

This tiny dinosaur hunted in the dark and heard better than an owl

By [Katie Hunt](#), CNN

Updated 1:01 AM ET, Fri May 7, 2021



Shown is a fossilized skeleton of *Shuvuuia deserti*. The chicken-size dinosaur had large eyes and an inner ear like that of a barn owl, suggesting it hunted at night, according to new research.

With unusually large eyes and hair-trigger hearing, the tiny desert-dwelling dinosaur hunted its prey at night, offering more definitive evidence that dinosaurs weren't only active in the daytime.

It's one of the findings of two groundbreaking studies published Thursday that examined and reconstructed the inner ears of ancient fossilized beasts and compared them with the ear canals of living animals.

The results offer intriguing insights into how dinosaurs may have experienced their world, including whether they were nocturnal hunters, attentive parents, clumsy flyers or land lubbers.

"Of all the structures that one can reconstruct from fossils, the inner ear is perhaps that which is most similar to a mechanical device," said paleontologist Bhart-Anjan Bhullar, senior author of one of the new studies that published in the journal *Science*, in a news release.



Tyrannosaurus rex walked surprisingly slowly, new study finds

"It's so entirely dedicated to a particular set of functions. If you can reconstruct its shape, you can reasonably draw conclusions about the actual behavior of extinct animals in a way that is almost unprecedented," said Bhullar, an assistant professor of earth and planetary sciences and an assistant curator at the Yale Peabody Museum of Natural History.



This is an artist's reconstruction of *Shuvuuia deserti* by Viktor Radermaker.

Both studies used computerized tomography (CT) scanning technology to peer through the rock and bone to visualize and model the inner ear, which is located deep within an animal's skull. This means it is often well preserved and protected in fossils but also difficult for paleontologists to access.

"Until recently, the advances presented by these teams of authors were unthinkable, in that many aspects of internal anatomy and certainly their connection to habits like parental care and daily activity patterns had been out of reach," said Lawrence Witmer, a professor of paleontology and anatomy at the department of biomedical sciences, Heritage College of

Osteopathic Medicine, Ohio University, in an article that accompanied the studies. Witmer wasn't involved in the research.

Night hunter

The traditional scientific view of dinosaurs was that they were predominantly active during the day. Anatomical evidence that would suggest sensory innovations -- like keen eyesight and hearing -- needed to hunt prey at night went undetected in the fossil record and were obscured by a lingering assumption that the dinosaurs were cold-blooded creatures.

In the second study, Lars Schmitz, an associate professor of biology at the W.M. Keck Science Center at Claremont McKenna, Pitzer and Scripps colleges, collaborated with a team of international researchers to collect detailed information on the relative size of the eyes and inner ears of nearly 100 living bird and extinct dinosaur species.

The scientists specifically looked at the lagena, which processes incoming sound information in the ear. (This structure corresponds to the cochlea in mammals and modern-day birds and crocodiles.) The team also measured the ring of bones that make up the eye socket. The larger the eye, the larger the pupil, which means more light can get in -- enabling better night vision.



Hungry teenage tyrants help explain puzzling fact about dinosaur diversity

The researchers found one small dinosaur, *Shuvuuia deserti*, had pupils proportionally larger than any living bird or dinosaur and an inner ear that was similar to that of a barn owl. These features suggested it was a highly specialized nocturnal hunter, said. A theropod -- the same family as the T. rex and a lineage that ultimately evolved into living birds, the chicken-size creature would have lived in very dry habitats in what is now Mongolia about 66 million years ago.

"It's a somewhat odd dinosaur," Schmitz said. "What we see are really large pupils, an elongated inner ear canal. Supersensitive eyes. It really rivals the nocturnal specialists today like barn owls and bats."

"We think it would have stalked its prey -- small mammals -- at night when the temperatures were cooler."

The team found that many carnivorous theropods such as *Tyrannosaurus* had vision optimized for the daytime, and better-than-average hearing, presumably to help them hunt. Other dinosaurs such as *Velociraptor*, the predatory meat-eater made famous by the "Jurassic Park" movie franchise, were possibly active at dusk, Schmitz said.



COURTESY RICK ELLISON/AMERICAN MUSEUM OF NATURAL HISTORY

Shuvuuia deserti lived in very dry habitats in what is now Mongolia about 66 million years ago.

Devoted parents?

Using CT scanning technology to determine its three-dimensional shape, Bhullar's study compared the inner ear of 128 different living and fossilized animals including Hesperornis, an 85-million-year-old birdlike species that has teeth and a beak; the Velociraptor; and the flying pterosaur Anhanguera.

The researchers found clusters of different species with similar inner ear traits. The clusters, the team said, corresponded with different ways animals moved through and perceived the world.



BOB NICHOLLS/PALEOCREATIONS.COM | 2020

This fossil reveals how dinosaurs peed, pooped and had sex

For example, one cluster included fitful or clumsy fliers like modern chickens and ducks, which fly in quick, straight bursts, and seabirds and vultures. The inner ears of birdlike dinosaurs called troodontids, pterosaurs, flying reptiles, Hesperornis, and the "dino-bird."

Archaeopteryx fell within this group, suggesting they had some simple flying ability but might not have flown gracefully in the air.

Bhullar and his team at Yale also identified a cluster of a large group of species, including all modern birds and crocodiles, known as archosaurs, that had a similar elongation of the lower portion of the inner ear -- the cochlear system -- that has been linked with greater hearing sensitivity, especially at higher pitches. Living animals in this group have a very complex vocal repertoire, explained Bhullar, who said that the common ancestors of crocodiles and birds also likely sang.

While this could be explained as an evolutionary adaption for locating prey, avoiding predators or communication, the authors said their analysis suggested that it was more likely linked to parental care -- allowing the creatures to respond to the high-pitched calls of their offspring to gain their attention (think chirping baby birds in a nest).

Recent technological advances, like the CT scanning used in these studies, are providing scientists with more opportunities for future findings, Witmer said. "Teeth and limbs will always provide clues for reconstructing evolutionary histories," he said. "But relatively new anatomical players like the inner ear and bony eye rings are opening new windows into the past."