



SHARKS

Life in the water

College of Marine Sciences Shanghai Ocean University

2017

On the move



- Most sharks don't have a fixed home. They are constantly swimming, looking for food or mate. Sharks don't build nests. They don't dig burrows or make any other kind of shelter.
- Some species appear to have a territory, or special area of their own, that they patrol and guard.
- Whitetip reef sharks stay in the same area for several months, or even years, although they don't defend it like a true territory.
- Underwater sea caves are used by some species as a place to rest during the day.



- Whitetip reef sharks rest during the day on the sea bed, and inside underwater caves or rock crevices. At night, they hunt for fish and octopuses among the coral.

Swimming skills



- To propel itself through water, a shark moves its tail from side to side.
- The pectoral and pelvic fins help sharks to steer and swim up and down.
- Some types, such as the sand tiger shark, swallow air to help them float better.
- To slow down, sharks change the angle of their pectoral fins and push against the water. The fins work rather like brakes.
- The basking shark's liver makes up about one quarter of its body weight and helps it to float at the surface of the sea.

Swimming type



Fast sharks



- Large sharks swim at an average speed of about **2.4 km/h**, but the most active hunter can speed along much faster when they need to catch prey.
- The fastest shark is the **shortfin mako**, which can reach speeds of over **50 km/h** and possibly over **75 km/h**.
- The mako needs to swim fast to catch its speedy prey, such as swordfish and sailfish, which are two of the world's fastest fish.
- The top speed of the **great white shark** is at least **40 km/h**, but it may swim as fast as **56 km/h** in short bursts of speed.

Fast sharks



- The mako and great white are able to swim so fast because they are warm-blooded, which makes their muscles more efficient than most other sharks.
- The blue shark is like an underwater glider plane, with long front fins and a flat belly.



Long-distance travel



- Many shark species travel long distances over the course of their lives. As all the seas and oceans are connected, it is easy for them to cover huge distances.
- Dogfish shark that have been tagged and released back into the sea have been located more than 8000 km away from where they were first caught.



Long-distance travel

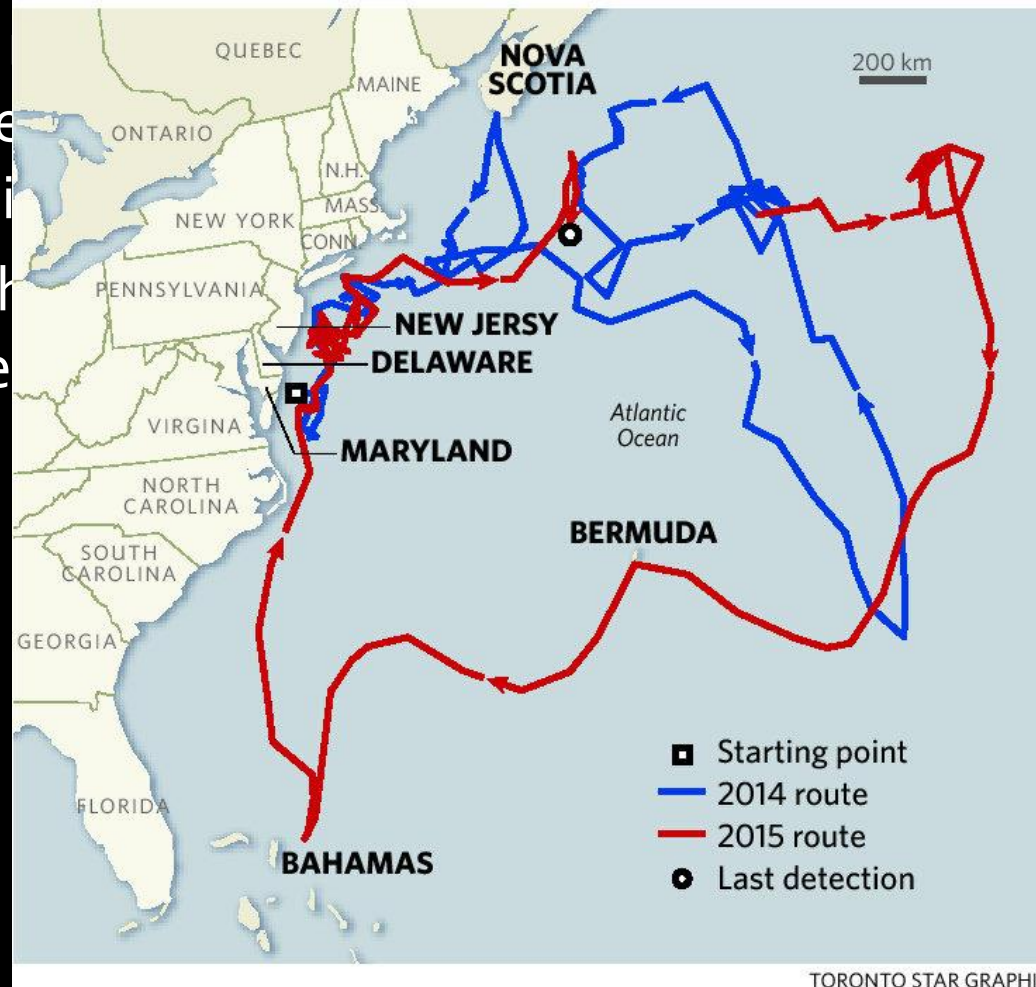


- The longest migrations are made by blue sharks. They swim around the Atlantic Ocean in a huge circle and can cover more than 15,000 km in just one year.
- Sharks sometime mate in one place, then swim far away to another area to lay their eggs or have their pups.
- Scientists think sharks may use their ampullae of Lorenzini to detect the Earth's magnetic field, helping them to navigate and find their way over long distances.
- Many species spend the day in deep water, but swim up to the surface at night. This is called vertical migration.

