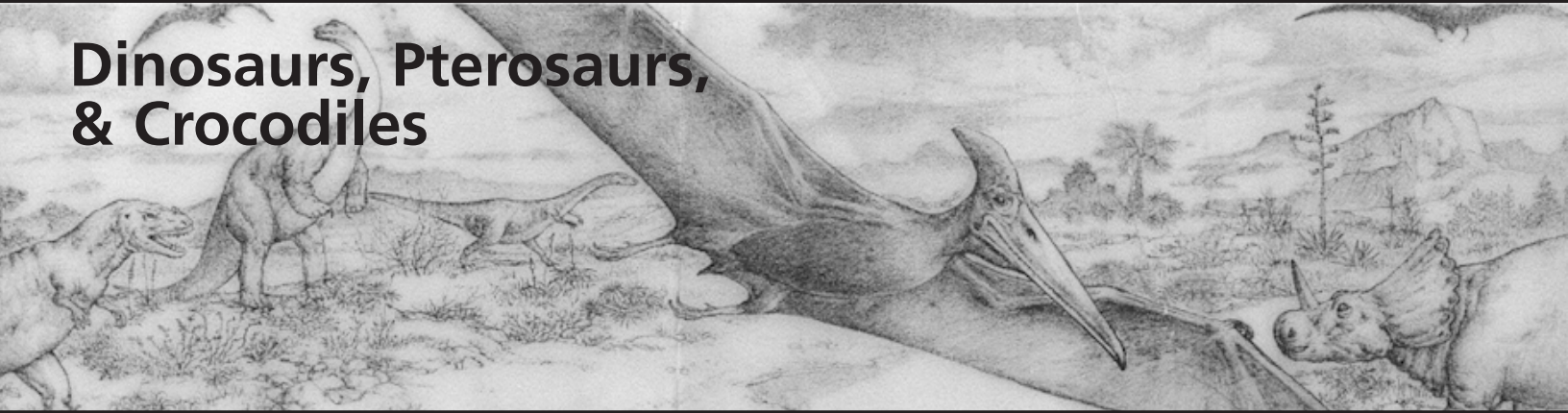




Dinosaurs, Pterosaurs, & Crocodiles



The Ruling Reptiles

Early in the Triassic Period, some 248 million years ago, the ruling reptiles appeared. They included DINOSAURS, PTEROSAURS, and CROCODILES. These reptiles dominated life on land throughout the Mesozoic Era. Although mammals appeared later in the Triassic Period, the mammals did not achieve dominance until the ruling reptiles became extinct at the end of the Cretaceous Period. The fossilized remains of many kinds of ruling reptiles have been found in Big Bend National Park.

Paleontological Paradise



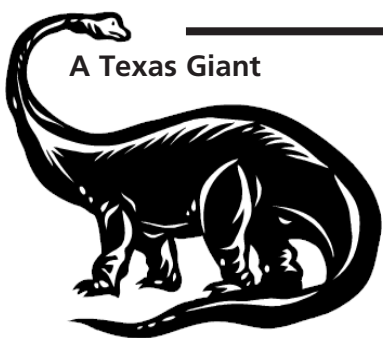
Exposing the skull of the horned dinosaur, *Chasmosaurus*

Big Bend is one of the true jewels for paleontological research in the world. Unique among U.S. National Parks, Big Bend exhibits dinosaur remains from the last 35 million years of the dinosaurs' existence. Furthermore, the fossil record here continues uninterrupted from the Age of Reptiles into the Age of Mammals. Over 90 dinosaur species, nearly 100 plant species, and more than two dozen fish, frogs, salamanders, turtles, crocodiles, lizards, and even early mammals have been discovered here, giving us one of the most complete pictures of a prehistoric ecosystem known anywhere on earth.

The fossil record here spans a rich history of 35 million years within the Cretaceous Period. Beginning about 100 million years ago, when a huge sea covered what is today most of the midwestern U.S., the of the ruling reptiles appeared in Big Bend's fossil record. The sea layers of limestone known as the **Boquillas Formation** (100-95 million years ago) preserve numerous marine fossils, including a 30-foot long sea-dwelling reptile known as *Mosasaurus*.

The most exciting finds have occurred in strata that chronicle Big Bend's emergence from this sea. Nearly 70 dinosaur species have been discovered in the **Aguja Formation** (80-75 million years ago) where we find evidence of a humid and swampy land. At this time, Big Bend was closer to the equator, and this tropical coastal swamp had palms, ferns, and diverse dinosaur life, including duck-billed Hadrosaurs.

