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What do you know about SHARKS?

Science World, May 7, 2001, by Sharon Guynup
They're ferocious predators. They haunt us in nightmares. But the scariest thing about sharks may be that they're vanishing from the world's oceans. Last December, former President Clinton signed an executive order to ban "shark finning" in U.S. waters. Fishers catch sharks, shear off their fins, then fling them back in the water to die. (The fins are used in shark fin soup, an Asian delicacy that can fetch \$100 per bowl.) "Shark populations have declined alarmingly--by up to 80 percent--along U.S. Atlantic and Gulf coasts since the mid-'70s," says Robert Hueter, director of the Center for Shark Research at Mote Marine Laboratory in Sarasota, Fla. Worldwide, up to 100 million sharks are caught, drowned, or tangled in fishing nets each year.

Why do sharks need protection? Sharks are top predators in the aquatic food chain--a web that interconnects all organisms, in which smaller creatures become food for larger predators. Without sharks, the ocean's delicate ecosystem would be disrupted. Species that sharks devour, like seals, for example, would overpopulate and in turn decimate other species, like salmon. Read our Q&A to learn more about the world's most fearful fish.

WHAT ARE SHARKS?

Sharks are fishes with skeletons made of rubbery cartilage (tough, flexible tissue) instead of bone. They're cold-blooded (unable to generate their own body heat), breathe through gills (respiratory organs), and have a two-chambered heart. Though most live in warm seas, the Greenland shark thrives in frigid Arctic seas.

WHAT'S THE LARGEST SHARK? THE SMALLEST?

Weighing in at 15 tons and stretching up to 14 meters (46 feet) long, the whale shark is the world's largest fish--bigger than a school bus!

Nine hundred meters (2,953 feet) below the ocean surface lives the smallest shark: the dwarf shark. An adult measures only 25 centimeters (10 inches) long!

ARE ALL SHARKS DANGEROUS TO PEOPLE?

Most sharks are harmless. "Out of 375 shark species, only two dozen are in any way really dangerous to us," says Hueter. Still, scientists don't know for sure why sharks sometimes attack humans. One theory: sharks may mistake the sound of swimming humans for that of injured fish--which are easy prey.

WHICH SHARK IS THE MOST DANGEROUS TO HUMANS?

"In terms of fatal attacks, it's a tossup between the great white, the tiger, and the bull shark," Hueter says. People fear the massive great white the most because of its size--up to 6.4 m (21 ft) long--and its large razor-like teeth, not to mention the terror stirred up by Jaws flicks. But great whites usually inhabit deep seas--not shallow waters where people swim. Worldwide, fewer than 100 human attacks by all shark species are reported each year.

WHERE DO MOST SHARK ATTACKS HAPPEN?

Florida leads the world in shark bites, with 22 to 25 reported incidents each year. But, claims Hueter, they're not repeated shark attacks--usually a single bite. In fact, shark attacks kill a human only once every few years. "Most really bad attacks occur off the coasts of California, Hawaii, Australia, and South Africa," Hueter says.

JUST HOW POWERFUL IS A SHARK'S BITE?

Scientists built a "shark-bite meter" that measures the jaw strength of one species, the dusky shark: it exerts 18 tons of pressure per square inch on a victim. That's like being crushed beneath the weight of 10 cars!

WHAT DO SHARKS EAT?

Sharks chow down on what they can when they can--usually smaller animals from shrimp and fish to turtles and seabirds. Some, like the bull shark, consume large mammals like sea lions or dolphins; others, like the whale shark, eat only plankton, tiny

drifting animals and plants. And tiger sharks devour just about anything--mammal carcasses, tin cans, plastic bags, coal, and even license plates have been found inside their stomachs!

HOW DO SHARKS FIND PREY?

Sharks can hear a wide range of sounds, but are attracted by bursts of sound--like those made by an injured fish--or occasionally humans romping in water. At close range, sharks also sense vibration with their lateral line, a sensory system that runs from head to tail on each side of a shark's body. Inside the lateral line, which helps a shark maintain balance as well as detect sound, are canals filled with fluid and tiny "hair cells." Sound causes the liquid to vibrate, alerting the shark to the presence of another creature. This sense allows sharks to hunt even in total darkness.

WHAT'S A "FEEDING FRENZY"?

Sharks usually travel solo, but if one finds easy prey, an excited, competitive swarm of sharks may join in the feast, biting anything that lies in its path.

HOW DO SHARKS BREATHE?

A shark usually swims with its mouth open to force oxygen-rich water to pass over a set of gills housed in a cavity behind its head--a process known as ramjet ventilation. Gill flaps called lamellae absorb and help diffuse oxygen into the shark's bloodstream. Lamellae also help sharks expel carbon dioxide, a gaseous waste product of breathing, from the bloodstream.

ARE SHARKS SMART?

Experiments show that sharks recognize and remember shapes and patterns. Using shark snacks as rewards, scientists have taught lemon sharks to swim through mazes, ring bells, and press targets. "Although we learn new things about sharks every day, there's still a lot we don't know about them," says Hueter.

WHAT ARE SHARKS' NATURAL ENEMIES?

