

ONION CREEK MOSASAUR JULIA CLARKE WEBCAST SATELLITE ACTIVITY

Lesson plan for grades 5-10

By: Laura Sanders, Environmental Science Institute, March 2011

Length of Lesson: 45-50 minutes

SOURCES AND RESOURCES:

- <http://www.geology.wisc.edu/~museum/hughes/FinalProjectMosasaur.htm>
Title: No Bones about It: Reconstructing a Mosasaur, by Don Vincent, West High School, Madison, WI 53705.
- <http://www.utexas.edu/tmm/exhibits/mosasaur/index.html>
- http://www.utexas.edu/tmm/sponsored_sites/dino_pit/pdf/mosasaur.pdf
- http://www.utexas.edu/tmm/sponsored_sites/dino_pit/mosasaurus.html
- <http://www.mosasaur.com/mosasaur/index.html>
- <http://www.unexplained-mysteries.com/forum/index.php?showtopic=136117>
- <http://www.bbc.co.uk/science/seamonsters/factfiles/giantmosasaur.shtml>
- <http://www.scribd.com/doc/13839250/onion-creek-mosasaur>
The Onion Creek Mosasaur by Wann Langston, Jr. Museum Notes Number 10, October 1966

SAMPLES OF POTENTIAL TEKS ADDRESSED THROUGH THIS LESSON:

§112.16. Science, Grade 5, Beginning with School Year 2010-2011. 2C, 2D, 2F, 2G, 3D, 7D, 10A

§112.18. Science, Grade 6, Beginning with School Year 2010-2011. 2E, 3D

§112.19. Science, Grade 7, Beginning with School Year 2010-2011. 2A, 2E, 3D, 11B, 12A

§112.20. Science, Grade 8, Beginning with School Year 2010-2011. 2A, 2E, 3B, 3C, 3D,

§112.34. Biology, Beginning with School Year 2010-2011 (One Credit). 2E, 2H, 3A, 3B, 3E, 3F, 7A

PERFORMANCE OBJECTIVES:

The students will be able to:

- Identify and compare homologous structures.
- Construct a model of a Mosasaur flipper based on current and fossil evidence.
- Model the thinking skills of a paleontologist.

CONCEPTS:

In this activity, students will model a paleontologist's activities. It is a difficult job; putting together bones of any extinct animal can be frustrating. Scientists do not always get it right the first time. Often the bones are mixed up, and in many cases, some of the bones are missing. Paleontologists use their knowledge of biology and comparative anatomy to assemble these extinct animals. When reconstructing a newly discovered and previously unknown skeleton, they may compare the bones to those of similar species to get an idea of how to assemble it. It is highly likely that the students will not be able to reconstruct the mosasaur flipper skeleton without a final figure showing where each bone belongs.

The purpose of this lesson is to have students use inquiry to determine the arrangement of bones of an extinct reptile. In addition to comparing bone structure, students can examine habitat comparisons or adaptations.

MATERIALS:

Per group of 3-5 students:

- 1 set of mosasaur flipper bones cut up
- Figure 1: A skull found near the bones you are assembling
- Figure 2: Drawing from Williston (1898) of skeletons found in Kansas
- Figure 3: Four homologous structures
- Figure 4: Bones of a homologous structure in a current organism

For instructor or groups:

- Mosasaur background information compilation
- Document that includes instructions and images
- Final image of completed skeletal flipper for end result comparison

TEACHER PREPARATION:

Copies of each figure (5 pictures in all) should be made, one per group. The bones from the mosasaur flipper figure should be cut apart before the students see them, and can be kept together for each group in baggies or envelopes. When cut, the bones can be separated individually, or in groups of 2, 3 or 4 bones, depending on the age level or time constraints for the groups. The process of uncovering the clues works best if they are kept in a folder or envelope, so that groups only see one clue at a time when instructed by the teacher to see the next clue. Figure 4 consists of several images of bones, and among the pictures is an example of a label that could be put on the outside of the folders to remind students to only remove one clue at a time.

OPTIONAL EXTENTIONS:

- Read about Mosasaurs, including: *A Dinosaur Dynasty* by Katherine Rogers, *Colorado's Dinosaurs* by John T. Jenkins, Jr. and Janice L. Jenkins, and *Discover magazine*; September 1993.
- Read about "The Curious History of Feathers" and see some of the latest news on how dinosaurs and birds are related, which dinosaurs had feathers and which had protofeathers. "The long curious extravagant evolution of feathers." *National Geographic*. February 2011. pp. 32-57.
- Draw 2-D or make 3-D models, investigating the size of real dinosaurs and other prehistoric creatures. (Carnegie models work well.)
- Scale drawings of other animals or comparisons of further homologous structures.
- Visit the Onion Creek Mosasaur at the Texas Memorial Museum at the University of Texas at Austin.