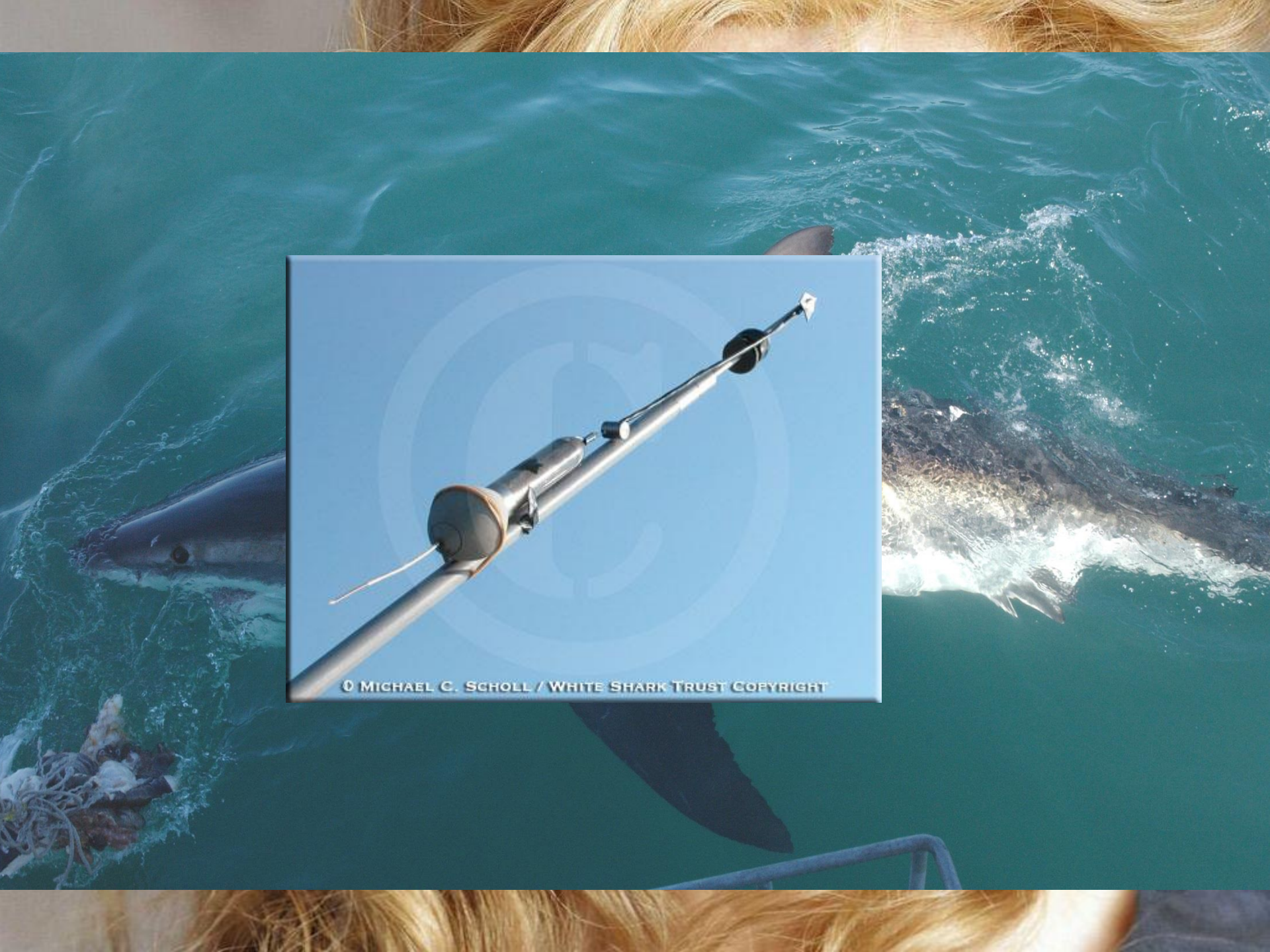
Long-distance travel

- Migrating Atlantic Ocean, the water is
- Sandbar shark around New

One mako shark's 17,700 km journey

