

The Truth About Sharks

Chapter 2: Sharks Across Time

Older than the Dinosaurs

When we think of the prehistoric world, we often think of dinosaurs. In our minds these dominant creatures ruled the land and seas, with the carnivores wreaking havoc on organisms lower down on the food chain. This perception of the early world is supported by popular culture's fascination with dinosaurs and the cinematic way they were brought to life in movies like *Jurassic Park*.

Sharks had been swimming in the Earth's oceans for nearly 220 million years BEFORE the dinosaurs arose, and survived the catastrophic events that caused the dinosaurs' mass extinction. In fact, the extinction of the dinosaurs likely provided an opportunity for sharks to dramatically increase their diversity, inhabiting ecological niches previously taken by dinosaurs. Dramatic changes in the Earth's environment, like those that wiped out the dinosaurs, have happened a total of five times in Earth's history. Sharks have survived all five of these mass extinctions.

Shark Fossils

Scientists who study the history of ancient living things are called paleontologists. These scientists reconstruct past climates and environments and their associated organisms by observing layers of sedimentary rock that contain fossils. When fossil-bearing rocks present a fossil sequence that is found in rocks at other locations, paleontologists can date the rocks relative to each other. On the basis of its fossils, a rock is placed earlier or further back in history along the geologic timespan. Because sharks have been on Earth for so long and have had such a wide geographical range, their fossils have been useful for correlation and relative dating of rock layers around the world.

Shark teeth fossilize well. They are key to understanding the long history of sharks and how they fit into the geologic timeline. The oldest known shark teeth fossils are from the Devonian Period, about 400 million years ago. Earlier evidence of prehistoric sharks is seen in the presence of shark-like scale imprints in rocks from the Ordovician (455 million years ago) and Silurian Periods (420 million years ago). More complete fossil records that date back 380 million years in Australia, Antarctica, and Saudi Arabia help us reconstruct a picture of these early sharks. Most of these early sharks looked quite different from modern sharks and were near-shore predators. By the mid-Cretaceous Period, about 100 million years ago, sharks had evolved into the fast-swimming, off-shore predators we know today.

Modern families of sharks emerged during the period of rapid species proliferation that took place during the Jurassic and Cretaceous periods, which was cut short by the mass extinction event that killed the dinosaurs. The sharks that survived this extinction are the ancestors of our modern sharks. Among these are deep-water sharks, such as the cow shark, which dates back to the early Jurassic (155 million years ago), and the frilled shark, which lived 95 million years ago. Fossil evidence of the ancestors of some of the best-known sharks, such as the great white and sand tiger sharks, is found in Jurassic fossil deposits. The ancestors of the famous Megalodon, a giant shark that grew up to 50 feet long, lived during the late Cretaceous to the mid-Paleocene, about 100 to 60 million years ago. The Megalodon existed much more recently, from 16 million years ago up to about 1.6 million years ago, when it abruptly died out.

Some of the shark species that still exist have much smaller teeth. They filter plankton from the water instead of hunting for prey. The first of these sharks appeared in the fossil record of the Tertiary Period, 65 to 35 million years ago. Today's whale sharks and basking sharks come from this lineage.

Further Reading

Geologic timespans are long. If you have not often discussed the scale of geologic time, it can be hard to grasp. Recognizing the long passage of time is the key to understanding the slow nature of evolution and the wonder of our natural world's diversity. You can learn more about geologic time by searching the Internet for discussions about it, ways to understand its vast length, and specific events within it that the Earth's rock layers preserve. Some of the following websites will get you started:

- [Geological Time Compared to a Roll of Toilet Paper](#)
- [Earth Science Concepts from the National Park Service](#)
- [Geologic Time Scale](#)
- [20-foot monster shark fossils found in Texas](#)
- [History of Sharks: Shark Origins and Evolution](#)
- [Coral Reef History](#) (for comparison to sharks)

Questions for Discussion

1. When did jawed fishes first appear? How does the emergence of this new evolutionary trait correspond to the emergence of sharks? What does this tell you about the likely characteristics of early sharks? How does this explain the fossil record of early sharks?

2. If you wrote about of the Earth's past with one page for each year of history, what would your answers be to the following questions?
 - How many pages would your book have?
 - On approximately what page did sharks appear? Dinosaurs? Humans?
 - If every 325 pages made a book one inch thick, how thick would your history book be in inches? In miles?
 - If you could read a page every two minutes, how many minutes would it take you to read your history book? How many days? How many years?
3. When did the five mass extinctions take place? Which one(s) posed the greatest threat to sharks? The least threat? Explain.
4. Corals have been on Earth for much longer than sharks (from 500 million years ago), although not continuously. They were wiped out during each extinction event, but eventually reappeared. What made corals more susceptible during extinction events than sharks? What does the future look like for both organisms?
5. People say that the 450-million-year legacy of sharks may be meeting its greatest challenge, and that challenge is us. Explain what this means, and why an animal that has survived five mass extinctions might not survive humans.