ENGAGEMENT:

As students arrive, the song "I Am a Paleontologist" by They Might Be Giants could be playing in the background. This can be found on CD, or through video where the matching of dinosaur bones can be viewed along with the song at <http://www.youtube.com/watch?v=B7zo2zY1Zqg>. Part of the video shows children paleontologist guessing which dinosaur skeleton a particular bone fits in.

EXPLORATION:

Overview: Students are in small cooperative groups to perform the tasks. Each group should carefully observe all of the bones in their packet. Students should estimate where they should be connected. Clues through facts and figures are given every few minutes to aid in constructing the Mosasaur flipper. The times listed below are merely suggestions. The lesson may flow naturally.

- 7 minutes – Students should form groups of 3-5 students. These groups will be referred to as “Paleontology Research Groups” in this lesson. Instructors share the information given on the first two slides of the slideshow, explaining the purpose of the groups and the exploration. Encourage students to work together and for each student to have turns working with the bones and figures and sharing ideas.
- 7 minutes – Students remove only the set of bones from their packets, examine them, and try to line the bones up in a way that shows how they think the bones should be connected. Invite one group to share how they decided to arrange their bones and why. Share the information from Slide 3 titled: “What do you know?” Ask students if this new information might change the way they have worked on their structures. Students may rearrange their bones.
- 5 minutes – Students may remove Figure 1 from their Paleontology Research Group packets. This figure matches the image on Slide 4. Does knowing about the skull make them think differently about their bones? Instructors share: Do any of your bones look like they attach to this skull? (They don’t.) Could they support a skull this large? Maybe they belong to a different part of the body. What other animals have skulls like this? Students may rearrange their bones.
- 5 minutes – Students may remove Figure 2 from their Paleontology Research Group packets. This figure matches the image on Slide 5. Instructors share: This drawing from Williston (1898) shows the skeletons of three common species of mosasaurs from Kansas. The mosasaur lived in the Cretaceous Sea over North America in the same time period as your bones. Notice that their skulls resemble the skull you found, and that they have flippers instead of legs. Which parts of these skeletons resemble your bones? (The flippers.) Students may rearrange their bones. Invite one group to share how they decided to arrange their bones and why.
- 5 minutes – Students may remove Figure 3 from their Paleontology Research Group packets. This figure matches the image on Slide 6. Instructors share: **Homologous structures** look the same in these different animals because they come from the same ancestor in evolution. The bones are the same, but they might be serving different functions now. How are the bones in these four organisms the same? How are they different (what are the different behaviors)? Which bones look the most like the bones you discovered?
- 5 minutes – Students may remove Figure 4 from their Paleontology Research Group packets. This figure matches the image on Slide 7. This modern whale flipper contains bones very similar to the bones found by the Paleontology Research Groups. Students may rearrange their bones. Invite one group to share how they decided to arrange their bones and why.

- Instructors share the image of the actual arrangement of the bones as they were found as seen in Slide 8. Notice that the groups did not have all of the bones because not all bones were found (as seen by the spaces in the image).

EXPLAIN:

- What clues did you use when you started to assemble your Mosasaur flipper?
- If you had not seen each of the figures, would you have been able to complete this skeleton? Why or why not? Which was the most helpful?
- What skills do paleontologists need to have in order to assemble extinct animals?

ELABORATE:

The final slides are photos of the actual skeleton of the Onion Creek Mosasaur and one of its discoverers, as well as an artist's depiction of what a mosasaur might have looked like in its habitat. Instructors can share background information on the Onion Creek Mosasaur or mosasaurs in general, found as an attachment to this lesson plan, or these can be read by students or groups.

Mosasaurus maximus

Mosasaur (MOSE-uh-sawrs), from Latin *Mosa* meaning the 'Meuse river,' and Greek *sauros* meaning 'lizard,' were alive during the Late Cretaceous, 65-80 million years ago.

The first fossil remains of these huge seagoing lizards were discovered in a limestone quarry at Maastricht on the Meuse in 1764. Since then, Mosasaur fossils have been found across the United States, in the Netherlands, Denmark, Portugal, Sweden, the United Kingdom, Angola, Morocco, Australia, New Zealand, Canada, Mexico, and on Vega Island off the coast of Antarctica. Today the closest living relatives of the extinct mosasaur are the members of a lizard lineage that includes the Komodo dragon and the Gila monster. The largest known mosasaur is Hainosaurus, which could reach 17 meters in length and weighed a maximum of 20 tons, but the smaller mosasaurs could be under 6 feet long.