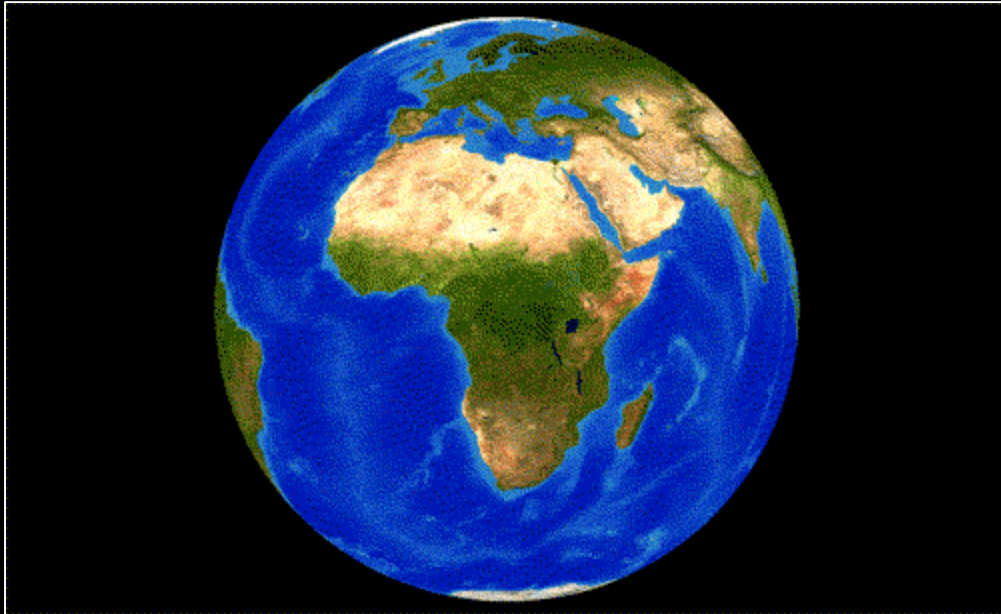


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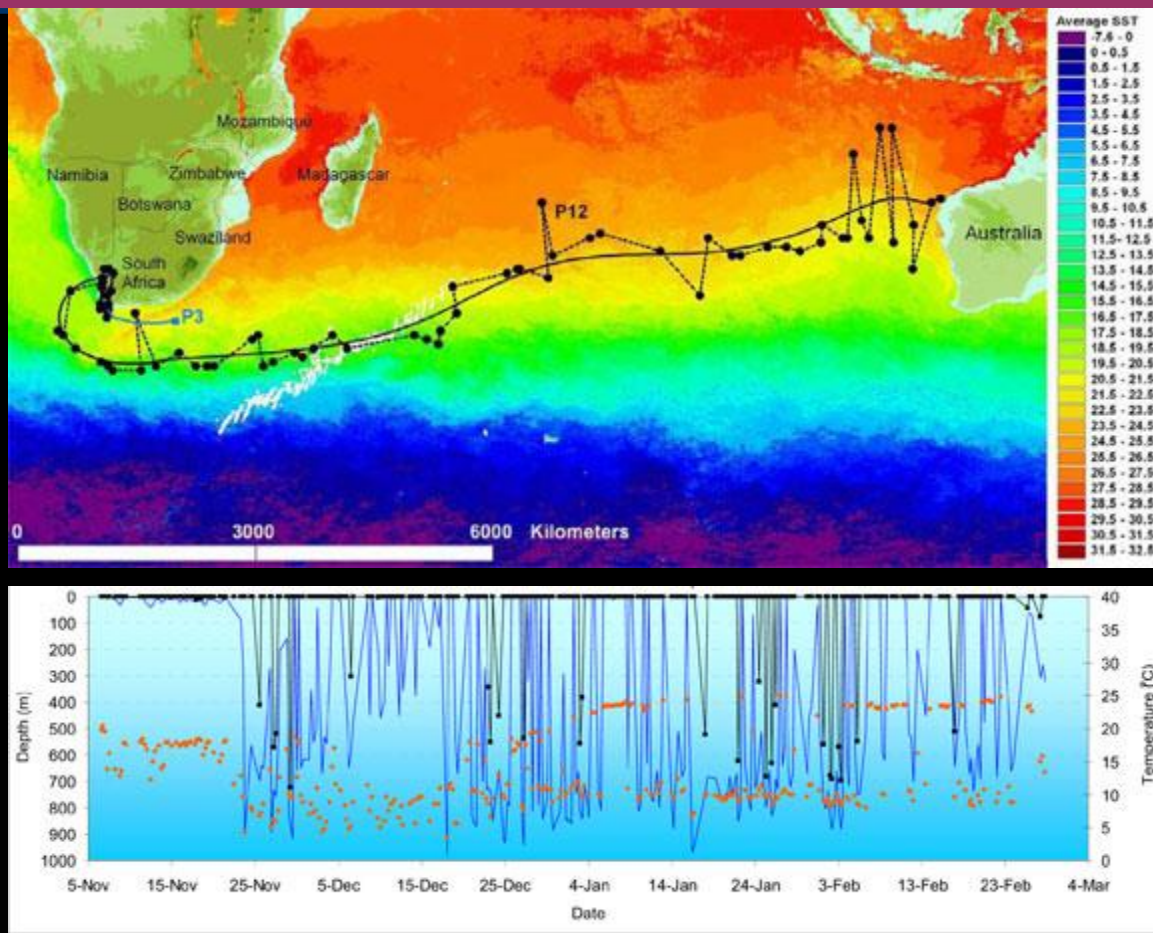


