicelled seaweeds, such as giant kelp.

BELL

The umbrella-shaped body of a jellyfish.

BIOLUMINESCENCE

The production of light by animals. It can be used to attract a mate, for camouflage, as a decoy, for catching prey, or for communication. It is created by a chemical reaction in the animal's body.

BUOYANCY

The ability of a marine organism to float in water.

CAMOUFLAGE

Colors and patterns on an animal's skin that help it blend in with its surroundings.

CANINE

A pointed tooth that is often enlarged in meat eaters and is used for tearing food. In walruses and narwhals the upper canines grow long enough to form tusks.

CARTILAGE

A tough, light yet flexible substance that makes up the skeleton of a shark or ray instead of bone.

COLD-BLOODED

Describes an animal whose body temperature varies with that of its environment. It controls its temperature by moving to hotter or cooler areas as needed.

COLONY

A group of animals that live closely together, often relying on each other. Corals live in colonies.

CORAL

Soft-bodied animals that live in large groups or colonies, usually in warm, shallow seas. They secrete a substance that hardens into stone around them for protection.

CRUSTACEAN

An animal such as a shrimp, crab, or lobster that has a hard outer shell and four or more pairs of limbs. They have to molt the outer shell to grow.

DECIBEL

A unit that measures the intensity or loudness of a sound. Total silence is just above 0 decibels (dB).

DISK WIDTH

Term used to describe the body size of a fish, such as a ray, that has "wings."

DORSAL FIN

An unpaired, upright fin on the back of a fish, whale, or dolphin.

ECHINODERM

A marine invertebrate that has a chalky outer skeleton and tube feet, such as a sea star (starfish) or sea urchin.

ELECTRORECEPTION

The ability of an aquatic animal to detect an electric field or current. It is used for detecting objects or for communication.

EGG CASE

The tough case that surrounds the fertilized egg of some sharks or rays. It protects the developing shark until it is ready to hatch.

ESTUARY

The mouth of a large river at the point where it meets the sea. The amount of salt in the water changes with the tide.

FEEDING FRENZY

When a group of predators, such as sharks or sailfish, work together to herd and attack prey, often with few of the prey surviving.

FEELER

Part of the body that is used to sense or touch things, especially when searching for food.

FILTER FEEDER

An animal that feeds by filtering out plankton or small particles of food suspended in water.

FLATFISH

A flattened species of fish that swims on its side, close to the seabed. Both eyes lie on the same side of the head. Members of this group include plaice, soles, and halibut.

GAPE

The wide opening of an animal's mouth or shell.

GESTATION

The period of time, also called a pregnancy, between the fertilization of an egg and the birth of an animal.

GILLS

The structures used by fish and other aquatic animals to obtain oxygen from water. Usually arranged in pairs, they also get rid of waste carbon dioxide from the blood.

HERTZ

A unit (Hz) used to measure the frequency of sound waves. One hertz is equal to one cycle per second. The higher the frequency of cycles, the higher-pitched the sound.

HYDROTHERMAL VENT

A crack in the seabed that pours out superheated water that is full of minerals. Vents are often home to unique colonies of animals that can survive in harsh conditions.

INVERTEBRATE

An animal without a backbone. Includes corals, mollusks, starfish, jellyfish, shrimp, and sponges.

JUVENILE

A young animal that is not yet able to reproduce.

LARVA

A young stage of an animal that looks very different from its adult form. Many marine animals spend part of their early life as a larva, including crabs, corals, and lobsters. (Plural is *larvae*.)

LURE

A part of the body of a marine animal that is used as bait to attract another animal when hunting. Lures can resemble a food animal, such as a worm, or be bioluminescent to attract prey in darkness.

MAMMAL

A warm-blooded animal that has hair and feeds its young on milk. Marine mammals include whales, dolphins, and seals.

MEMBRANE

A thin, flexible piece of skinlike tissue that acts as a barrier.

MIDNIGHT ZONE

The cold, dark zone in the middle of the ocean. It generally describes depths between 3,300–13,100 ft (1,000 and 4,000 m) below the surface. Animals that live here have to cope with intense pressure and constant darkness.

MIGRATION

The regular return journey that an animal makes every year to reach feeding or breeding grounds.

MOLLUSK

An invertebrate animal that has a soft, muscular body. Sometimes the body is surrounded by a hard shell. Mollusks include snails, clams, and sea slugs.

