

Missouri State Dinosaur: An Odd Duck By Erika Woehlk, Visual Materials Archivist

Dinosaur fossils are rare in Missouri: so rare, in fact, that only one site has ever been found. In 1942, geologist Dan R. Stewart heard of an unusual discovery near Glen Allen (Bollinger County) on a farm belonging to the Chronister family. They were digging a new well when they stumbled upon a set of large, fossilized bones. The Missouri Geological Survey and Water Resources department sent Stewart to investigate the find. He saw twelve vertebrae and a few bone fragments belonging to a previously undiscovered species of dinosaur!

Stewart then enlisted help from Dr. C.W. Gilmore of the U.S. Geological Survey. Together, the two published a paper in 1945 announcing the discovery. Gilmore took responsibility for the classification and described the dinosaur as an Upper Cretaceous sauropod. Sauropods are the largest dinosaurs and include favorites such as Brachiosaurus, Brontosaurus and Apatosaurus. Gilmore named the Missouri specimen *Neosaurus missouriensis*.

Gilmore's fellow paleontologists were quick to point out that "Neosaurus" was already taken as a genus. Gilmore's intent had been to create a new genus, so he published a revision eight months later reclassifying Missouri's dinosaur to "Parrosaurus." With this, the Missouri dinosaur became *Parrosaurus missouriensis*.



The original 12 caudal vertebral bones discovered at the Chronister site in 1942.
The specimens are now housed at the Smithsonian Institution.

(Source: RG005 Secretary of State Record Services Division Photograph Collection, IMG_0006.tif, by Smithsonian Institution, 12 December 2019; image modified by MSA staff, 05/11/2020.)

There was little to no movement on the Chronister site or the bones over the next few decades. Then, in 1979, paleontologists Donald Baird and John Horner suggested that Missouri's dinosaur was worthy of reclassification. They argued that the bones were very similar to samples from a species called *Hypsibema crassicauda* found in North Carolina. Back in 1945, Gilmore had considered *Hypsibema*, but rejected the genus because it was part of the hadrosaur family: commonly called "duck-billed" dinosaurs. He did not think the vertebrae were hadrosaur-like (remember, he called the dinosaur a sauropod). Baird and Horner had the advantage of time and more research material. As they said, "A genus known only by its tail bones is necessarily somewhat difficult to characterize and classify." (Baird and Horner 1979, 15)

With all that in mind, it now made sense to put *crassicauda* and *missouriensis* together in the *Hypsibema* genus. Consequently, Missouri's dinosaur became *Hypsibema missouriensis* and an official "duck-bill" as of 1979.

Hypsibema was unaffiliated with a taxonomic *family*, though. "Neither extensive comparison nor expert advice has enabled us to improve on Gilmore's treatment of the problem, so we must leave the family assignment open until more diagnostic material is found." (Baird and Horner 1979, 16) That tantalizing phrase – "until more diagnostic material is found" – encouraged budding Missouri paleontologist Bruce Stinchcomb to investigate the old Chronister site. Stinchcomb actually bought the property from the Chronister family. Together with colleagues from the American Museum of Natural History, University of Kansas Natural History Museum, New Jersey State Museum and Smithsonian Institution, he excavated an additional 31 fossils.

Stinchcomb et al. published their findings in 1994. In addition to four more *Hypsibema missouriensis* central caudal vertebrae, they found many fragments (teeth, hand, arm and leg bones) of indeterminate hadrosaurs, a crocodylian phalanx (a hand or foot bone) and some partial turtle shells. A clearer picture of the Chronister site was emerging.

Other paleontologists worked the Chronister site in the 1980s through 2000s, namely Michael Fix and Guy Darrough. Fix wrote in 2007, "Thus far we have found numerous



A lake on a misty morning, something akin to prehistoric Missouri where the state dinosaur roamed. (Source: MS436 Bill Nunn Collection, by Bill Nunn, October 1982.)

bones of a hadrosaur (duck-bill dinosaur) called *Hypsibema missouriense* (our official state dinosaur), including a partial skull of a juvenile, which according to Dr. John Horner is probably the most complete dinosaur cranial material ever found in the eastern U.S. The site has also yielded fossils from a member of the tyrannosaur family, a possible tooth from a relative of the velociraptor, as well as numerous fossils of turtle, crocodile, fishes, and amphibians." (Fix 2007)