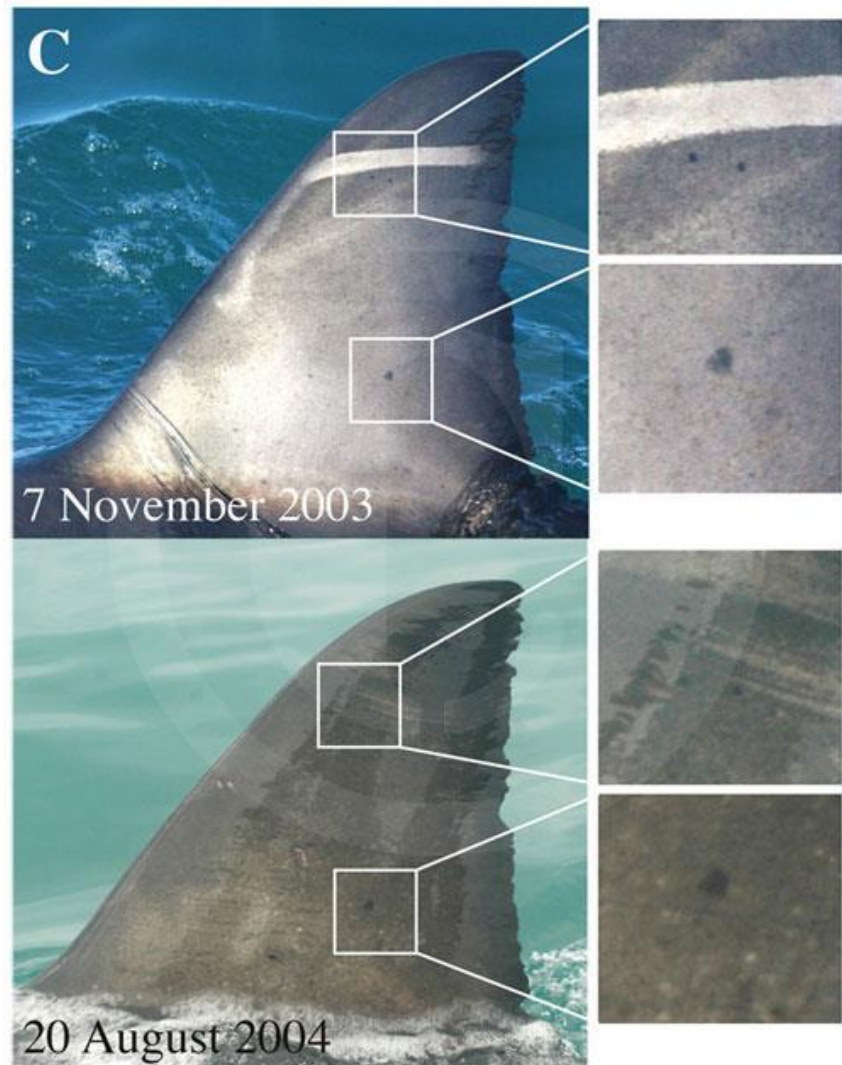
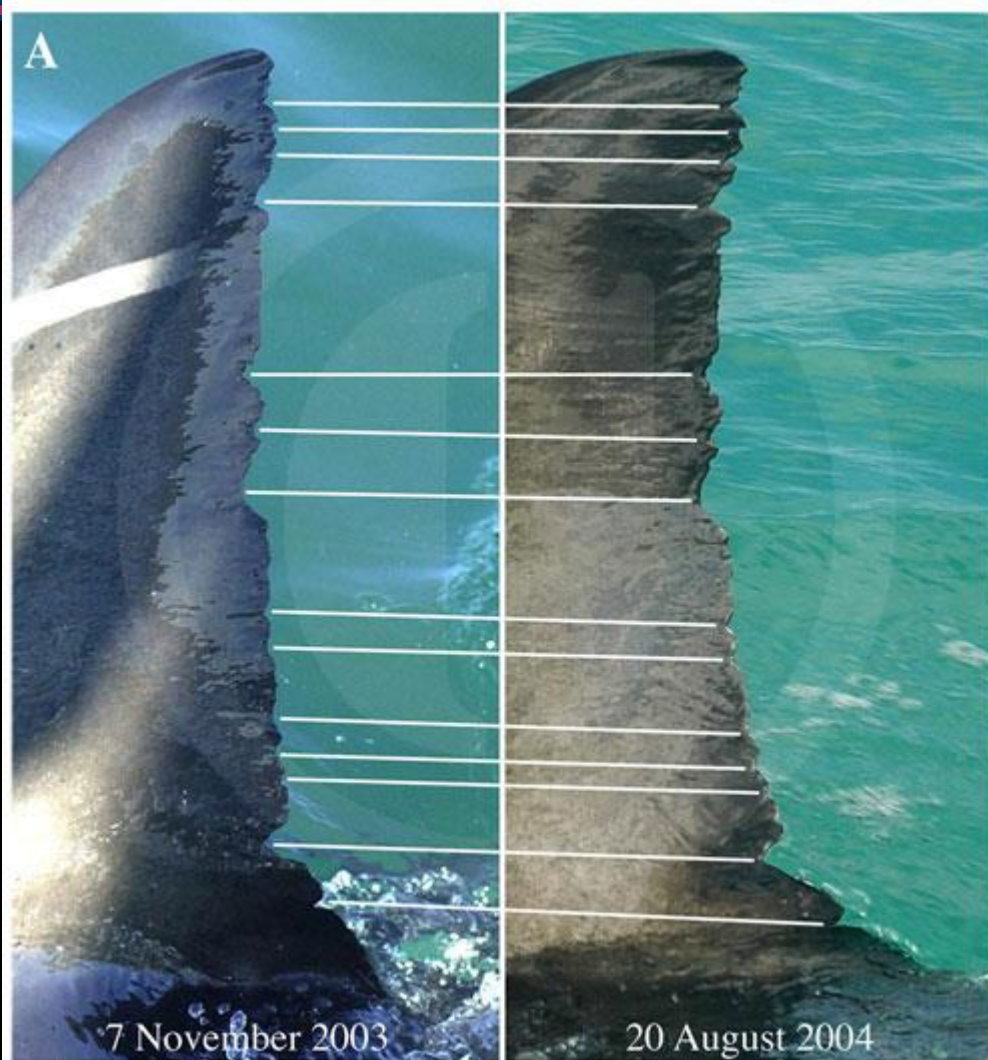
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Great White Transoceanic Migration



Breaking records





Food and feeding



- Large, fast, hunting sharks, such as great whites and bull sharks, feed on **large fish (including other sharks), as well as seals, turtles, octopuses, squid, seabirds and others.**
- Smaller sharks, such as dogfish sharks, hunt **smaller fish, octopuses and squid.**
- Slow-moving sharks, such as nurse sharks, angel sharks, and carpet sharks, crunch up **crabs, shrimps and shellfish** that they find on the sea bed.
- Tiger sharks will eat **anything** they can find, even objects that aren't food.