MOLT

The process of shedding an outer layer of skin or an external shell so that an animal can grow. This occurs at certain times of the year or at particular points in the animal's life cycle.

MOUTHBROODER

Species of fish in which one of the parents holds the developing eggs in its mouth until they hatch. During this time the adult cannot feed.

NOCTURNAL

Describes an animal that is active at night and sleeps during the day.

NUTRIENT

A substance that provides vital nourishment needed for the growth and maintenance of life.

OCEAN TRENCH

A very deep canyon in the ocean floor. The temperature is barely above freezing and the water pressure is crushing. Few animals can survive here.

PARASITE

An organism that lives on or inside another animal to gain food or shelter. It is usually harmful to its host.

PECTORAL FINS

A pair of fins that lie either side of a fish's head that help control its direction of movement.

PITCH

The high or low quality of a sound.

PLANKTON

Tiny animals and algae that drift or float in the sea and other water bodies. They provide food for larger animals.

PREDATOR

An animal that hunts and kills other animals (its prey) for food.

PREY

An animal that is killed and eaten by a predator.

PROPULSION

The action of moving forward.

RAKER

A structure in a filter-feeding fish that scrapes food particles off the gills and diverts them to the food pipe.

REEF

A ridge of jagged coral, rock, or sand lying just above or below the surface of the sea.

REPTILE

A cold-blooded vertebrate with scaly, waterproof skin, such as a marine iguana or a sea snake.

SALINITY

The amount of salt dissolved in water. Seawater has 35 g of salt for every liter of water. Fresh water is usually less than 0.5 g of salt per liter.

SCAVENGER

An animal that feeds on dead plants or animals.

SCHOOL OR SHOAL

A large number of fish that swim together.

SENSORY PORE

Part of a network of jelly-filled pockets on the skin of sharks and other electroreceptive fish. These pores help fish detect electric fields.

SKELETON

A framework of bone or cartilage that supports the body of an animal and provides attachment points for muscles.

SKIN PIGMENT

Color found in the skin of an animal.

SLIME

A soft and slippery substance that is produced by the skin of an animal. It helps fish swim more easily, but also protects them against parasites and infections. Some slimes are poisonous to predators.

SPAWN

The eggs of a fish, amphibian, or invertebrate. Spawning is the laying of the eggs.

SPECIES

A group of animals that look like one another and can reproduce with each other—animals cannot reproduce with members of another species.

STINGER

A weapon used by some animals in self-defense or to capture prey by injecting a poison through a hollow spine or harpoon.

SUBMERSIBLE

A small underwater craft designed for research and exploration.

SUNLIGHT ZONE

The uppermost layer of the ocean, which is bathed with sunlight during the day. In clear water it can extend down as far as 655 ft (200 m); in murky water as little as 50 ft (15 m). Most fish live in this zone.

TENTACLE

Thin, flexible limb mainly used for grasping and feeding. Some carry sense organs for touch, taste, smell, or vision. Others may be equipped with suckers, stingers, hooks, or even teeth.

TIDE

The twice-daily rise and fall in sea level that is caused by the pull of the Sun and Moon.

TOXIC

Describes a substance that is poisonous. The bite or sting of an animal may have a toxic effect on another animal.

TWILIGHT ZONE

The region immediately below the sunlight zone, from 655 to 3,300 ft (200–1,000 m). Very little light reaches this level and plants cannot grow.

WARM-BLOODED

Describes an animal that is able to keep its body temperature constant regardless of the temperature of its surroundings. All marine mammals and some sharks are warm-blooded.

WATER PRESSURE

The weight of the water pressing down on an animal as it goes deeper into the ocean. At the bottom of the deepest trench it is as much as 8 tons per square inch (1 tonne per square cm).

VENOM

A poison, or toxin, produced by an animal that is used in hunting or self-defense. It is injected into another animal through a bite or sting.

VERTEBRATE

An animal that has a backbone or spinal column made up of individual bones or pieces of cartilage called vertebrae. (Single is *vertebra*.)

VERTICAL MIGRATION

A pattern of movement of animals (and plankton) between deep and shallow waters. This may happen daily or be seasonal. It also occurs in animals that spend different stages of their lives at different depths.

