

# **SEA MONSTERS: A PREHISTORIC ADVENTURE**

## **AN EPIC TALE OF LIFE IN A CRETACEOUS SEA**

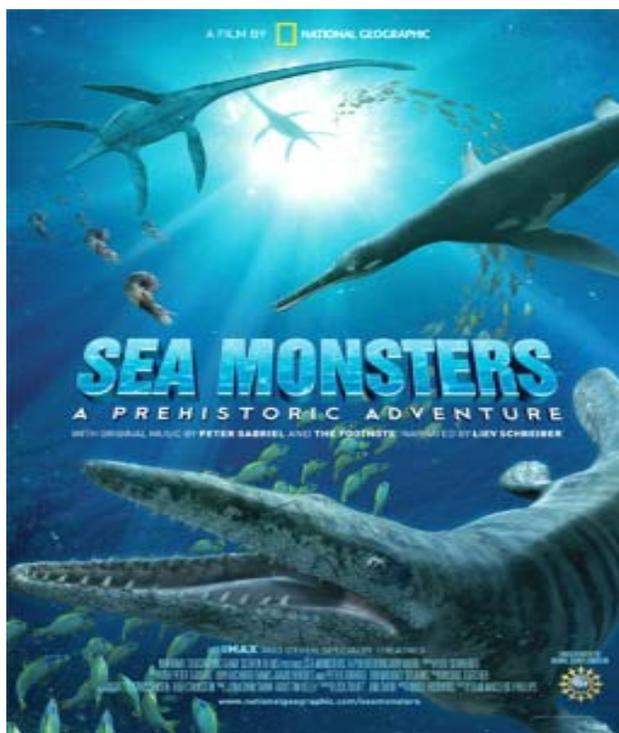
**By John W. Hoganson**

Twins are born in the shallow, warm-water breeding grounds of the Western Interior Seaway 82 million years ago. The twins, a male and female, are siblings of the small marine plesiosaur (reptile) called *Dolichorhynchops*. It is a time of tranquil renewal in the Mediterranean-like ocean that we call the Pierre Sea. Thus, the epic of life in the vast ocean that covered the North American mid-continent during the Late Cretaceous, including North Dakota, begins and traces the lives and adventures of these siblings as they face the beauty and dangers in this ocean inhabited by many species of long-extinct animals. If living today, many of the reptiles that inhabited this ocean would be viewed as sea monsters. The story is told in the new National Geographic 3-D IMAX film released in October 2007 entitled “*Sea Monsters: A Prehistoric Adventure*”.

and author of the award winning website Oceans of Kansas, was the lead consultant for the film. I was among about 35 other scientific advisors.

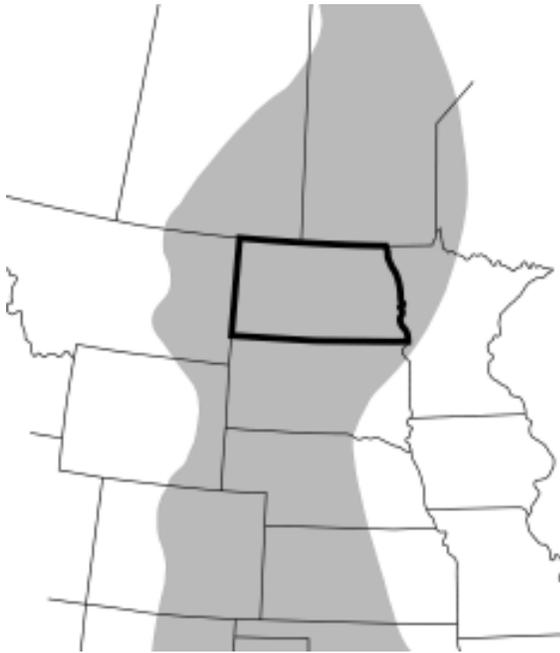
I suppose it is ironic being from North Dakota that I have been interested in marine animals my entire life. I was finally able to pursue those interests at the University of Florida where I participated in two scientific oceanic cruises to gain biological information in the Gulf of Mexico and where my Master’s Degree research was about Eocene (about 40 million years old) sea urchins. My first professional position was with Union Oil Company of California where I was employed as a paleontologist analyzing the microscopic fossils of sea animals and plants. As paleontologist for the North Dakota

“*Sea Monsters: A Prehistoric Adventure*” movie poster. Courtesy of the National Geographic Society.



Last year I was contacted by Melanie Blair with the National Geographic Sea Monsters project asking if I would be willing to supply information for the film, primarily about the appearance of the marine animals that inhabited the Western Interior Seaway during the Cretaceous about 80 million years ago. She was also interested in the life habits of the prehistoric animals and how they may have interacted in this ancient marine community. She was aware of the research that I have been doing on Cretaceous marine faunas in North Dakota. Mike Everhart, curator of vertebrate paleontology at the Sternberg Museum of Natural History in Hays, Kansas,

Geological Survey for the past 25+ years I have collected and studied fossils of marine animals from the Cannonball Formation (Paleocene), Breien Member of the Hell Creek Formation (Cretaceous), Fox Hills Formation (Cretaceous), and the Pierre Formation (Cretaceous). Regular readers of this Newsletter have probably read the several articles that I have written about the fossils from these formations in North Dakota. It was studies of the marine fauna of the Pierre Formation in North Dakota that drew the attention of the National Geographic filmmakers.



Extent of the Pierre Sea that covered North Dakota and much of the mid-continent 80 million years ago.