Because of the number of aquatic and semi-aquatic species discovered at the site by

Stinchcomb, Fix and Darrough, paleontologists could now surmise that it had been near a body of fresh water: specifically, "a backwater, wetland, or oxbow lake." (Fix and Darrough 2004, 14)

The additional *H. missouriensis* material was significant in further narrowing the dinosaur's taxonomy. In 2018, Chase Brownstein wrote, "This dinosaur [*missouriensis*] is likely assignable to its own genus, *Parrosaurus*, as it is not only separated from the localities where the material assigned to *H. crassicauda* was found but also is now known from more materials, which may allow for detailed description (e.g., Darrough et al., 2005). Therefore, the name *Parrosaurus missouriensis* is preferred herein." (Brownstein 2018, 18) Brownstein reverts the genus back where Gilmore placed it in 1945!

Date assigned	Scientific name (genus, species)	By
January 1945	<i>Neosaurus missouriensis</i>	Gilmore
September 1945	<i>Parrosaurus missouriensis</i>	Gilmore
November 1979	<i>Hypsibema missouriensis</i>	Baird & Horner
February 2018	<i>Parrosaurus missouriensis</i>	Brownstein

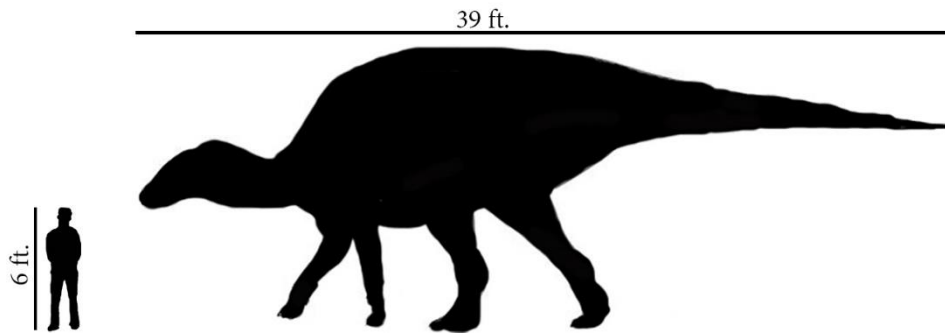
Table 1: Taxonomic history of Missouri's state dinosaur

It really is not that unusual for a species to be reclassified. Taxonomic charts are finessed all the time as new discoveries are made or research furthered. Further fossil specimens unearthed in 2017-2018 revealed a skull, forelimbs and tail of an adult *Hypsibema missouriensis* as well as a partial juvenile skeleton. (Makovicky et al. 2020) Those findings were reported in 2020.



Model of an adult *Parrosaurus missouriensis* dinosaur sculpted by Guy Darrough and displayed at Powell Gardens for its 2011 "Jurassic Gardens" exhibit. It is posed lying on the ground next to a nest filled with eggs. (Source: RG005 Secretary of State Record Services Division Photograph Collection, *Bicentennial_Exhibit_01d.tif*, by Kenneth Keith, 2011.)

