

Fossils In North Dakota

FIND is a newsletter dedicated to helping young readers (in age or spirit) express their love of fossils and paleontology, and to help them learn more about the world under their feet. Each issue will be broken up into sections including Feature Fossils, Travel Destinations, Reader Art, Ask Mr. Lizard, and more!

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Feature Fossil: Coprolite

Holy coprolite! Can you believe we've made 30 issues of the FIND?! If you've been with us since the start – Thank You! If you're new to this publication – welcome! Coprolites, by the way, are fossilized feces (yes, even poop can fossilize). Most of the time when we think about fossils, bones and shells come to mind – and for good reason. The hard parts of plants and animals (bones, teeth, seeds) tend to fossilize easier than soft-squishy parts. This is why whenever an exceptional fossil with skin or internal organ casts are found, scientists make such a fuss. So what about coprolites? Weren't they soft and squishy? I'm so glad you asked – yes they were. So how did they turn to rock? Well, it's a numbers game. Let's use people as an example...

We have one skeleton. One. Yes, there's lots of bones in that skeleton, but I digress. If a human lives to be 100 years old, and has a bowel movement every day, then that person by the time they are 100 has pooped ~36,500 times. That's a lot. So if you have 1 of something, and 36,500 of something else, NUMBERS tell us that at least some of the larger number has a better chance of staying around than our single skeleton.

Feces can dry out in the sun, it can get buried in mud, or buried by the critter that left it (think cats in a litterbox) – there are lots of ways that it can stick around long enough to fossilize. Once it becomes a fossil – why in the world would we be interested in collecting old poop?! Because it's a snapshot into a very short window of time, in the life of one animal. The bones we collect are only a small portion of what makes up the flora and fauna in an environment. Coprolites (leftover food) can sometimes be sliced, or even dissolved, and the fossils inside recovered.

This could mean bits of bone, teeth, or scales if it came from a carnivore. It could also mean twigs, seeds, and pollen, if it came from an herbivore. These little fragments help fill in more of the environment. Every little bit helps us learn more about the past.

With coprolites, most of the time you can't really tell who did the eating. Critters have a tendency to drop - and - walk. However, there are rare cases where we can narrow it down. Kind of a "Clues" scenario. Take this past summer at

Medora, for instance. Our fossil technician Trissa

came across a monster of a dropping, probably the longest we've ever recovered from there. Based on the size, we can rule out some possible depositors: it wasn't a mouse. The largest creatures we have at the site that are carnivores (the poop had some scales and bones in it) are crocodiles. So, most likely,

the largest poop is coming from our largest creature. This monstrosity probably came from a

large crocodile called *Borealosuchus*.



2018 Public Fossil Dig Recap

Dickinson Area

The first dig of the 2018 season was our Dickinson Area site. Wandering through the Oligocene Little Badlands of ND, you can definitely see why they're called "badlands." Dry, arid, not a lot of plants, but lots of area good for fossil prospecting. We had 69 people from 13 states join us for 7 days. Similar to years past, we found a lot of rhino (*Subhyracodon*) bones. We were very excited to find a partial jaw of *Archaeotherium*, a pig-like creature. A layer of pond turtles, most likely *Chrysemys*, were also uncovered. Becky calls them her little sandwiches, because they look bite-sized. The last day, an oreodont skull was also located. While common in the Big Badlands of South Dakota, they're a little more rare up here.

Medora

No huge discoveries (other than the largest coprolite yet) this year at Medora, but a steady stream of smaller finds. Fish skull bones, crocodile gastralia (abdominal-muscle bones), and a few champsosaur limb bones. We had 75 people from 9 states join us. We did have a special visitor – Governor Doug Burgum came out for a day to experience some real fossil digging. He called us “Team Awesome.”



Bismarck Area

This was our longest dig this summer with 18 days spent on site, and we were joined by 128 people from 16 states. We brought out a whopping 66 jackets by the end of the three weeks – and not small ones either! Other sites like Medora, we can pull 30 or 40 small (baseball to basketball sized) jackets out, no sweat. The Bismarck Area site mostly contains dinosaur material, which means that one rib can be multiple feet long, and weigh significantly more than a small fish skull bone. Ufda.

Our last day on site last year, we found a monster of a *Tyrannosaurus* tooth (now in display at the State Museum & Heritage Center). Our first day on site this year, Trent from ND found ANOTHER monster *Tyrannosaurus* tooth. This ended up being the first of 5 teeth found this year.



Trent, left, with his monster tooth find. Not all of the 5 teeth were in great condition however - the handful of fragments at right is also a tooth!

Will from TN found our first theropod bone, a little phalanx. We find lots of teeth – a carnivore doesn't need to die to lose a tooth, as they shed and regrow teeth throughout their life. A carnivore *does* need to die for us to find a limb bone, or a rib bone – so this gives us hope that maybe there is an elusive meat-eating dinosaur somewhere in this site.



