
SKELETON OF THE RARE GIANT SEA TURTLE, *ARCHELON*, RECOVERED FROM THE CRETACEOUS DEGREY MEMBER OF THE PIERRE SHALE NEAR COOPERSTOWN, GRIGGS COUNTY, NORTH DAKOTA

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Introduction

In 2002, while hiking along the Sheyenne River valley near Cooperstown, Griggs County, Peter Mack of Christine, North Dakota (formerly of Cooperstown) discovered a portion of the lower jaw and several other bones of the giant sea turtle called *Archelon* (Figures 1 and 2). Peter contacted Dennis Halvorson of Cooperstown, who in turn contacted us about the find. We visited the site and determined that at least a partial skeleton of this turtle was entombed in the 75 million year old DeGrey Member of the Pierre Shale. This summer we gathered a volunteer team of “top gun” fossil diggers to excavate the fossil.

The *Archelon* fossil was found at a place we call the Cooperstown site. This extremely important fossil site is on private property owned by the Beverly and Orville Tranby family. With their permission, encouragement, and support we have been investigating the geology and paleontology of the site for several years. The Cooperstown site was first

reported to us by Mike Hanson and Dennis Halvorson of Cooperstown who discovered the skeleton of a mosasaur (marine lizard) called *Plioplatecarpus* and many other fossils in the Pierre Shale at this site (Hoganson et. al., 1999). In 1996, we collected the *Plioplatecarpus* skeleton and the restored 23 foot long skeleton is now on display suspended from the ceiling of the North Dakota Heritage Center in Bismarck. A cast of the skull, and many other fossils found at the Cooperstown site, are exhibited in the Griggs County Museum in Cooperstown. The *Archelon* fossil was discovered only 200 feet from the *Plioplatecarpus* excavation site.

Geographic and Stratigraphic Setting

The Cooperstown site is located in the Sheyenne River valley southeast of Cooperstown in an area locally referred to as “Indian Mounds” (Figure 3). The name “Indian Mounds” was first used about the turn of the 20th century and refers to the haystack-shaped hills in the valley that were thought to be Indian burial mounds. These hills, however, are erosional remnants of the once more extensive Pierre Shale rock formation. The Pierre Shale was deposited in a shallow ocean that covered North Dakota about 75 million years ago. This ocean occupied the Western Interior Seaway that extended from the Gulf of Mexico to the Arctic Ocean (Figure 4). Erosion from floodwaters during melting of the last continental glaciers about 10,000 years ago and continuing erosion today has exposed the Pierre Shale in this area of the Sheyenne River Valley. The Pierre Shale is about 130 feet thick at this site. This site contains the most diverse assemblage of fossils found in the Pierre Shale in North Dakota. It is the most important Pierre Shale fossil site in North Dakota and the recent find of *Archelon* at the site increases its importance.



Figure 1. Peter Mack pointing to the place where he found the partial lower jaw of *Archelon*.

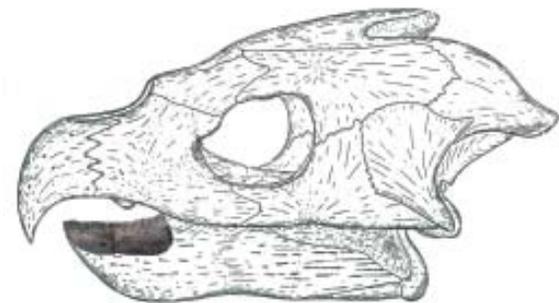


Figure 2. The portion (shaded) of the lower jaw of *Archelon* found by Peter Mack superimposed on a sketch of an *Archelon* skull. The huge skull is about 30 inches long.



Figure 3. View of the Pierre Shale exposed in the “Indian Mounds” at the Cooperstown site and location of the *Archelon* discovery (arrow).



Figure 4. Map showing the Pierre Sea in the Western Interior Seaway about 75 million years ago and position of the Cooperstown site (arrow).