For reasons that are not fully understood, the ancestors of the mosasaur lineage left the dry land and adapted to life in the seas. They swam in the shallow seas that covered 40% of present day North America, as in the epicontinental seas around the world. Unlike modern sea turtles, which come out on dry land to lay eggs, mosasaurs gave birth in the water to live young.

With long slender bodies, whale-like flippers instead of feet, and a large, flattened tail, these giant creatures probably swam with a snake-like motion, using the tail as a propeller and rudder and the flippers as stabilizers.

Aggressive predators of the seabed, mosasaurs were at the top of the food chain. As the mosasaurs were not fast swimmers they would have stalked their prey using natural cover provided by seaweed and rocks. Only when the prey was within striking range would the mosasaur propel itself forward.

Mosasaurs had long sharp teeth perfect for preying upon other marine creatures. Several known specimens preserve possible stomach contents, which indicate that mosasaurs ate other vertebrates (birds, sharks, bony fish, turtles, other marine reptiles, etc.). The shells of extinct molluscs known as ammonites have also been found with holes interpreted as bite marks made by mosasaurs. Mosasaurs were equipped with several sharp conical teeth that were used to capture and hold prey, but not to chew it into pieces. To assist in the eating of large slippery prey, mosasaurs had a set of teeth on the pterygoid bones in the roof of the mouth.

The lower jaw is loosely hinged to the skull with a moveable joint on each side just behind the teeth. This loose joint likely permitted the animal to swallow large prey, much as some living snakes do. Put your hands together, fingers extended and together (as if you were praying) and then with the heels of your hands touching, move your palms apart, so that your hands form a "V". That's what a crocodile can do with its jaws. Now, perform the same motion, except also bend one of your hands at the first knuckle (where your palms meet your fingers) while performing the same motion and you can see how much wider a snake or a Mosasaur could open its mouth.

Although giant mosasaurs were the top predators in the sea, they were still vulnerable to attack. One mosasaur fossil bears the marks of a shark bite in its spine.

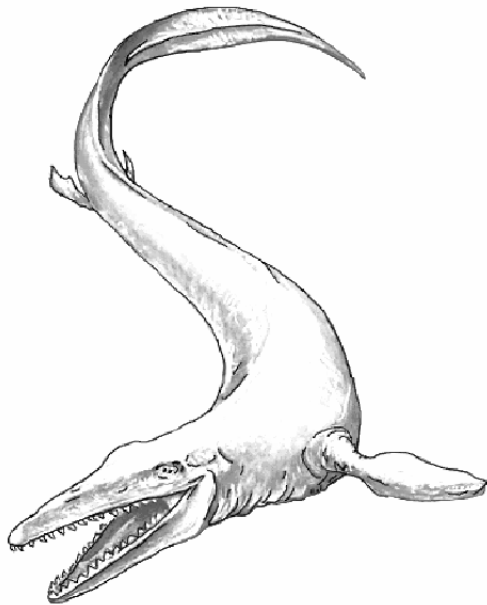
The Onion Creek Mosasaur

Mosasaur fossilized bones are fairly common across the state of Texas, and they are especially abundant in Central Texas. But complete skeletons are very rare.



The Onion Creek Mosasaur, *Mosasaurus maximus*, belonged to one of the larger species of mosasaurs, and one that lived only a short time before the last mosasaurs went extinct. Discovered in 1934 by The University of Texas at Austin geology students W. Clyde Ikins (shown in the photo on the left) and John Peter Smith, the Onion Creek Mosasaur is 30 feet long, about 12 feet of which are tail. The head is 4 feet 8 inches long, and the jaws, when fully opened, have a gape of about 3 feet.

The complete skeleton was first put on public display at the Texas Centennial in 1936. The mounted and reconstructed skeleton is currently on display at the Texas Memorial Museum, the exhibit hall of the Texas Natural Science Center.



Sources:

- <http://www.scribd.com/doc/13839250/onion-creek-mosasaur>, The Onion Creek Mosasaur by Wann Langston, Jr. Museum Notes Number 10, October 1966
- <http://www.utexas.edu/tmm/exhibits/mosasaur/index.html>
- http://www.utexas.edu/tmm/sponsored_sites/dino_pit/pdf/mosasaur.pdf
- <http://www.oceansofkansas.com/mus-mosa.html>
- <http://www.mosasaur.com/mosasaurs/index.html> (LOTS OF IMAGES)
- <http://www.mosasaur.com/oops/chomp.gif> (ANIMATION!)