ABBREVIATIONS USED IN THIS BOOK

/	per—for example, km/h means kilometers per hour
°C	degrees Celsius
cal	calories
cm	centimeter
dB	decibel
°F	degrees Fahrenheit
fl oz	fluid ounce
ft	foot
g	gram
Hz	hertz—see glossary for definition
in	inch
kg	kilogram
km	kilometer
lb	pound
m	meter
min	minute
ml	milliliter
mm	millimeter
mph	miles per hour
oz	ounce
s or sec	second
sq	square

INDEX



A

abyssal zone 191
algae 41, 111, 191
anemones 76, 77, 100, 199, 201
angel shark 35
anglerfish 18-19
Antarctic Ocean 34, 110-11
Arctic 56, 155
arms, starfish 54, 55

B

bamboo shark, brown-banded 108-9
banded sea snake 121
barnacles 81, 199
barrel shrimp 150-51
basking shark 10-11
batfish, red-lipped 52-3
beaks 126, 139
biting reef worm 44-5
bivalves 40
black smokers (hydrothermal vents) 7, 195
black swallower 191
blacktip reef shark 158-61
blacktip shark 68-9
blind shark 128-9
blood
 crocodile icefish 34
 great white shark 36
 sensing in water 37, 186
 thresher shark 79
blue shark 136-7
blue-streak cleaner wrasse 106-7
blue swimming crab 26-7
boxer crab 76-7
brains 169, 171
breathing 171
broadclub cuttlefish 169
broadnose sevengill shark 178-9
bronze whaler 86-7
brown-banded bamboo shark 108-9
bull shark 102-5, 197
burrows 93, 131

C

California horn shark 16-17
camouflage 13, 25, 29, 30, 35, 50, 52, 122, 127, 169
catshark, small spotted 152-3
clam, giant 40-41

cleaner wrasse, blue-streak 106-7
clownfish 100-101
coastal waters 7
colors 70, 114, 127
communication, sperm whale 171
cone snail 48
copepods 118
coral reefs 6, 192-3, 199, 203
courtship, seahorses 118
crabs 116, 134, 153
 blue swimming crab 26-7
 boxer crab 76-7
crocodile icefish 34
cuttlefish, broadclub 169

D

deep sea 6, 7, 190-91, 200-201
defenses
 boxer crab 77
 clownfish 100
 cone snail 48
 flying fish 66
 lionfish 32-3
 parrotfish 156, 157
 pufferfish 42-3
 sea cucumber 114-15
 seahorses 119
 shy shark 94
 swell shark 30
 zebra shark 121
devilfish, spiny 122-3
diving 196-7
 gentoo penguin 89
 narwhal 21
 sperm whale 171
 submersibles 194-5
dogfish, spiny 117
dolphins 7, 36, 178
 spinner dolphin 80-81

E

eels
 garden eel 130-31
 moray eel 14-15, 192
eggs
 barrel shrimp 151
 blue swimming crab 27
 California horn shark 17
 common octopus 126, 127
 giant clam 40

eggs *continued*
 jawfish 92-3
 lionfish 33
 loggerhead turtle 138
 pygmy seahorse 29
 seahorses 118
electricity, torpedo ray 180-81
eyes 12, 13, 50, 129, 152, 164, 173, 174, 177

F

feeding frenzies 47, 68, 186
feelers 129, 168
filter feeders 60
fins 17, 33, 35, 47, 51, 52, 66, 67, 70, 71, 181
fish

 blue-streak cleaner wrasse 106-7
 clownfish 100-101
 crocodile icefish 34
 deep-sea fish 6, 200-201
 flying fish 66-7
 garden eel 130-31
 groupers 15
 jawfish 92-3
 lefteye flounder 12-13
 lionfish 32-3
 mobula ray 84-5
 moray eel 14-15, 192
 parrotfish 156-7
 pufferfish 42-3
 pygmy seahorse 28-9
 red-lipped batfish 52-3
 remora 72
 ribbon-tailed stingray 50-51
 sailfish 70-71
 sardines 87, 96-7
 sea lamprey 49
 Sloane's viperfish 62-3
 spiny devilfish 122-3
 torpedo ray 180-81
 see also sharks
flatfish 12-13
flippers, loggerhead turtle 138, 139
flounder, lefteye 12-13
flying fish 66-7
frilled shark 124-5, 190