There was quite the game of Giant Pick-up Sticks on site this year. Some very large *Triceratops* ribs were scattered in the middle of our quarry, weaving above and below each other. Some ribs we could split, others ended up in huge plaster jackets. That was a case where one bone took weeks to pull out, rather than a couple days.

Pembina Gorge

Our last site of the season was in the Pembina Gorge. We were joined by 107 people from 14 states. Our initial plan was to head back to our “Eustace” mosasaur area, push back the hillside, and look for more. Some of our friends from the “Canadian Fossil Discovery Centre” in Morden, Manitoba came down to visit us, and during their wanderings, Joe found yet ANOTHER mosasaur jaw (this one we called “Adolfo”) at the base of “gypsum hill.” We have checked this hill to the south every year for the last eight years, and have found nothing but gypsum crystals (hence the name). This year was apparently our year however. We scrounged around briefly, and found more mosasaur jaw, as well as a very large portion of vertebrae from the big fish *Xiphactinus*.



So, we decided to split our team. Clint took half of the diggers each day and continued his hunt for the rest of “Eustace,” while Becky took the other half and slowly, oh so slowly, combed the entire south hill to look for more mosasaur and *Xiphactinus*. Each day Becky's crew would carve a large “bench” into the hill, then step up on the bench they had carved, in order to carve the next step. Over and

over. We had to get through all of the slumped and weathered material just in case more of the creatures had washed down from the top. Some days were filled with fossils, some we got skunked. By the last day and a half, Becky's side finally made it to the top of the hill. They found where the mosasaur was coming out, and they found another skeleton from a large fish called *Enchodus*. Just in time to pack up and head back to Bismarck! Next year... next year Becky is going fossil-fishing... she knows the BIG one is out there!

Dig Photo Montage!



Turtle rib from the upper shell (carapace) from Chrysemys. Dickinson Area.



Erin found the maxilla of an Archaeotherium - a big pig-like creature called an entelodont. Dickinson Area.



Sharon, Dale, Leena, Becky, and Kim work on an outcrop of Chrysemys turtle shells. Dickinson Area.



Micah helps students from the South Dakota School of Mines & Technology mix plaster. Rhino bones were carefully wrapped in a burlap-plaster cocoon called a "jacket." Dickinson Area.



Diggers spread across the landscape. Dickinson Area.



Dina pulled out some nice looking Metasequoia needles. Medora.



Andrew looks on as Klara practices what we dubbed "Paleo Yoga." Medora.



Ada had eagle eyes, and spotted a small fish jaw. Medora.



Governor Burgum and family getting an up-close view of digging. Medora.



Mara has been digging at both Pembina and Medora. This year she found some small fish bones. Medora.



Paul found one of a small cache of crocodile osteoderms. Medora.



Terry and Glen work in their (nicely brushed clean!) quarry section, as Alyssa practices more Paleo Yoga in the back. Medora.



Beautifully textured fish skull bone. Medora.



Ryan with his Edmontosaurus chevron (top) and metatarsal (bottom). Bismarck Area.



Fred gently clearing off an Edmontosaurus pubis. Bismarck Area.



This little juvenile Brown-headed cowbird became our mascot for a day. S/he was fearless and followed us around, eating all the bugs we uncovered as we dug. It spent the whole day walking between diggers, begging for food.



Closeup of the Tyrannosaurus tooth Trent found. Bismarck Area.



Jon helped open up the new/old "Xiphactinus Hill" - very interesting brown carbon preservation of fish bones - here he's holding a chunk of fish jaw. Pembina Gorge.



Some of our days got HOT. Everyone's sweaty, dirty, tired, and happy. Pembina Gorge.



Innes and her seven Xiphactinus vertebrae. Pembina Gorge.



On the last day, we uncovered a whole chain of fish vertebrae. Large Enchodus? Small Xiphactinus? Pembina Gorge.



Alyssa posing with our plush site mascots, Hester the Hesperornis and Evinrude the Mosasaur. Alyssa was a shovel and pick master, helping to move the hillside back. Pembina Gorge.



Success! After a week+ of hard work, we reached the top of "Xiphactinus Hill." Pembina Gorge.



Joshua dug right in and found a champsosaur tail vertebra. Not too shabby for a first-timer. Medora.



Barry found more of the fourth mosasaur, "Adolfo." Here he is posing with the snout, modeling the position of the bone. Pembina Gorge.



After the dig, we hit another spot of the Niobrara Formation to see if we could find anything of note. Trissa (left) and Becky (right) sat and split shale for an hour, uncovering these beautiful ammonites. Pembina Gorge.