Food and feeding

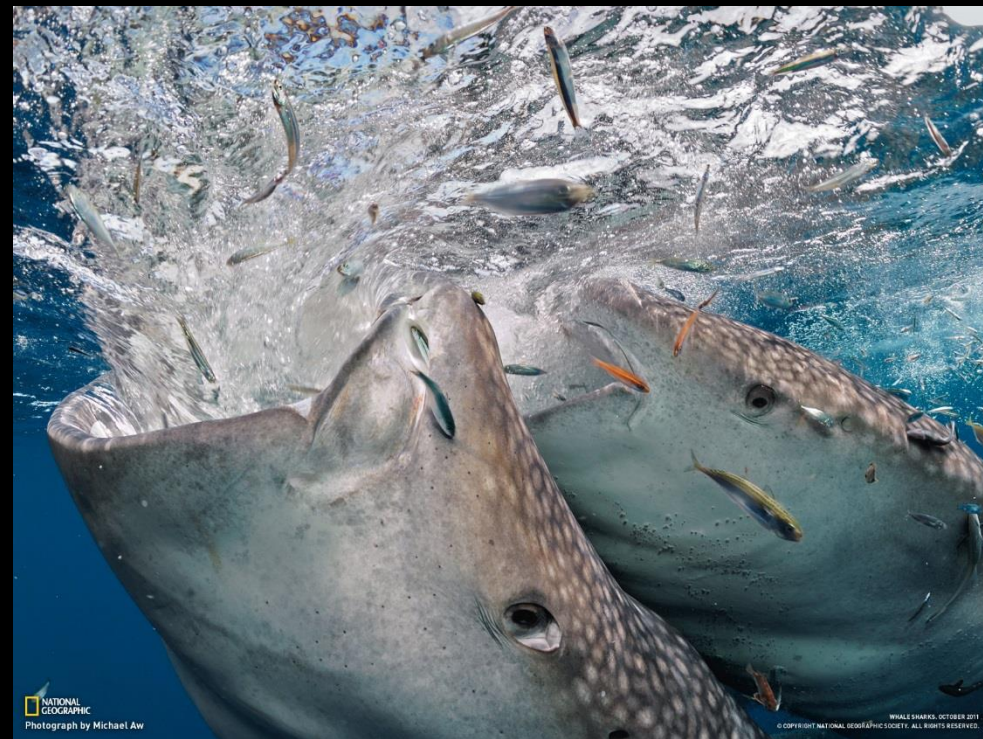


- Most sharks don't eat every day. Some large hunters can go without food for months.
- Big sharks often feed on smaller sharks. Sometimes, they are cannibals, eating sharks of their own species. Tiger sharks are cannibals.



Food and feeding

- The biggest sharks eat the smallest food.



Food and feeding



- The biggest sharks eat the smallest food.



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Going hunting



- Most sharks are nocturnal- they hunt at night-or crepuscular- they hunt at dusk.
- Before attacking, some sharks 'bump' their prey with their snouts, probably to see if it's edible.
- Some species shake their prey from side to side to help rip it apart. Shark don't usually chew-they tear their prey into chunks or just swallow it whole.
- Sometimes lots of sharks are attracted to a source of food, and they all rush to eat it at the same time. This is known as a **feeding frenzy**.

Going hunting



- Many sharks give their prey a fatal bite, then move away while it bleeds to death. They return later to feed on the body.
- A great white shark usually attacks from behind or below so its prey does not see it coming. It moves so fast, it may leap right out of the water with its victim in its jaws.
- The cookie-cutter sharks scoop out chunks of flesh from much larger living animals, such as whales or tuna fish.



Cookie-cutter shark



- Video from youtube

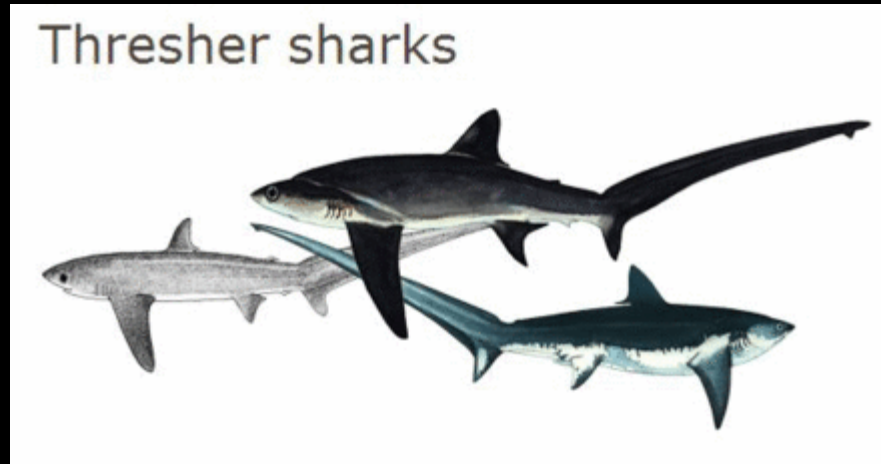
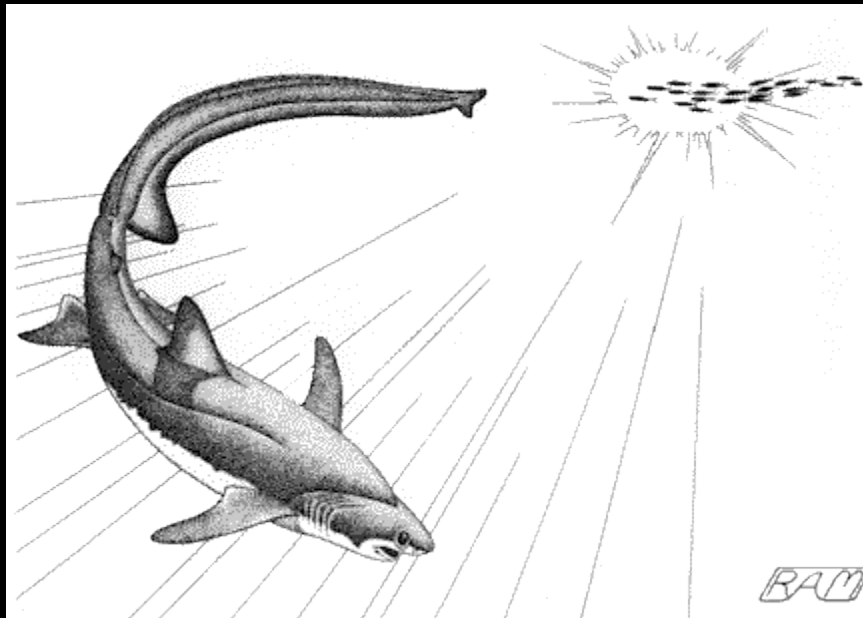
Pack hunters