The giant sea turtle, *Archelon*

The Cretaceous sea turtle *Archelon ischyros* was first described by George Wieland in 1896 based on fossils found in South Dakota. That specimen has been on display at the Peabody Museum of Natural History at Yale University, New Haven, Connecticut since 1907. *Archelon* turtles were huge animals that inhabited the Western Interior Seaway during the Cretaceous Period about 75 million years ago. Although they were not dinosaurs they were reptiles that lived at the same time as the land-dwelling dinosaurs.

These turtles generally ranged in length from 9 to 13 feet from snout to tail and when stretched out were about 12 feet from flipper tip to flipper tip. The shells alone of these animals were about 5 to 7 feet long. They were similar in size to the largest leatherback sea turtles that live today. The largest *Archelon* skeleton ever found was collected in South Dakota and was 16 feet from snout to tail and 13 feet wide from flipper to flipper. That turtle is believed to be the largest turtle that ever lived on Earth. Its remains are on exhibit at the Naturhistorisches Museum Wien in Vienna, Austria. *Archelon* had paddle like legs and arms (flippers), a long, narrow head, and a short pointed tail (see cover of Newsletter). These turtles did not have a solid shell like most turtles. An *Archelon* shell consisted of a framework of transverse bony struts, made of ribs, that were probably covered by a thick coat of leathery skin, similar to the modern leatherback turtles. They propelled themselves gracefully through the water with their massive paddle-like flippers with powerful, vertical strokes similar to modern penguins. A distinct characteristic of *Archelon* is its huge over bite (Figure 2). These gigantic turtles were carnivores and with

their heavy mandibles, thick palates, and hooked, toothless beaks must have had a deadly bite. They probably ate jellyfish and other soft-bodied animals.

This is the first report of *Archelon* in North Dakota. Fossils of this turtle have also been found in South Dakota, Nebraska, and Kansas.

Excavation and Restoration

We assembled a crew of experienced fossil collectors and excavated the *Archelon* specimen from July 16 through July 20 and July 27 through July 29, 2004. Our first task was to define the extent of the bone bed by flagging the position of weathered bone. We determined that an area about 20 feet in diameter contained bone fragments. We then had to move a property line fence that was constructed over the fossil many years ago. This was a wise thing to do because a herd of cattle visited the excavation one day (Figure 5). We began the excavation in the area where Peter Mack had collected the lower jaw fragment (Figure 1). We were quickly able to determine that at least a partial skeleton of *Archelon* was present at the site. We also learned that the skeleton had collapsed and was mostly disarticulated. The bones were only a few inches below the surface, which meant they were subject to weathering and some were deteriorating.

As standard practice dictates, we mapped the position of individual bones using a meter-square grid and took GPS readings at the site to determine the fossil's exact position (Figure 6). Four plaster field packages containing *Archelon* bones were removed from the site (Figure 5). Generally, fossil bones are fragile and when we excavate them we wrap the bone, which is still embedded in the rock, with strips of burlap soaked in plaster. When dry the burlap holds the bone together to transfer it to the laboratory. This "plaster jacket" is removed (sawed off) in the laboratory and the fossil is removed from the rock under controlled laboratory conditions using specialized tools. We had to construct a massive plaster field jacket, 5 feet in diameter, because in one area of the excavation there was a large concentration of bones (Figure 7). Orville and Scott Tranby brought a tractor to the site to lift this block of rock containing bones onto a flat bed trailer (Figure 8). We then hauled it in to the Griggs County Museum in Cooperstown for storage until we could secure a State trailer to transport it to the Johnsrud Paleontology Laboratory at the Heritage Center in Bismarck, which we did on August 5, 2004. At that time, Cooper Implement in Cooperstown brought a forklift to the Griggs County Museum and lifted the field package onto our trailer. That field package is now in our laboratory in the Heritage Center and has been opened (Figure 9). We have started to prepare the *Archelon* bones in the field package (Figure 10).



Figure 5. Excavation crew at the *Archelon* site. White plaster jackets (arrows) and large Pierre Shale block (arrow), to be jacketed, in the foreground. I. to r., Jim Daly, Cathy Clayton, Orville Tranby, Peter Mack, Jake Saylor, Brett Woodward, and herd of about 100 cattle.



Figure 6. Brett Woodward mapping the position of *Archelon* bones by using a meter-square grid. I. to r., Brett Woodward, Jake Saylor, and Jim Daly.