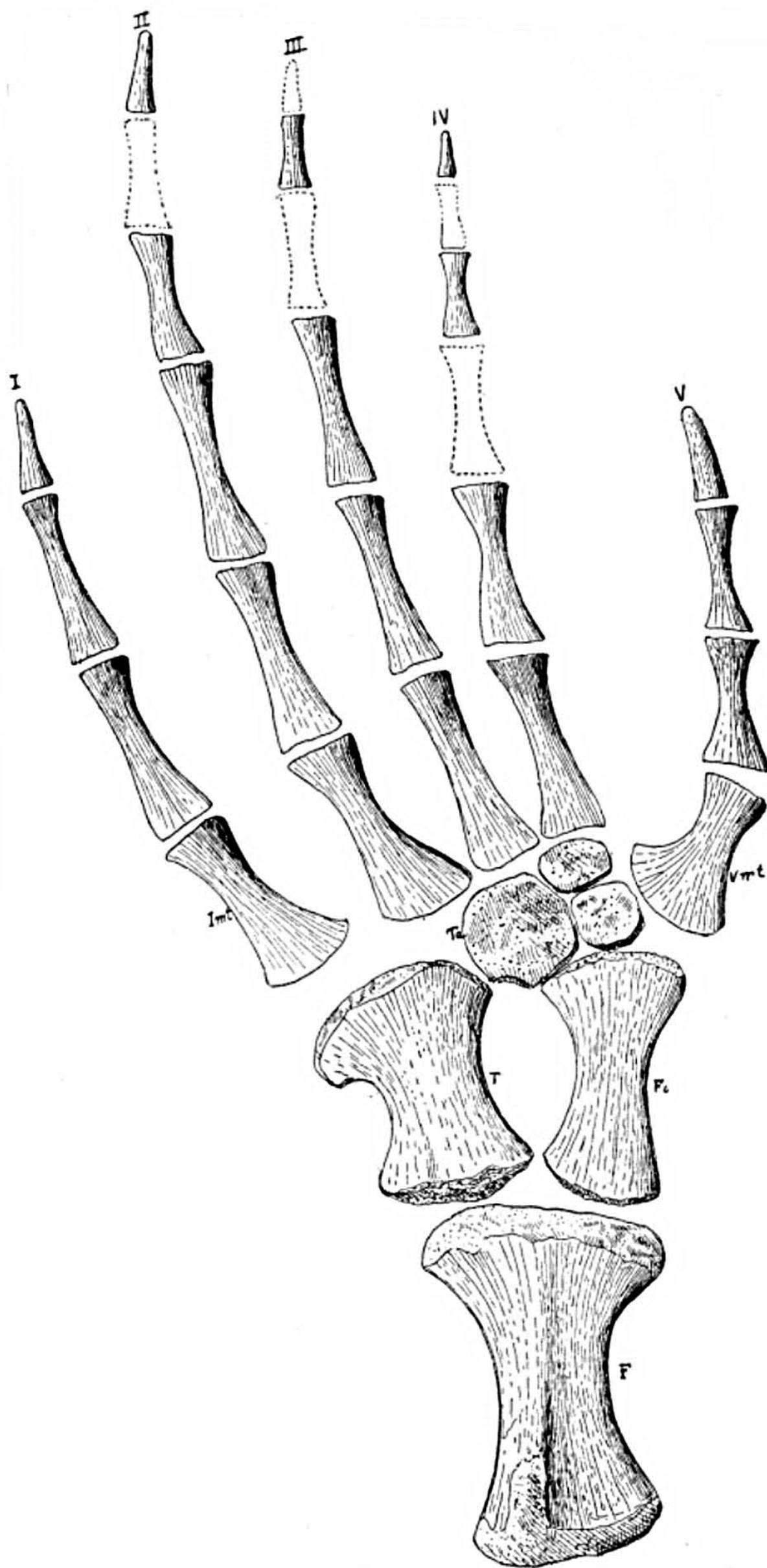


FIG. 5.

Hind paddle of *Platecarpus coryphaeus*, in part after Marsh.
F, femur; *T*, tibia; *Fi*, fibula; *Ta*, tarsals; *Imt-Vmt*,
 first-fifth metatarsals; *I-V*, first-fifth digits.

Paleontology Research Group

IMPORTANT: Only pull each item out of the envelope when instructed to do so.