- Some species **work together to catch prey**. They catch more food by working as a team.
- Blacktip reef sharks co-operate to **drive fish into shallow water and onto the beach**. Then they wriggle onto the beach, grab the fish and slide back into the sea.
- A group of sharks will often **herd fish into a tight ball** by swimming towards them from different directions. The sharks then grab the fish from the outside of the ball.
- Sharks that herd fish like this include silky, dusky, bronze whaler, whitetip reef and sand tiger sharks.

Pack hunters

- Thresher sharks work in pairs, using their long tails to push fish into swirling balls of bite-size mouthfuls.



Pack hunters

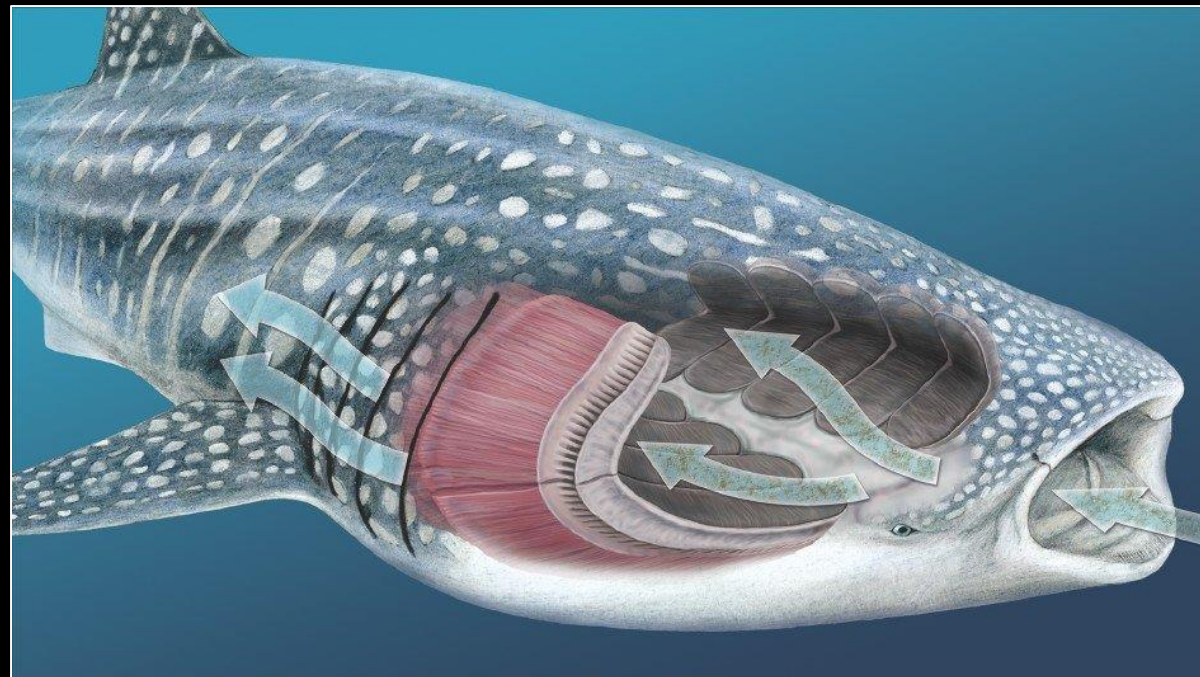
- Spiny dogfish sometimes gather in huge groups and swim along the sea bed, forcing prey to swim away. Any animal that cannot escape is eaten by the sharks.



Filter-feeding

- The biggest shark species of all- whale sharks, basking sharks and megamouths-eat plankton, which is the smallest prey. These sharks are called filter-feeders.

Filter-feeding sharks have gill rakers. These are comb-like bristles in their throats that sieve plankton out of the water



Scavenging food



- Scavenging means feeding on other hunters' leftovers, or on animals that are dying or already dead. **Almost all sharks will scavenge if they cannot find other food.**
- In deep water, sharks often feed on dead sea creatures that sink down from higher levels.
- Scavenging is a kind of natural recycling. It keeps the oceans clean, and makes sure leftovers and dead animals are rapidly removed rather than left to slowly decompose in the water.