Figure 7. Large plaster jacket containing *Archelon* bones with the crew that plastered the block. I. to r., Jim Daly, Jake Saylor, Andrew Pamonis, Cathy Clayton, Brett Woodward, and Peter Mack.



Figure 8. Preparing to lift the large plaster jacket containing *Archelon* bones with Tranby's tractor. I. to r., Orville Tranby, Brett Woodward, Scott Tranby, and Jake Saylor.



Figure 9. Cutting the plaster jacket off the Pierre Shale block containing *Archelon* bones at the NDGS Johnsrud Paleontology Laboratory at the Heritage Center in Bismarck. I. to r., Jake Saylor and Brett Woodward.



Figure 10. *Archelon* vertebra found in the large field jacket.

Significance of the Cooperstown *Archelon*

We will not know how complete the *Archelon* skeleton is for several months, so we do not know if we will be able to completely restore the skeleton for display. The finding of this fossil is, however, very important because this is the first discovery of *Archelon* fossils in North Dakota. In fact, there have been very few *Archelon* fossils found anywhere and even fewer with partially complete skeletons, probably less than six. This occurrence of *Archelon* extends the range of the turtle as far north as central North Dakota. We will certainly learn more about *Archelon* after we have removed the bones from the field packages and have analyzed them. Finding *Archelon* at the Cooperstown site provides more information about the marine fauna that inhabited the Pierre Sea in North Dakota 75 million years ago. Previous findings at the site indicate that *Archelon* was a member of an underwater community that consisted of at least two species of huge marine lizards called mosasaurs, including *Plioplatecarpus*; the flightless sea bird, *Hesperornis*; several species of sharks including *Squalus*, *Squalicorax*, *Pseudocorax*, *Cretolamna*, and *Carcharias*, bony fish including the salmon-like *Enchodus*; and several kinds of invertebrate animals.

Acknowledgments

We would like to thank Beverly, Orville, and Scott Tranby and Bev's sisters for again allowing us to collect fossils from their property. The Tranbys and Bev's sisters, Gloria Thompson, Jacqueline Evenson, and Susan Wilhelm, have been supportive of our paleontological work on their land and recognize the importance of keeping the fossils in the public domain and available for public exhibits and educational activities (Figure 11). Orville and Scott also brought heavy equipment to the site to help in the excavation. We appreciate the help of Cooper Implement, the John Deere dealership in Cooperstown, in helping to move the large field package. We are grateful to the following for volunteering to help at the excavation: Jake Saylor (NDGS summer student employee from Bismarck), Andrew Pamonis (high school student from Bismarck), Peter Mack (Christine), Denise Anderson (Coleharbor), Dennis Halvorson (Cooperstown), Mike Hanson (Cooperstown), Jim Daly (Little Canada, Minnesota), Cathy Clayton (Lake Elmo, Minnesota), Mike Newbry (student at NDSU), Becky Mink (student at NDSU), Valerie Barbie (student at Minnesota State University-Moorhead), Mike Frohlich (Bismarck), and Billie Jo Lorus (Bismarck) (Figures 12, 13, 14 and 15).

References

Hoganson, J.W., Campbell, J.M., Hanson, M., and Halvorson, D.L., 1999, *Plioplatecarpus* (Reptilia, Mosasauridae) and associated vertebrate and invertebrate fossils from the Pierre Shale (Campanian), Cooperstown Site, Griggs County, North Dakota: Proceedings of the North Dakota Academy of Science, v. 53, p. 119-123.

Wieland, G.R., 1896, *Archelon ischyros*: A new gigantic cryptodire testudinate from the Fort Pierre Cretaceous of South Dakota: American Journal of Science, v. 11, no. 12, p. 399-412.



Figure 11. Beverly Tranby and her sisters, Gloria Thompson and Susan Wilhelm, at the *Archelon* excavation. l. to. r., Denise Anderson, Brett Woodward, Gloria Thompson, Jim Daly, Susan Wilhelm, and Bev Tranby.



Figures 12, 13, 14, and 15. Volunteers working at the *Archelon* excavation.