G

garden eel 130-31
gentoo penguin 88-9

ghost shark 201
giant clam 40-41
gills 58, 59, 107, 125
Great Barrier Reef 192
great white shark 36-9, 79
Greenland shark 154-5
groupers 15

H

hammerheads 164-7
harpoons 23, 48
hearing, silky shark 186
horn shark, California 16-17
hydroids 185
hydrothermal vents (black smokers) 7, 195

I

icefish, crocodile 34
iguana, marine 98-9
ink, cuttlefish 169
intestines, tiger shark 172

J K

jawfish 92-3
jaws 14, 15, 16, 25, 36, 44, 60, 63, 73, 75, 113, 116, 117, 125, 171
jellyfish
 lion's mane jellyfish 56-7
 Portuguese man o' war 22-3
jumping
 blacktip shark 68
 flying fish 66
 great white shark 39
 mobula ray 84-5
 spinner dolphin 81
krill, Antarctic 110-11, 113, 136

L

lamprey, sea 49
leaping *see* jumping
lefteye flounder 12-13
lemon shark 140-43
light zones 191
lionfish 32-3
lion's mane jellyfish 56-7
liver, shark 10, 172
lizards 98-9
loggerhead turtle 138-9

M

mackerel 47
mako, shortfin 82-3
mammals
 manatee 202-3
 sea otter 134-5
 walrus 146-7
 see also dolphins; whales
manatee 202-3
manta ray 7
mantis shrimp 176-7
marine iguana 98-9
megamouth shark 112-13
midnight zone 191
migration 10, 49, 58, 82, 97, 137, 139, 145, 164
mimicry 121
mobula ray 84-5
mollusks 40
moray eel 14-15, 192
mouths 10, 12, 14, 15, 16, 28, 33, 49, 51, 54,
 58, 63, 73, 75, 93, 113, 118
muscles
 giant clam 40
 great white shark 36, 37
 shortfin mako 82
mussels 54, 134

NO

narwhal 20-21
nurse shark 72-5
oceanic whitetip shark 46-7
octopuses 126-7, 169, 191
otter, sea 134-5

P

Pacific Ocean 195
packs and schools 21, 85, 87, 97, 110, 111,
 117, 136, 142, 160, 166, 183
 predators 60-1, 68-9, 79, 87, 160, 183
parasites 85, 107
parrotfish 156-7
penguin, gentoo 88-9
pincers, crabs 27, 76, 77
plankton 6, 7
plankton feeders 10, 28, 41, 49, 58, 77
poisons *see* venom
polar seas 6
pollution 203
porcupinefish 43
Portuguese man o' war 22-3
pregnancy 125, 140, 141, 144, 158
pufferfish 42-3
pygmy seahorse 28-9

R

rays 183
 manta ray 7
 mobula ray 84-5
 torpedo ray 180-81

red blood cells 34
red-lipped batfish 52-3
reef sharks 190, 192, 198
 blacktip reef shark 158-61
 whitetip reef shark 132-3
reef worm, biting 44-5
reefs 6, 192-3, 199, 203
remora 72
reptiles
 marine iguana 98-9
 sea snakes 121, 148-9
 turtles 138-9, 172, 203
ribbon-tailed stingray 50-51