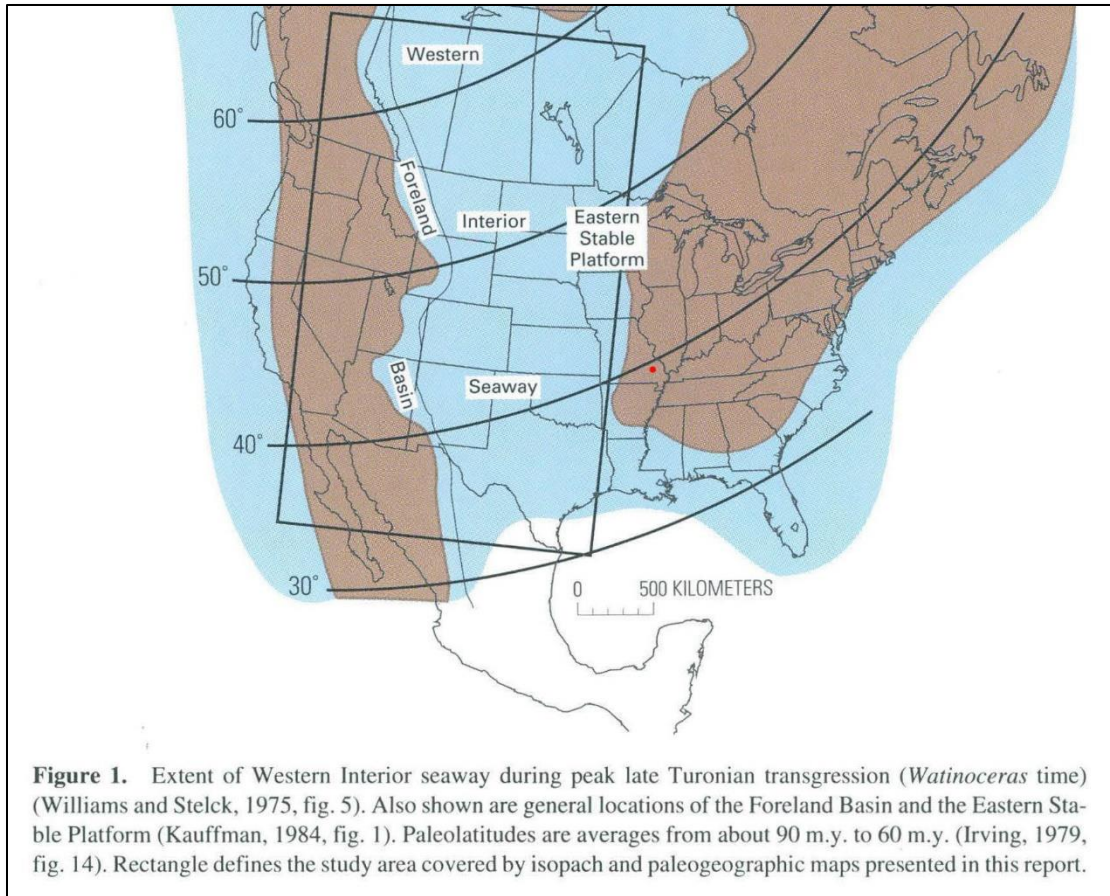
Duck-billed dinosaurs were herbivores. They laid eggs and bred in colonial nesting sites. Their nickname comes from the shape of their face, which ends in a shape not dissimilar to a duck's beak. *P. missouriensis* was "of huge size, as its distal caudal vertebrae are similar in dimensions to those of *Hypsibema crassicauda*." (Brownstein 2018, 18) *H. crassicauda* is estimated to be 12 meters long or more. That's over 39 feet!



Scaled drawing comparing a 6-foot-tall person to a 39-foot-long hadrosaur.
(Source: MSA staff, using modified stock hadrosaur image)

These latest discoveries help paint a picture of Cretaceous Missouri as a land that supported creatures small, big and very big.

There is another reason the Chronister site is special: its location on the ancient map. In the Upper Cretaceous, the continent we now call North America was essentially split in half by a body of salt water called the Western Interior Seaway. The land to the west of the Seaway (today's Rocky Mountains and everything west) was the continent Laramidia. The land to the east of the Seaway (today's Midwest and east coast) was the continent Appalachia. Most of Missouri fell in Appalachia, with the north and western parts of the state actually underwater.