By 75-60 million years ago, plant fossils suggest that the sea had retreated and Big Bend had become a drier floodplain environment. The sediments from these times, the **Javelina Formation**, have yielded over 80 species of plants, including cypress, laurel, conifers, and mangroves. While these plant finds are remarkable in their own right, they are usually overshadowed by several unique and spectacular dinosaur finds. Over 20 dinosaur species have been found in the Javelina Formation, giving us a rich glimpse into the last days of the ruling reptiles. These were the giants who ruled the earth at the time of the great extinction. These finds, and the possibility of future discoveries, make these sediments worth their weight in gold for paleontologists.



A Texas Giant

In 1999, Dana Biasetti, a graduate student from the University of Texas at Dallas, discovered giant dinosaur bones protruding from a dry hillside in the Javelina Formation of Big Bend National Park. Upon careful excavation, this hillside yielded partial pelvic bones and ten articulated cervical vertebrae of an adult *Alamosaurus*.

Alamosaurus belongs to the group of dinosaurs named Sauropods—large herbivores with extremely long necks and tails. The Big Bend *Alamosaurus* appears to have been a massive individual, measuring in at 100 feet in length and probably weighing over 50 tons.

Due to their extreme size and the remote location of the fossil site, excavation and removal of these giant bones by hand was nearly impossible. As a result, Big Bend National Park issued a special permit to the excavation team to remove the fossil by helicopter. In 2001, UT Dallas, now teamed with the Dallas Museum of Natural History, made history with Big Bend's first ever "dinosaur airlift." Over the next several years, the fossil will be cleaned, studied, and prepared for display.

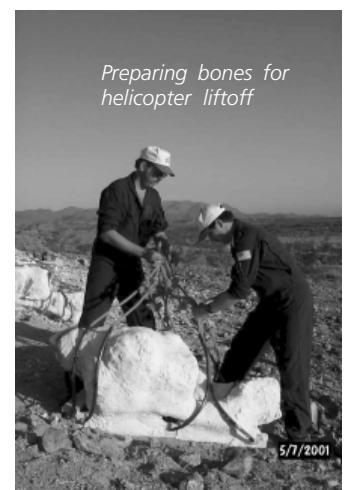
Work continues at the site where scientists are searching for more bones that may still be embedded in the hillside.



Giant Vertebrae



How to move a 1000 pound bone



Preparing bones for helicopter liftoff

5/7/2001



The fossilized remains of gigantic crocodiles have been discovered in the Aguja Formation in the south-central part of the Big Bend National Park. These are among the largest crocodiles ever known.

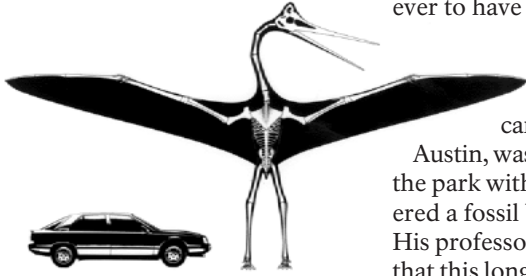
With lengths of 40-50 feet and jaws studded with 6-inch teeth, these powerful predators were extraordinarily equipped to feed upon a variety of dinosaurs. In fact, dinosaur bones have been found here that are heavily damaged and covered with

distinctive crocodile bite marks! Just like modern day crocodilians, *Deinosuchus riograndensis* probably hunted by ambush...lying submerged near shore, and violently seizing large dinosaurs as they foraged amid the vegetation of Big Bend's ancient swamps.

The magnificent skull of *Deinosuchus* is on display at the Dallas Museum of Natural History.

The Big Bend Pterosaur

An impressive exhibit in the Panther Junction Visitor Center displays a life-size replica of the wing bones of an enormous pterosaur. The huge specimen was discovered in Big Bend National Park and represents the largest known flying creature ever to have existed. Its name is *Quetzalcoatlus northropi*.



In 1971, Douglas Lawson, a masters candidate at the University of Texas in Austin, was performing geological field work in the park within the Javelina Formation. He discovered a fossil bone eroding out of an arroyo bank. His professor, Dr. Wann Langston Jr., determined that this long, hollow, very thin-walled bone could only be from a pterosaur wing. Subsequent excavations recovered more wing bones, but unfortunately the wing must have detached from

the body before being buried and fossilized, because no body bones could be found. Lawson named his discovery *Quetzalcoatlus* after the Aztec feathered snake deity Quetzalcoatl.

Dr. Langston continued to search and eventually found other specimens of *Quetzalcoatlus* in the park. Although these were smaller than the original, they were more complete and had a very impressive wingspan of at least 18 feet. Comparison of these complete specimens with the huge bones of the original *Quetzalcoatlus* made it possible to calculate the body size of Lawson's specimen. This enormous pterosaur had an estimated wingspan of 36-39 feet, making it the largest known flyer of all time.