S

sailfish 7, 70-71
sandtiger shark 182-5
sardine 87, 96-7
sawshark 168
scalloped hammerhead 166
schools *see* packs and schools
scuba divers 197
sea apple 115
sea cucumber 114-15
sea floor 12, 200-201
sea lamprey 49
sea lion 94
sea otter 134-5
sea snakes 121, 148-9
sea urchins 199, 201
seahorses 118-19
 pygmy seahorse 28-9
seals 36, 39, 154, 155
seaweed 98, 99
sensors 164, 165, 168, 176
sevengill shark, broadnose 178-9
sharks 6, 197
 angel shark 35
 basking shark 10-11
 blacktip reef shark 158-61
 blacktip shark 68-9
 blind shark 128-9
 blue shark 136-7
 broadnose sevengill shark 178-9
 bronze whaler 86-7
 brown-banded bamboo shark 108-9
 bull shark 102-5, 197
 California horn shark 16-17
 common tope shark 144-5
 frilled shark 124-5, 190
 ghost shark 201
 great white shark 36-9, 79
 Greenland shark 154-5
 hammerhead 164-7
 lemon shark 140-43
 megamouth shark 112-13
 nurse shark 72-5
 oceanic whitetip shark 46-7
 reef sharks 190, 192, 198
 sandtiger shark 182-5
 sawshark 168
 shortfin mako 82-3
sharks *continued*
 shy shark 94-5
 silky shark 186-7
 small spotted catshark 152-3
 spiny dogfish 117
 starry smooth-hound 116
 swell shark 30-31
 thresher shark 78-9
 tiger shark 172-5
 whale shark 58-61, 197
 whitetip reef shark 132-3
 wobbegong 24-5
 zebra shark 120-21
shells 26, 27, 40, 138
shipwrecks 198-9
shoals *see* packs and schools
shortfin mako 82-3
shrimp 192
 barrel shrimp 150-51
 mantis shrimp 176-7
shy shark 94-5
silky shark 186-7
skin 99, 123, 127, 133, 152, 169, 187
sleep 146, 147, 156
slime 100, 156, 157
Sloane's viperfish 62-3
small spotted catshark 152-3
smooth-hound, starry 116
snails 48, 169
snakes, sea 121, 148-9
speed
 blue shark 136
 broadnose sevengill shark 178
 California horn shark 17
 flying fish 66
 gentoo penguin 88
 great white shark 36
 Greenland shark 155
 mobula ray 85
 Portuguese man o' war 23
 red-lipped batfish 52
 sailfish 70-71
 shortfin mako 82
 Sloane's viperfish 63
 tiger shark 173
sperm whale 170-71
spines 32, 33, 42, 43, 50, 51, 117, 122
spinner dolphin 80-81
spiny devilfish 122-3
spiny dogfish 117
spotted catshark, small 152-3
squid 125, 136, 153, 169, 171
starfish 54-5
starry smooth-hound 116
stingrays 50-51, 164
stings 16, 22, 23, 56, 77, 100
stomachs 32, 42, 54, 55
submersibles 191, 194-5
suckers 114, 115, 127, 169
sunlight zone 190
swell shark 30-31
swim bladder 118
swordfish 82

T

tails 35, 50, 78, 79, 82
teeth 15, 16, 19, 21, 25, 36, 49, 58, 63, 73,
 99, 116, 117, 125, 146, 171, 173, 185
tentacles
 anemones 100
 lion's mane jellyfish 56-7
 Portuguese man o' war 22-3
 sea cucumber 115
thresher shark 78-9
tides 7
tiger shark 172-5
tope shark, common 144-5
torpedo ray 180-81
tracking animals 203
tube feet 55, 114, 115
tuna 47, 82
tunicate 200
turtles 172, 203
 loggerhead turtle 138-9
tusks 21, 146, 147
twilight zone 190

V

venom
 biting reef worm 44
 cone snail 48
 lionfish 32
 Portuguese man o' war 22-3
 pufferfish 42
 ribbon-tailed stingray 51
 sea cucumber 114
 sea snakes 148, 149
 spiny devilfish 122
 spiny dogfish 117
viperfish, Sloane's 62-3

WZ

walking fish
 brown-banded bamboo shark 108
 California horn shark 17
 common octopus 126
 red-lipped batfish 52
 spiny devilfish 122
walrus 146-7
whale shark 58-61
whaler, bronze 86-7
whales 36
 narwhal 21
 sperm whale 170-71
whitetip reef shark 132-3
whitetip shark, oceanic 46-7
wings 35, 50, 51, 66, 85, 89, 181
wobbegong 24-5
worm, biting reef 44-5
wrasse, blue-streak cleaner 106-7
zebra shark 120-21