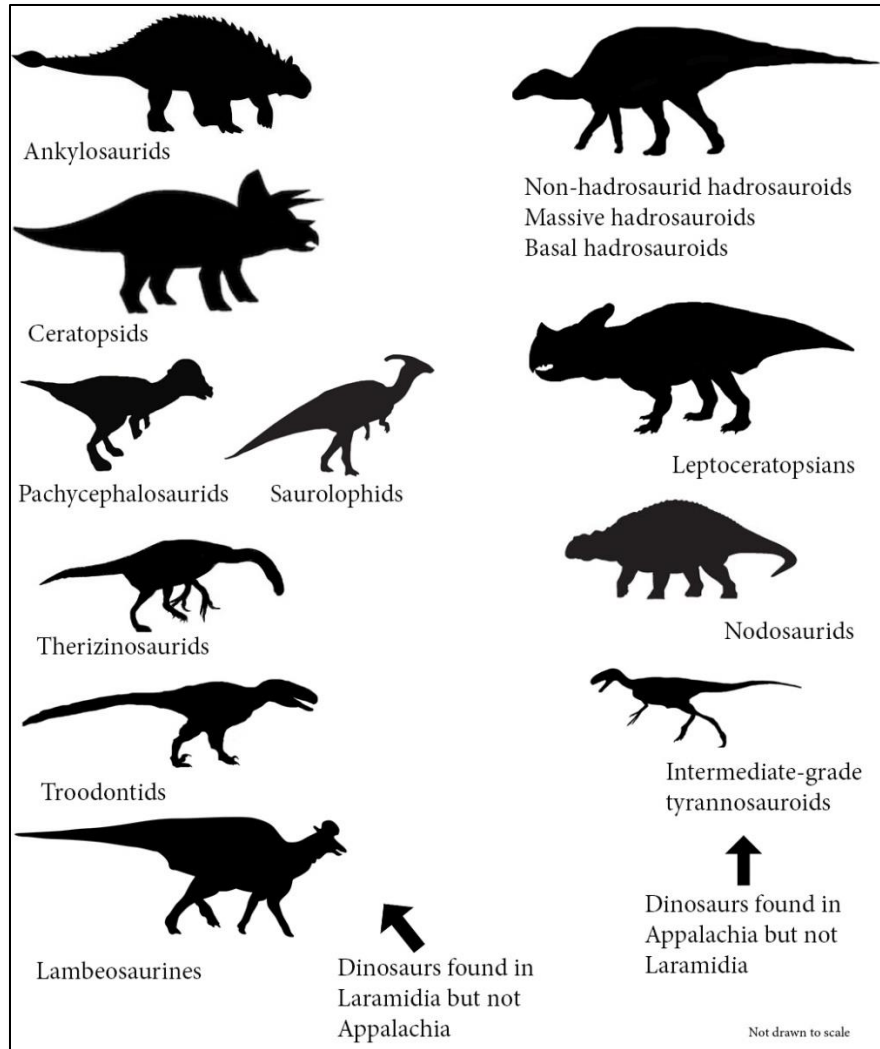
The Western Interior Seaway approximately 94 to 90 million years ago (early in the Upper Cretaceous), as illustrated by Roberts and Kirschbaum.

The red dot indicates the Chronister Site in Bollinger County, Missouri.

(Source: Roberts, Laura N. Robinson and Mark A. Kirschbaum. (1995) "Paleogeography of the Late Cretaceous of the Western Interior of Middle North America – Coal Distribution and Sediment Accumulation." United States Geological Survey Numbered Series. Paper 1561, p. 2.)

When most people think of dinosaurs, familiar names like *Tyrannosaurus rex*, *triceratops*, *stegosaurus*, *brontosaurus*, etc. are likely the first to come to mind. All those classic dinosaurs lived in Laramidia. Relatively speaking, there are far fewer dinosaur fossil sites in Appalachia. Missouri's one-and-only dinosaur fossil bed is one of them. That means "our" dinosaurs can tell a seldom-heard story of what life was like years ago east of the Western Interior Seaway.

There is quite a difference between the dinosaur fauna found in Laramidia and Appalachia. According to Brownstein, they are distributed like this:



Dinosaurs found on one continent but not the other.
 Missouri's state dinosaur is on the upper right:
 a non-hadrosaurid hadrosauroid.
(Source: various stock images modified by MSA staff.)

Furthermore, fossils in Appalachia are hard to come by because the continent was in an erosion phase in the Cretaceous. Sediment would break down resulting in unstable soil. Fossils need stability over eons in order to form, which is what was happening in Laramidia. That continent was in an uplift phase. That meant that dead dinosaurs had a chance of being buried in sediment washed down from higher ground and preserved, undisturbed. Appalachia was so unstable, in fact, that there have been zero late Jurassic fossils discovered on its present-day landmass and only one early Cretaceous site. (Kowinsky) The scarcity of Missouri fossils and the rarity of species combine to make Missouri's official state dinosaur one-of-a-kind.

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