Each packet should contain:

- **1 set of bones** (about 65 million years old) found in Onion Creek (Austin, TX) to be assembled
- **Figure 1:** A skull found near the bones you are assembling
- **Figure 2:** Drawing from Williston (1898) of skeletons found in Kansas
- **Figure 3:** Four homologous structures
- **Figure 4:** Bones of a homologous structure in a current organism

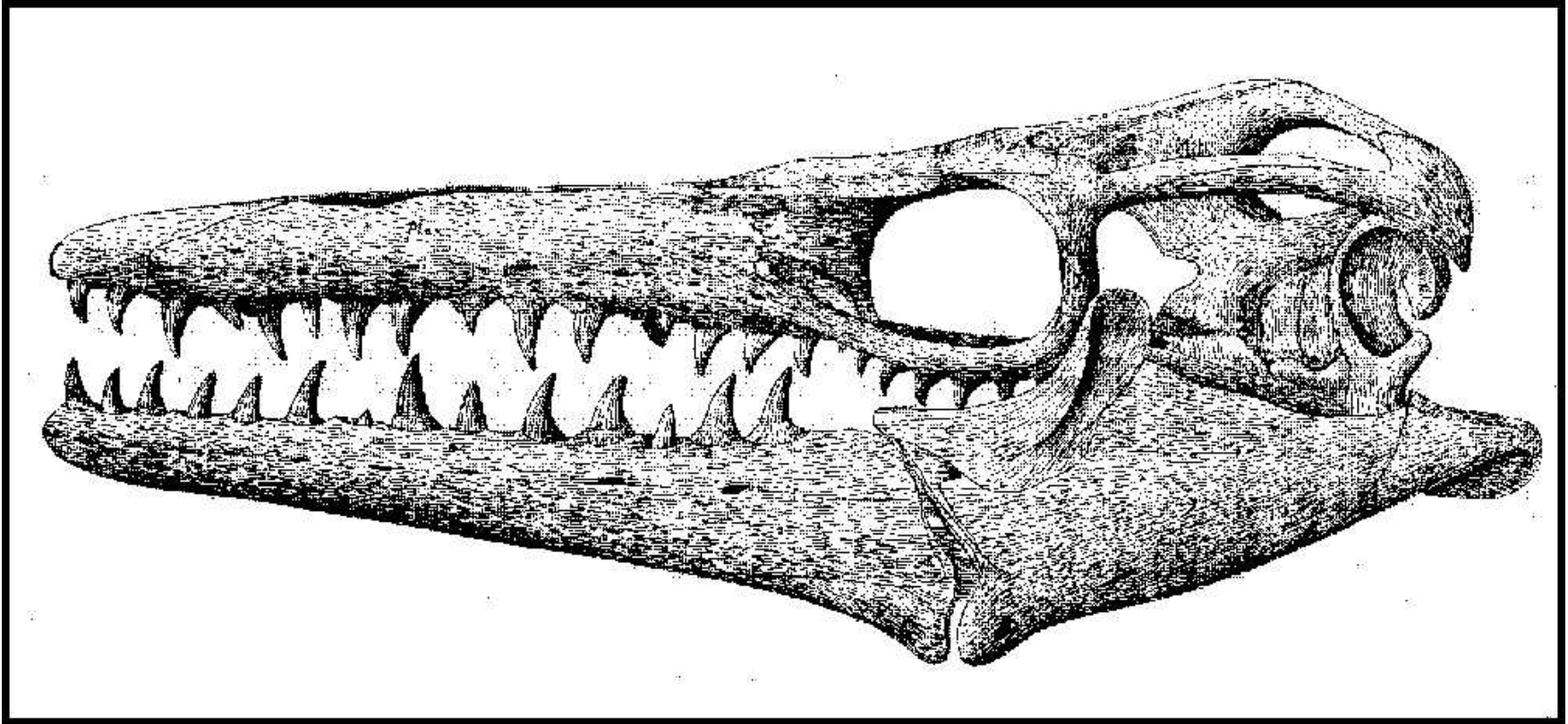


Figure 1: This skull was found near the bones you are trying to assemble.

