The 2005 Medora Public Fossil Dig:
An example of the popularity of fossil digs as part of North Dakota's Nature Tourism efforts

By John W. Hoganson

Introduction:

In 2004, Darrell Nodland, a field inspector for the North Dakota Industrial Commission–Oil and Gas Division, discovered the partial skeleton of a champsosaur (crocodile-like reptile) weathering out of the Paleocene Sentinel Butte Formation in the Badlands near Medora. Realizing that this was probably a significant fossil site he contacted Brett Woodward, NDGS paleontology laboratory specialist, and me. During a visit to the site with Darrell, we determined that fossil bones from several different kinds of animals were weathering out of a thin, carbonaceous mudstone. The bone bed extended for several hundred feet around the barren badlands terrain. It appeared to me that this site would be a good place to conduct another of our public fossil digs.

About five years ago, the NDGS and North Dakota State Tourism office started exploring the idea of allowing pay-to-dig public participation at some of our fossil excavations, thus enhancing North Dakota's tourism efforts and providing a unique kind of economic diversity to rural areas that contain fossil resources. The public fossil dig program would also provide paleontological experiences for North Dakota residents interested in this kind of ecotourism adventure. The program has been an overwhelming success.

Pembina Gorge Mosasaur Digs

The first two public fossil digs, in 2000 and 2001, were in the Pembina Gorge area of northeastern North Dakota near Walhalla. At that site, the Cretaceous (80-million-year-old) Pierre Formation is exposed in an extensive road cut along a hill side. From about 90 million years ago until about 70 million years ago North Dakota was covered by shallow, warm oceans that connected the Gulf of Mexico to the Arctic Ocean. The remains of the animals that inhabited these oceans including: marine reptiles (mosasaurs, plesiosaurs, turtles); sharks and other fish; birds; and invertebrates including squids, snails, clams, and cephalopods were entombed in sediments, now turned to rock, that accumulated on the oceans' floors. This site is located on land administered by the North Dakota Parks and Recreation Department and they became our partner in the dig. Dakota Adventures, a Walhalla-based outfitter that provides ecotourism tours, handled most of the logistics. The digs were an overwhelming success from two perspectives. First, we recovered some interesting and scientifically important fossils. Second, participation was outstanding. Fifty people from seven states and Norway participated in the eight-day-long 2000 dig and one hundred people from 10 states and Canada and Norway participated in the ten-day-long 2001 dig.

Marmarth *Triceratops* Dig

In 2002, we administered another public fossil dig in southwestern North Dakota near Marmarth. At that site, the partial skeleton of a *Triceratops* dinosaur was weathering out of an ancient, Cretaceous (about 65-million-year-old), river channel in what is now called the Hell Creek Formation. By about 68 million years ago the ocean that had covered North Dakota earlier had receded and a huge delta developed in what is now western North Dakota. This delta provided habitats for dinosaurs, including *Triceratops* and *Tyrannosaurus rex*, rodent-sized mammals, freshwater snails and clams, and exotic plants. Their remains are found in the Hell Creek Formation that is exposed in the badlands of southwestern North Dakota. This site is on land managed by the United States Forest Service-Dakota Prairie Grasslands and they became a partner in the dig. Dakota Adventures won the contract to outfit the dig. During the 10-day excavation, 35 people from seven states participated. The *Triceratops* skull recovered from this site is restored and is on display at the North Dakota Industrial Commission office building in Bismarck.

Medora Crocodile Dig

During the Paleocene, between about 60 million and 50 million years ago, rivers and streams deposited sediments derived from the Rocky Mountains and other western sources over much of western North Dakota. Swamps also occupied vast areas in western North Dakota. The climate was subtropical, similar to south Florida today. Dawn redwood, bald cypress, *Ginkgo*, *Magnolia*, palm and many other exotic plants grew in these swampy lowlands and formed extensive forests. The swamps were inhabited by crocodiles, alligators, champsosaurs (crocodile-like reptiles), turtles, salamanders, mammals, clams and snails. It was one of these fossiliferous swamp deposits in the Sentinel Butte Formation that Darrell Nodland discovered and eventually became the place where we conducted our 2005 public fossil dig.