It can take up to 100 years for a whale carcass to be eaten by scavengers.

Lighting up



- Each species of lantern shark has its own distinct pattern of glowing photophores.

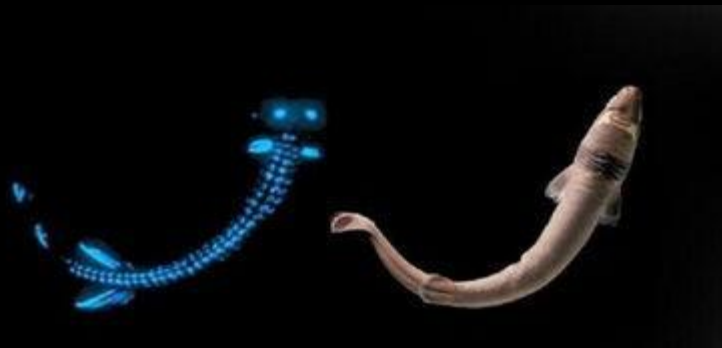


- Glowing sharks are often found in the deepest, darkest ocean. They use their lights to illuminate their surroundings and help them see prey.

Lighting up



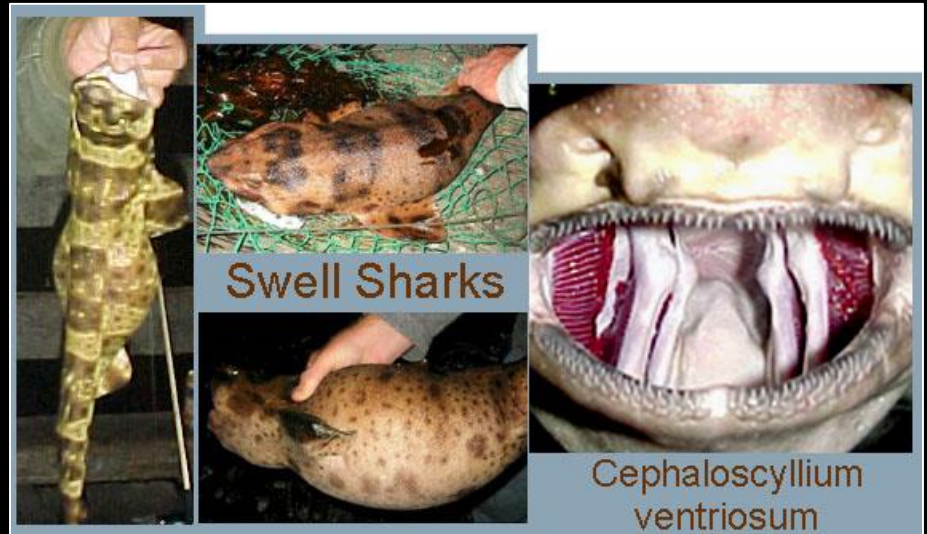
- Sharks that live at medium depths have glowing undersides. This makes them hard to see from below, as their light bellies match the light coming down from the sea's surface.
- Bioluminescence is made in tiny organs in the skin called photophores. In a photophore, two chemicals are combined, creating a reaction that gives off light.



DID YOU KNOW?
The cookie-cutter shark's Latin name, *Isistius*, comes from the Egyptian goddess of light, Isis.

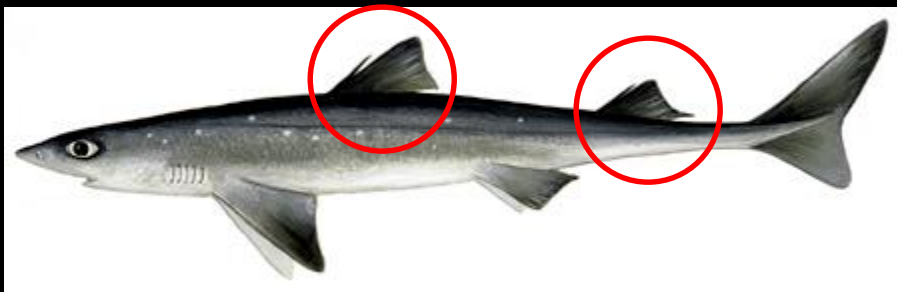
Staying safe

- Great white sharks are hunted by **Orc- the killer whale**.
- Thresher sharks use their tails to fight off predators
- A swell shark can puff up its body with air when is in a small space in-between rocks. A predator can't pull the shark out because it is wedged in so tightly.



Spikes and spines

- Many prehistoric sharks have sharp spines in front of their dorsal fins. Scientists think they may have helped hold the fins up.
- Today only a few species have spines, spikes or sharp horns on their bodies. They are usually used for defense against attackers.