Pterosaur Lifeways

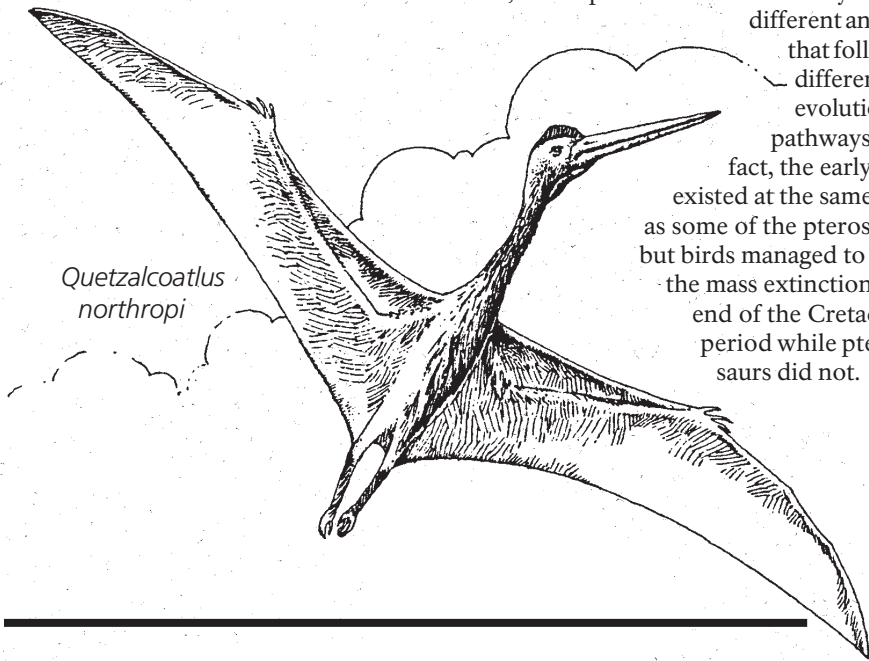
The earliest known pterosaurs lived about 220 million years ago in the Triassic period, and the last ones died about 65 million years ago at the end of the Cretaceous period. They ranged from pigeon-sized with a wingspan of 18 inches to ultralight-airplane-sized *Quetzalcoatlus* with a wingspan of 36-39 feet. Exceptionally well-preserved fossils have shown that pterosaurs were covered with hair.

Pterosaurs were the first vertebrates to adapt to a life of active flight. Only two other groups of vertebrates are active fliers, namely birds and bats. Despite the unavoidable comparison of pterosaurs with birds, it is important to note that they are very

different animals that followed different evolutionary pathways. In fact, the early birds existed at the same time as some of the pterosaurs, but birds managed to survive the mass extinctions at the end of the Cretaceous period while pterosaurs did not.

Flight tests with models of *Quetzalcoatlus* suggest that it was primarily a soaring creature controlling its direction by turning its head, flexing the three fingers on the wing's leading edge, and warping the wing tip. These giants, the last of the flying reptiles, were able to climb or dive by changing the wing sweep, but were probably unstable in gusty winds.

Some pterosaurs probably were carrion-eaters, at least on an opportunistic basis. Although it may be tempting to compare the giant *Quetzalcoatlus* with large modern birds such as condors and eagles and conclude that, like them, it too ate carrion, the anatomical evidence does not support this. *Quetzalcoatlus* had a long inflexible neck that would not have been desirable for vulture-like feeding. Its long, tweezer-pointed, and toothless jaws were not suited for tearing apart dinosaur cadavers, and are more suggestive of a diet of fish. But this observation creates another puzzle because the Big Bend fossil sites were some 250 miles from the sea coast at that time. Dr. Wann Langston proposes that *Quetzalcoatlus* used its slender beak to probe for molluscs and arthropods in shallow flood basins. His view is supported by numerous traces of burrowing animals in the strata in which the *Quetzalcoatlus* fossils were found.



Protect Fossil Resources

Remember: All natural resources in National Parks, including rocks and fossils, are protected by federal law. A scientific research permit, issued by the park's Division of Science & Resource Management is required for any fossil study on park land. Specific locations of fossil discoveries remain classified due to their sensitive nature.

The ancient fossil stories of Big Bend's past are among the park's most priceless treasures. If you discover a fossil, enjoy the experience of seeing the remains of ancient life. Please do not dig, disturb, or collect any fossils in Big Bend National Park; instead make careful notes of their location and report them to a park ranger or visitor center.



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