The Cretaceous Pierre Formation, which consists mostly of shale, was deposited in shallow, marine waters. At that time (about 80 million years ago) the Earth was much warmer than today – there were no polar ice caps. Shallow oceans, like the Pierre Sea, covered vast areas of the planet. Perhaps as much as 85% (compared to about 70% today) of Earth was covered by these oceans. The Pierre Sea was not more than a few hundred feet deep. Entombed in the Pierre Formation are the remains of the animals that inhabited the Pierre Sea, which covered North Dakota and most of the mid-continent. Many of these animals are featured in “*Sea Monsters: A Prehistoric Adventure*”. Four major fossil sites that have yielded fossils from the Pierre Formation have been discovered in North Dakota: the Pembina Gorge site, Cavalier County; the Cooperstown site, Griggs County; the McCanna site, Grand Forks County; and the south Marmarth site, Bowman County. The remains of mosasaurs (giant marine lizards – referred to as sea monsters in the film) have been collected at all of these sites, and fossils of a diverse marine fauna have been recovered at the Cooperstown site.

In 1995, Mike Hanson, an electrician from Cooperstown, and Dennis Halvorson, the town’s plumber, discovered the skeleton of a mosasaur on the Tranby and Olson farm near Cooperstown. The 23-foot-long skeleton of the mosasaur called *Plioplatecarpus* was collected and restored and is on display at the North Dakota Heritage Center in Bismarck. A vast array of fossils from many marine animals have subsequently been recovered from that site including the remains of flightless sea birds, several species of sharks, giant sea turtles, bony fish, gastropods (snails), bivalves (clams), cephalopods (ammonites), crabs, brachiopods, and sea urchins. The “*Sea Monsters*” film is mostly about fossil discoveries in Kansas although fossil sites in Europe, the Middle East, Australia, and other places in North America, including North Dakota are also featured. Mike and Dennis (played by actors) are briefly shown in the film collecting fossil shark teeth at the Cooperstown site, although the scene was not



Ammonites in the Pierre Sea. From the movie “*Sea Monsters: A Prehistoric Adventure*”. Courtesy of the National Geographic Society.

shot in North Dakota. The makers of the film re-created real fossil discoveries and excavations, using actors, to provide the viewers with historical perspective and insight on how fossils are discovered and collected. Scenes flash back and forth from these re-created fossil excavations and the animated underwater community of “sea monsters” and other creatures living in the Pierre Sea.

Skeleton of the mosasaur *Plioplatecarpus* on display at the North Dakota Heritage Center in Bismarck



The film actually has a storyline that is based on a fossil find by Charles Sternberg, a member of the famous Sternberg family of paleontologists, in Kansas in 1918. His incredible discovery was a mosasaur skeleton with the remains of a small plesiosaur in its stomach. When found, Sternberg announced the discovery, but it was mostly overlooked until Mike Everhart



The sea turtle *Protostega*. From the movie “*Sea Monsters: A Prehistoric Adventure*”. Courtesy of the National Geographic Society.

“rediscovered” the specimen in 2001. Mosasaurs were the apex predators of the Cretaceous oceans and preyed on many kinds of animals, but this was the first evidence that plesiosaurs were among their prey. So the story unfolds with the two juvenile plesiosaurs mentioned earlier living in the ancient ocean and encountering other strange, and sometimes very dangerous, creatures populating this warm, marine habitat. You might guess the fate of at least one of these plesiosaurs.

Plesiosaur remains have been found in North Dakota, but none of the fossils have been complete enough to determine if *Dolichorhynchops* lived here. Other animals featured in the film did. Remains of several mosasaur skeletons have been found at the Cooperstown site. In



Giant bony fish, *Xiphactinus*. From the movie “*Sea Monsters: A Prehistoric Adventure*”. Courtesy of the National Geographic Society.



Huge mosasaur *Tylosaurus* feeding on the shark, *Squalicorax*. From the movie “*Sea Monsters: A Prehistoric Adventure*”. Courtesy of the National Geographic Society.



Skeleton (cast) of the flying reptile, *Pteranodon* on display at the North Dakota Heritage Center in Bismarck.

one scene, it is suggested that gnaw marks on mosasaur bones indicate that sharks scavenged mosasaur carcasses. Gnaw marks such as these are evident on parts of the *Plioplatecarpus* skeleton from the Cooperstown site displayed in the Heritage Center. In addition, fossils of the 5-foot-tall, flightless seabird, *Hesperornis*; the 10-foot-long sea turtle, probably *Protostega*; several species of sharks including *Squalicorax*, salmon-like fish, *Enchodus* and cephalopods or ammonites have been found at the Cooperstown site, all of which are featured in “*Sea Monsters*”. The Pembina Gorge site has yielded similar fossils. The most spectacular fossils found there are the remains of the giant (at least 15 feet long) squid called *Tusoteuthis*, and the 18-foot-long bony fish, *Xiphactinus*, which are also featured in the film. The massive, 40-foot-long mosasaur *Tylosaurus* is depicted in the film as the animal at the top of the marine food chain. We recently excavated the partial skeleton

of one of these beasts from the McCanna site near Larimore. Fossils of the flying reptile, *Pteranodon*, seen in the film have also been discovered in North Dakota.

If you are interested in experiencing what life was like in the ocean that covered North Dakota about 80 million years ago, “*Sea Monsters: A Prehistoric Adventure*” is a must-see. According to Ann Hornaday of The Washington Post, “It’s ‘Finding Nemo’ with a ‘Wow’ factor of about 100.” 3-D animation on the large screen results in spectacular visual effects, perhaps a bit too intense for younger children. Original music by Peter Gabriel and narration by Liev Schreiber enhance the experience. My only regret is that the closest IMAX theaters are in Minneapolis or Winnipeg. I give the movie four thumbs up and recommend that it is well worth a small journey to see.

The flying reptile, *Pteranodon*, cruising along the shoreline of the Pierre Sea. From the movie “*Sea Monsters: A Prehistoric Adventure*”. Courtesy of the National Geographic Society.