Large sharks sometimes eat smaller sharks,

and killer whales also dine on sharks. But the shark's greatest enemy is people. Humans kill sharks for food, use their skins for leather, make medicine from their liver oil, and use shark teeth for jewelry. Many sharks are killed senselessly for sport or get trapped and die in fishing nets. And it takes a long time for shark populations to rebound: most shark species take 10 years to reach reproductive age and produce small litters of less than a dozen pups. For more fascinating shark facts, check out "Shark-A-to-Z Science" at DiscoverySchool.com

NURSE SHARK

Nurse sharks are gish bottom dwellers found in the Atlantic Ocean. They're usually not dangerous, and are one of the few sharks that breathe by pumping water through their gills while lying motionless. They sometimes suck in prey as well.

WOBBERGONG SHARK

Wobbegongs are found resting on the sea floor in shallow waters of the Indo-Pacific and Red Sea. The barbels, or fringe of flesh around their mouths, are feelers that act as camouflage.

HAMMERHEAD SHARK

Hammerheads inhabit shorelines and deep seas worldwide. The head, or cephalofoil, provides greater maneuverability--and enlarged nostrils and eyes at the ends of their "hammer" receive more information giving them a hunting advantage.

GOBLIN SHARK

Goblin sharks feature needle-like teeth. They're rarely spotted--only 36 specimens have been counted--most found in waters deeper than 1,150 feet. Scientists think they inhabit seas from Europe to Australia.

LEOPARD SHARK

The largest fish in the sea--whale sharks--are very docile. They feed on plankton, tiny drifting plants and swim with their enormous mouths open, filtering food from the water with 15,000 tiny teeth.

LEOPARD SHARKS

Leopard sharks are commonly found near shore, often in large schools along the Pacific coast from Oregon to Mexico. They feed on small fish and crustaceans, and are generally harmless.

SHARK ATTACK

A sea lion at Ano Nuevo Island off the California coast managed to survive a vicious attack by a great white

shark, only to die a day later.

BRUSHING AND FLOSSING

Sharks continually lose their teeth, but some species grow new teeth as often as every week to replace worn or lost ones. During their lifetime, some species shed 30,000 teeth. Shark teeth vary according to what's on the menu:

- * Top: nurse shark teeth, jaw. Nurse sharks dine on shellfish.
- * Middle: tiger shark teeth, which crunch everything from fish and birds to tin cans and other garbage.
- * Bottom: mako shark teeth, which grind up squid and big fish like tuna and mackerel.

Sharks have good eyesight and can see colors. Their eyes are protected by a nictitating membrane that moves up and down like an eyelid. The membrane protects the eye of a Caribbean reef shark as it feeds.

BITE-SIZE FACTS

- * The first sharks appeared in the ancient oceans about 400 million years ago--200 million years before the dinosaurs!
- * Sharks are carnivores (meat-eaters). Most gobble their prey whole or rip it into large, shark-size bites.
- * Most sharks are found in the ocean but some, like the bull shark, also swim in lakes and rivers. Most shark attacks occur in warm waters--20 [degrees] to 30 [degrees] C (68 [degrees] to 86 [degrees] F).
- * Sharks lack the inflatable swim bladder that allows bony fish to control buoyancy. Most sharks must swim endlessly. If they stop, they sink to the bottom and may drown from a lack of water flowing over the gills.

Did You Know?

- * The biggest shark--the megalodon--was the most fearsome predator in the sea about 15 million years ago. They reached 13 meters (43 feet) in length.
- * Sharks' closest relatives aren't normal fish--they're rays, skates, guitarfish, and sawfish, a group known as elasmobranchs. All have cartilaginous skeletons.
- * Most sharks give birth to live young, but some

reproduce by laying eggs. The fertilized eggs are encased in a leathery shell and are deposited on the seafloor. It takes 10 months for the fully developed pup to hatch.

Cross-Curricular Connection

English: Write a short story with a shark as the main character.

[ILLUSTRATION OMITTED]

National Science Education Standards

Resources

"The Secret Life of Sharks," Discover, June 1999, p. 54 Sharks by Erik D. Stoops and Sherrie Stoops, Sterling Publishing, 1994

The Shark Almanac by Thomas B. Allen, Lyons Press, 1999

Directions: Read our story on sharks and then answer the questions in complete sentences.

1. Are all sharks dangerous to humans? Which is the most dangerous?
2. Why are sharks important to the marine ecosystem?
3. Why are shark numbers declining?
4. What are three interesting features of shark anatomy to you? Why are they of interest?
5. Is it important to protect sharks? Why or why not?
 1. No. The great white shark is considered the most dangerous.
 2. Predators at the top of the food chain are important. They keep populations of other fish and animals in balance.
 3. Sharks are declining because they are overfished for sport and for many products: rood, leather, medicine, and jewelry. And they are drowned in nets set for other fish.
 4. Sharks breathe through gills--and most species must swim constantly to push water through their gills. And sharks have a nictitating membrane that protects their eyes while they feed. Sharks have rows of teeth to replace worn or lost ones. The shark has skin made of teeth-sharp scales called placoid scales.
 5. Every animal on Earth has its place in the delicate web of life. If one declines or disappears, it affects many others, and the whole ecosystem falls out of balance.

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The fear i have of sharks Is ther extinction