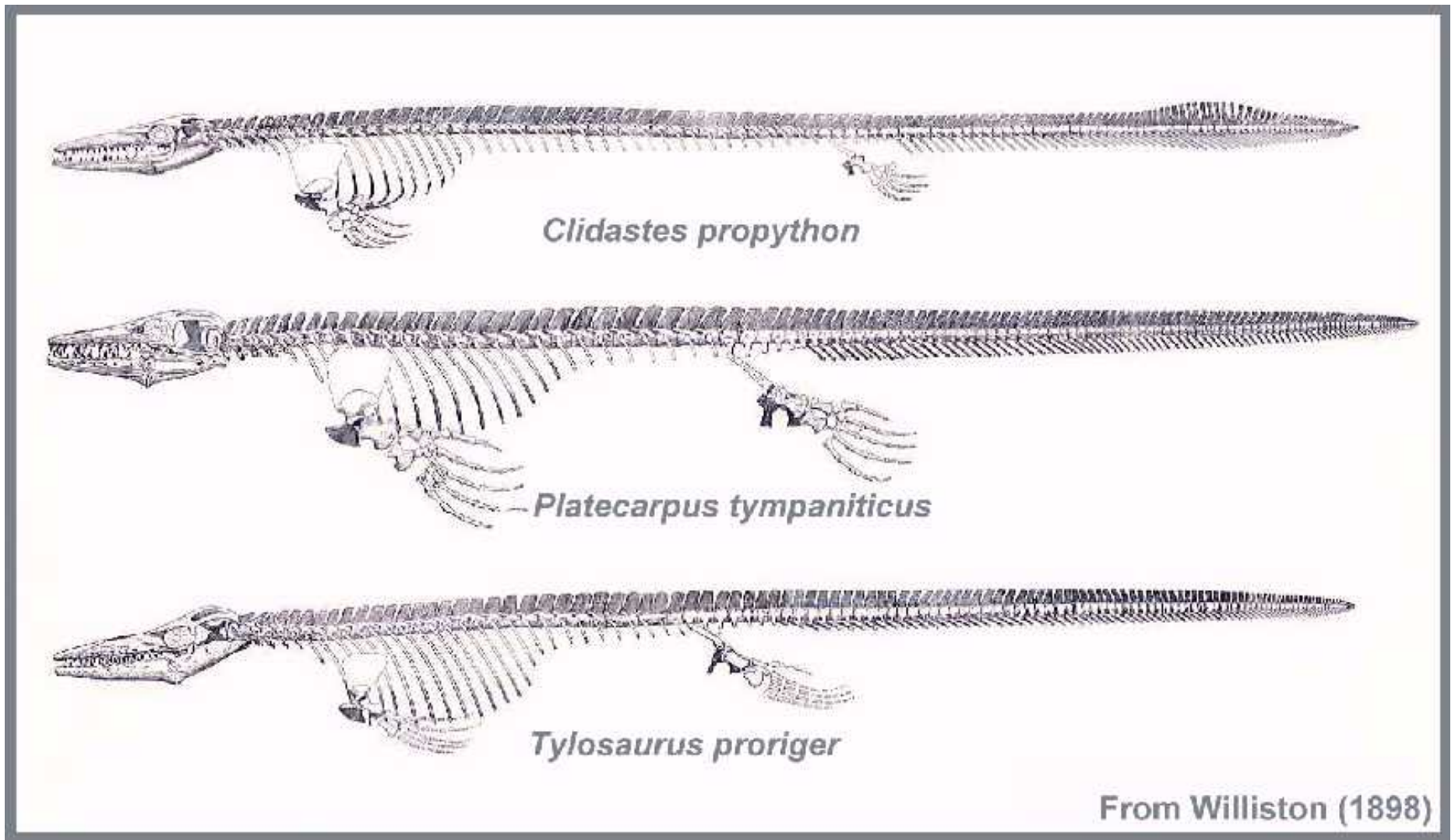


Figure 2: This drawing from Williston (1898) shows the skeletons of three common species of mosasaurs from Kansas.