The Medora site is located on Theodore Roosevelt Medora Foundation property. I approached Randy Hatzenbuhler, President of the Foundation, with the idea of providing a public dig at the site, and that the NDGS and the Foundation co-sponsor the dig. He thought it was a grand idea because this would provide an additional activity for visitors to Medora and would attract visitors that may not otherwise visit Medora. The North Dakota State Tourism Office endorsed the plan and provided advertising support.

Once again, the excavation was a success because of participant interest and because of the scientific importance of discoveries made at the site. Fossils recovered during the excavation included: two partial skeletons of the crocodile-like *Champsosaurus gigas*; teeth, scutes, and other bones of the large crocodile *Borealosuchus*; remains of at least five kinds of fish including gar, *Leidyosuchus*, and dogfish, *Amia*; shell fragments of three kinds of turtles including the soft-shelled turtle, *Plastomenus*; vertebrae of the large salamander, *Piceoerpeton*; trace fossils including worm burrows and coprolites (fossil feces); freshwater snails (*Campeloma*) and clams (mussels); and plant remains. This was a swamp or pond that was teeming with life and a feeding place for crocodiles and champsosaurs. This site is providing insight about life in North Dakota and the State's climate about 60 million years ago.

About 80 people, both residents and non-residents of North Dakota, participated in the 10 day long excavation.

Future Public Fossil Digs

The Medora site is an extensive fossil bed and only a portion of the site was excavated during the 2005 dig. It is an extremely important site because of the information it is yielding. We have decided to return to the site in 2006 and will offer another public fossil dig there from July 14 through July 24. As before, the Theodore Roosevelt Medora Foundation will co-sponsor the event and will handle reservations. Potential participants can contact either me or Kathy Miller, group sales with the Foundation, at 1-800-633-6721 for additional information.

We are considering expanding our public fossil dig program and may offer a second dig experience in 2006 near Marmarth in collaboration with the Marmarth Research Foundation. More and more people are becoming interested in nature tourism adventures whether it is hiking, mountain biking, birding, or digging for fossils at professionally administered, scientific excavations. In the future, we hope to annually provide fossil excavation opportunities for visitors to North Dakota.

Brett Woodward and Allan Schwatz from San Francisco, California.

Mavis Rogers from Miles City, Montana; Terri Villarreal from Edinberg, Texas; Sherri Doiron from Cedar Hill, Texas.

Cynthia Loftus from St. Joseph, Michigan and Allan Schwatz from San Francisco, California.

Sheila Schafer from Medora and Maureen Limond from Austin, Texas.

Carolyn Ebbenhous from Michigan excavating partial champsosaur skeleton. Larrie Halverson from Minot in background.

Partial champsosaur skeleton.

Andrea Wheeler from Butte, Montana holding a larger fish vertebra that she excavated.

Large fish vertebra.

Allan Schwatz from San Francisco, California holding a coprolite (fossil feces) that he excavated.

Large coprolite.

Steve Crane from Bismarck excavating large fish.

Large fish bones.

Sally Hirsh from Erskin, Minnesota excavating freshwater mussels (clams).

Freshwater mussels (clams).

Carolyn and Rick Devine from Sagamore, Hills, Ohio.

The Fuecker family from Sauk Rapids, Minnesota.

Wayne "Bubba" Kubista from Mandan.

Laretta and Brooke Biederstedt from Dickinson.

Debra and Bill Marlenee from Stanton; Mike Arneson from Dickinson; Pamela John from Crowley, Louisiana; Cody Vanderbusch from Dickinson.

Roger and Jackie Schroeder from Stanley.

Debra and Bill Marlenee from Stanton; Pamela John from Crowley, Louisiana.

Fish vertebra and turtle shell still in outcrop.