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121 Getty Images: Gerard Soury / Oxford Scientific (cr). **122 Dreamstime.com:** Howard Chew / Singularone (cl). **122-123 Scubazoo.com:** Jason Isley. **124-125 Photoshot.** **125 FLPA:** Kelvin Aitken (cr). **127 Corbis:** Chris Newbert / Minden Pictures (tl). **128-129 Science Photo Library:** Visuals Unlimited Inc. / Andy Murch. **129 FLPA:** Biosphoto / Gérard Soury (cr). **130-131 Alamy Images:** FLPA.
131 Scubazoo.com: Jason Isley (cr).
132-133 Scubazoo.com: Jason Isley.
134-135 FLPA: Gerry Ellis / Minden Pictures. **134 Getty Images:** David Courtenay / Oxford Scientific (cl).
136-137 Alamy Images: Mark Conlin.
138 FLPA: Biosphoto / Brandon Cole (clb); Minden Pictures / Mitsuki Iwago (cl). **Scubazoo.com:** Christian Loader (tr).
139 Alamy Images: Martin Strmiska (cr).
140-141 Alamy Images: WaterFrame.
142-143 Scubazoo.com: Jason Isley.
144-145 Alamy Images: Dan Sullivan.
145 Photoshot: Charles Hood / Oceans Image (cr). **146-147 Robert Harding Picture Library:** Reinhard Dirscherl.
147 Alamy Images: Photoshot Holdings Ltd (cr). **148 Scubazoo.com:** Jason Isley (cl). **148-149 Scubazoo.com:** Christian Loader. **150-151 Getty Images:** David Wrobel / Visuals Unlimited, Inc.
151 Photoshot: NHPA (cr). **152-153 Getty Images:** Marevision. **154-155 Photoshot:** Saul Gonor / Oceans Image. **156-157 Getty Images:** Visuals Unlimited, Inc. / Reinhard Dirscherl. **156 Alamy Images:** Adam Butler (cl). **158-159 Getty Images:** Barcroft Media / Contributor. **160-161 Getty Images:** Sakis Papadopoulos / The Image Bank.
164 Alamy Images: Martin Strmiska (br). **Photoshot:** Michael Patrick O'Neill (cl).
165 FLPA: Imagebroker / Norbert Probst (tr).

166-167 Naturfoto www.naturephoto.cz.com. **168 Alamy Images:** Marty Snyderman / Stephen Frink Collection (cl). **169 Corbis.** **170-171 FLPA:** Hiroya Minakuchi / Minden Pictures.
172 Scubazoo.com: Jason Isley (tr).
173 Scubazoo.com: Jason Isley (tr, br).
174-175 SeaPics.com: Eric Cheng.
176-177 Dreamstime.com: Beverly Speed.
177 Photoshot: LOOK (cr). **178-179 Alamy Images:** Tobias Friedrich / F1online digitale Bildagentur GmbH. **178 Scubazoo.com:** Jason Isley (cl). **180 Science Photo Library:** Visuals Unlimited Inc. / Andy Murch (bc). **181 FLPA:** Biosphoto / Bruno Guenard (tr). **182-183 Photoshot:** Richard Smith / NHPA. **184-185 Scubazoo.com:** Jason Isley. **186-187 FLPA:** Imagebroker.
186 Science Photo Library: Andy Murch / Visuals Unlimited, Inc. (cl). **190 FLPA:** Biosphoto / Pascal Kobeh (cla). **Getty Images:** (crb). **Scubazoo.com:** Jason Isley (bc). **191 imagequestmarine.com:** Peter Herring (cb). **naturepl.com:** David Shale (bl). **192 FLPA:** Biosphoto / Yann Hubert (c). **Scubazoo.com:** Jason Isley (clb).
192-193 Scubazoo.com: Jason Isley.
194-195 Getty Images: Brian J. Skerry.
195 Science Photo Library: Alexis Rosenfeld (cb). **Woods Hole Oceanographic Institution:** Image courtesy Charles Fisher, Penn State / NSF, NOAA / HOV Alvin 2002 (cr).
196-197 Scubazoo.com: Jason Isley.
197 Getty Images: Wayne Lynch (c). **Scubazoo.com:** Adam Broadbent (bc); Jason Isley (crb). **198-199 Science Photo Library:** Photostock-Israel. **198 Corbis:** Stephen Frink (bc, c). **Scubazoo.com:** Jason Isley (clb). **200-201 FLPA:** Minden Pictures / Norbert Wu. **200 FLPA:** Frans Lanting (c); Minden Pictures / Norbert Wu (bc). **Science Photo Library:** Dr. Ken MacDonald (clb). **202-203 Science Photo Library:** Douglas Faulkner. **203 Alamy Images:** Rheinhard Dirscherl (cr). **Scubazoo.com:** Roger Munns (cb). **204 Scubazoo.com:** Jason Isley (tr, ftr); Christian Loader (tc).
206 Scubazoo.com: Jason Isley (tr, ftr); Roger Munns (tc). **208 Scubazoo.com:** Jason Isley (tr)
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