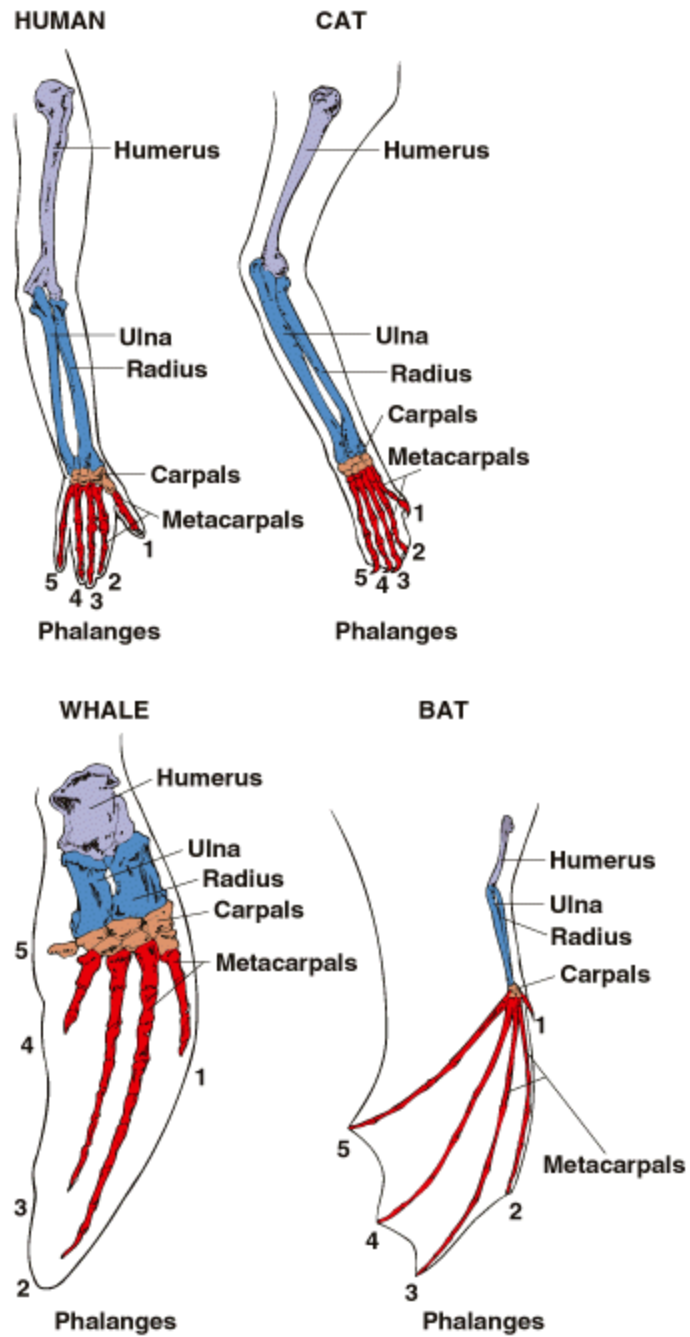


Figure 3: Homologous Structures

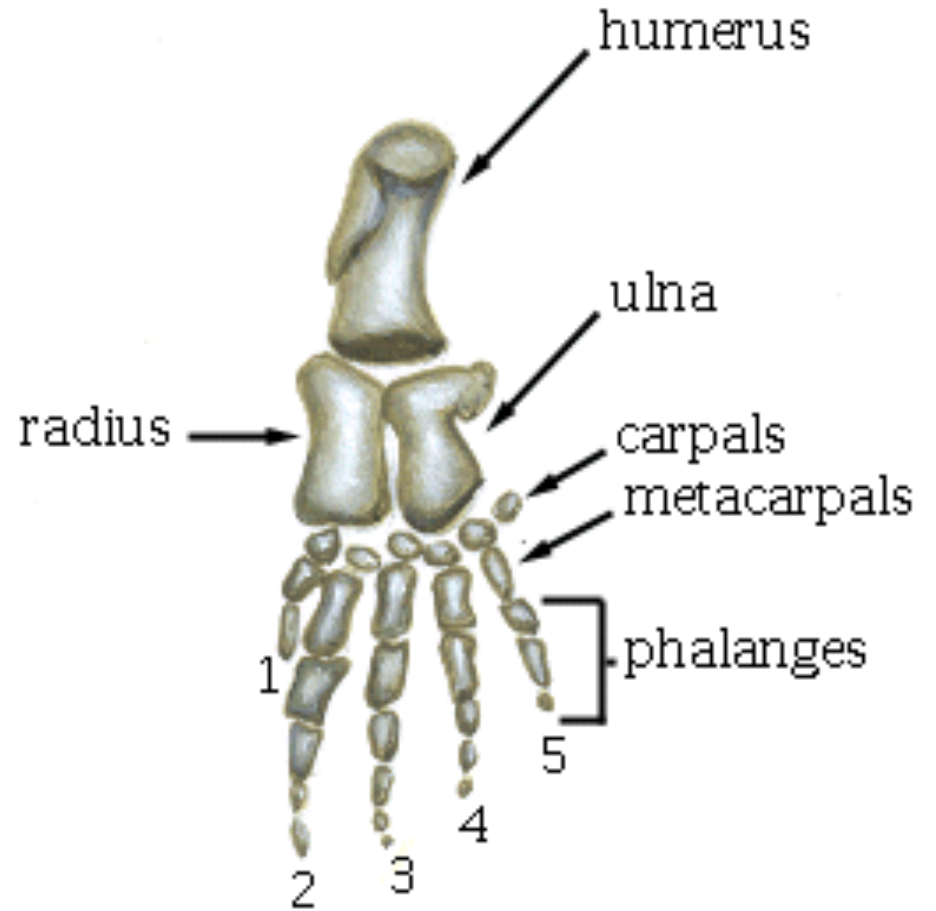


Figure 4: Bones of the left whale fin.