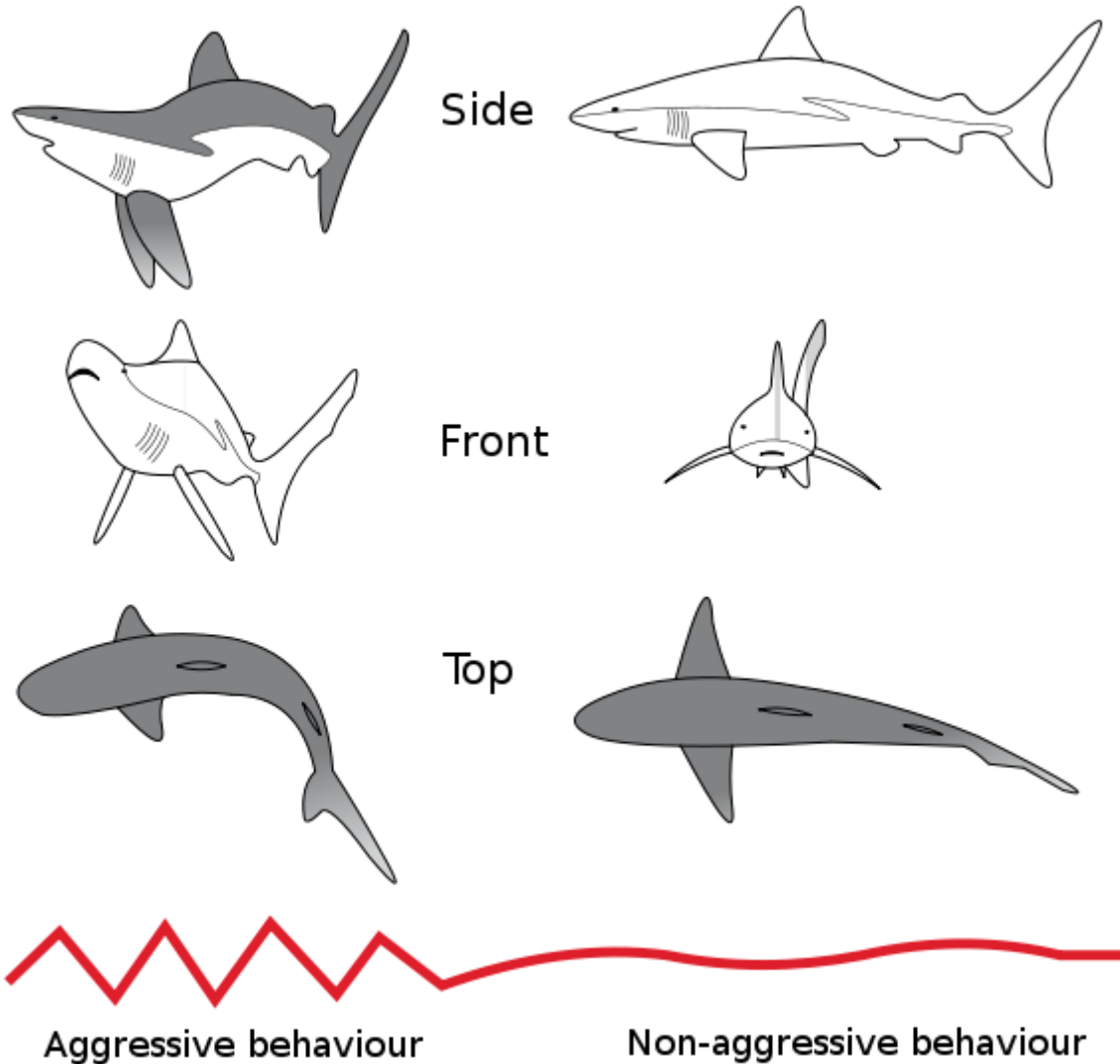
In disguise

- When leopard sharks are young, they have spots for camouflage. As they get older and bigger, they don't need as much protection, so the spots fade.



Sending messages

- Sharks posture
- When a shark raises its



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s back,

Sending messages



- Sharks release special scents called pheromones to send messages to other shark. These can indicate if a shark is looking for a mate or feeling agitated.

Sending messages



- Great white sharks warn rivals to keep away by showing their sharp teeth, splashing their tail at the surface, or even hitting a rival with their strong tail. If a rival does not back off, the great white will give it a small bite and hope that it swims away without the need for a proper fight, which may injure both sharks.

Boy (male) and girl (female) sharks



- In male sharks, the clasper is located on the ventral side of the tail.
- Female sharks do not have claspers.
- The clasper is a modified dorsal fin ray. They are not true fins.



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Boy (male) and girl (female) sharks



Boy (male) and girl (female) sharks



- Inside a female shark there are usually two **ovaries**, which make eggs and two egg tubes, called **oviducts**.
- Sometimes, sperm from a male shark is stored by a female shark for fertilization in the future, perhaps in a year or more.
- After fertilization, the eggs are covered with a tough, protective covering and move into the female's womb, or uterus, which has two chambers.

Meeting and mating



- Males sometimes bite females to show that they want to mate with them. Female often have thicker skin than male (up to three times thick) so that being bitten during courtship doesn't harm them.
- Most shark species only reproduce once every two years.
- Lemon sharks mate while slowly swimming along, with the back of their bodies touching, but their heads apart.
- Female whitetip reef shark release chemicals called pheromones to help males locate them.





Laying eggs



- Video from youtube.

Giving birth



**SHARK
ACADEMY**

Newborn sharks



- The pups of some species are born with the yolk still attached. The yolk continues to nourish the shark as it grows.



Newborn sharks



- Mako sharks produce large, strong pups which are ready to swim in the open ocean and begin hunting as soon as they are born.
- Lemon sharks hide among seaweed in shallow water for the first two years after they are born, before moving to deeper water.
- Newborn dusky sharks have a huge liver, which helps them to survive until they catch their first meal. The liver quickly reduces in size, from 20% of pup's body weight at birth to only 6% after a few days.

Growing up



- Sharks grow slowly. It can take a pup up to 20 years to mature into an adult.
- Blue sharks grow about 20 cm every year. Greenland sharks grow about 0.5 cm a year.
- Sharks are born with a full set of teeth, so they can start to hunt straight away.





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Shark suckers

