

# Prehistoric Soundscape



Imagine you're being chased by a *T. rex*. What would you hear? Some very big footsteps. Some very heavy breathing. Someone screaming—maybe that's you. What else?

Scientists have been trying to determine what the prehistoric world sounded like by studying the sounds of modern animals.

Sounds of aggression, like roars and screams. Sounds of communication, like birdsong or a wolf howl. Perhaps most amazing, echolocation—used by bats and whales to find prey and avoid obstacles.

The organs required to make, and hear, these sounds had to evolve sometime. So scientists went looking for them in the fossil record. And here's what they found:

For 90% of Earth's history, the only sounds were natural phenomena, like waves and thunder. That would have made little difference to early life forms—because none of them could hear.

Then around 400 million years ago, crustaceans started making clicking sounds. Early fishes, looking for a meal, developed the ability to hear them.

It took land animals a long time to catch up. But by 200 million years ago, insects were chirping, early birds were honking, and, to track them, predators developed the tympanic eardrum.

So what would you have heard from that tyrannosaur? Well, not much. He might have been able to huff or hiss. But with no vocal cords, he couldn't roar like in the movies.

And he'd probably be too far behind you anyway. Turns out *T. rex* may have been much slower than we thought. But that's a story for another EarthDate.

Painting of a hypothetical dinosaur scene.

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# Background: Prehistoric Soundscape

**Synopsis:** We live in a world that is rich with the sounds of nature and human activity. But what did the prehistoric world sound like? How do scientists reconstruct the “soundscape” of past geologic eras?

- Bioacoustics, the study of sound production and reception in modern animals, provides us with a rich understanding that can also be applied to the study of fossil animals, enabling scientists to trace the origins of vocalization and hearing through Earth history; some have proposed calling this field “paleobioacoustics.”
  - Today’s living creatures make sounds for a variety of reasons—for defense and territorial alerts, for locating and courtship with others of their species, and even for echolocation.
  - Creatures’ organs are specialized to make and receive the sounds necessary for their survival and for continuation of their species.
- Scientists can study sound producing and receiving organs in fossils to determine when creatures first had the capability to make certain sounds, and how that capability developed through Earth’s history.
  - By using what they know about how vocalizing and hearing organs work in today’s animals, researchers can determine when specific sounds may have originated.
  - From a practical standpoint, vocalization and hearing would not have evolved without a reason to make or receive certain sounds.
  - Ancient creatures first evolved to use their hearing to be better predators, and their prey survived if they could sense and evade their predators by knowing when to silence their characteristic sounds or alert others.
  - As ancient predators evolved to detect prey, the prey that remained undetected lived to breed and pass on the traits that enabled them to evade predators.
  - As sound production improved, selection of mates with the most attractive song ensured that the diversity of sound would expand beyond just utilitarian noises.
- How do animals produce sound?
  - Aquatic creatures appear to produce and sense water displacement or echolocation.
  - Five types of airborne sound production occur and are principally sensed by animals and insects with tympanic membranes, or eardrums.
    - Stridulation, which occurs when body parts are rubbed together, including crickets chirping and insects buzzing.
    - Percussion, the hitting of a body part against a substrate or water.
    - Forced ventilation, such as hissing.
    - Tymbals, folds on the abdomen of true bugs, which produce vibrations on the surface on which the bug is perched.
    - Vocalization, the vibration of vocal cords of a larynx in mammals or membranes of a syrinx in birds using expulsion of air in the respiratory tract to produce sound.
- What did the prehistoric world sound like?
  - For more than 4 billion years, only sounds of natural phenomena existed: Rain falling, thunder booming, waves lapping, waterfalls splashing, wind whistling, volcanoes erupting, lava bubbling, earthquake and landslide rocks tumbling.
  - But about 400 million years ago, insects and crustaceans began to make buzzing or clicking sounds with their body parts, and early fishes acquired the ability to hear low-frequency sounds so they could hunt. Both fishes and four-legged land animals could snort and huff and puff as much as they needed to, since vertebrate predators had not yet acquired tympanic ears and so could not hear their sounds.

## References: Prehistoric Soundscape

[Voices of the Past: A Review of Paleozoic and Mesozoic Animal Sounds | Historical Biology](#)  
[Dinosaur Likely Did Not Sing | Science Daily](#)  
[Turtle Song? | Lang Elliott: Music of Nature](#)

Contributors: Phil Senter (Fayetteville State University), Juli Hennings, Harry Lynch



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- About 320 million years ago in the Carboniferous, critters learned to puff up their bodies as a visual warning and hissed to scare away predators.
- The chorus exploded 250 million years ago in the Triassic period, when crickets evolved and added chirping to the mix, stoneflies started drumming, and turtles started their courtship songs.
- Venomous mammals made their first vocalizations 50 million years later in the Jurassic period, and tympanic ears developed in mammals to help locate insect prey. Many insects evolved with their own specific sounds. Some sauropods made percussion sounds by cracking their tails in the air like a whip.
- In the Cretaceous period, geckoes and birds joined in, and beetles, termites, horseflies, mosquitoes, and cicadas appeared. Mammal vocalization became higher pitched as hearing evolved to recognize higher sounds, and some mammals learned to growl. Crocodiles slapped their heads in the water, and some mammals developed echolocation. Fishes developed the capability to hear high-frequency sounds, ancient birds honked and quacked, dinosaurs made closed-mouth booms and forced-air hisses.
- The Chicxulub asteroid impact quieted the chorus 65 million years ago, but it didn't silence it forever!
- In the Cenozoic, with a tremendous range of habitat available after the demise of their dinosaur cousins, birds flourished. Within 15 million years, they developed much of the range of birdsong that we hear today, perfecting it for another 50 million years. Mammals of less than about 50 lbs survived, thrived, and evolved to make the huge variety of sounds we hear from them today. And, of course, insects continued as the most successful life forms on Earth.
- A little over 3 million years ago, the ancestors of humans arrived on the scene, walking on two feet; the earliest *Homo sapiens* fossils are thought to be 350,000 years old. Recorded human history started about 5,000 years ago.
- The Industrial Revolution, which revved up 200 years ago, turned up the volume like never before, with every frequency and volume of sound imaginable!

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