(Source: <http://www.unexplained-mysteries.com/forum/index.php?showtopic=136117>)

1 set of bones to cut up and distribute to groups for assembly.

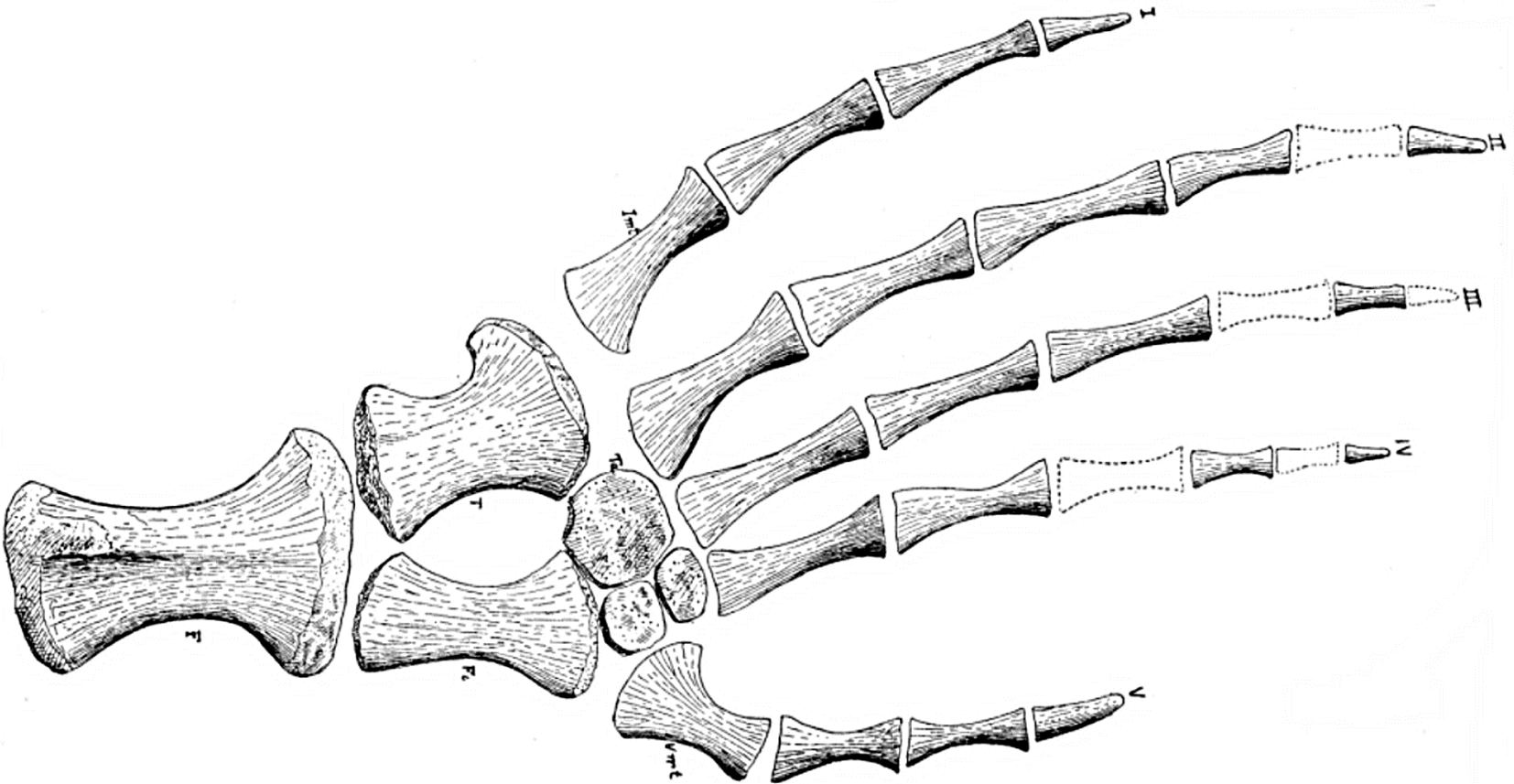


FIG. 5.

Hind paddle of *Plateacarpus coryphaeus*, in part after Marsh.
F, femur; *T*, tibia; *F2*, fibula; *Ta*, tarsals; *Imt* - *Vmt*,
first-fifth metatarsals; *I* - *V*, first-fifth digits.