

August 8, 2022

News and notes

Before going on to looking at some of the marine reptiles and avian dinosaurs of the [Cretaceous Period](#), here are some news items that I thought were interesting.

Research

- Lunar mineralogy: [Trace element partitioning between olivine and melt in lunar basalts](#): behind a paywall.
- Geophysics: [Earth is spinning faster than usual, but why? What experts say after shortest day ever](#).
- More geophysics: [Improving estimates of the ionosphere during geomagnetic storm conditions through assimilation of thermospheric mass density](#); a [Carrington event](#) can really wreck your day. Related: [Huge, potentially disruptive sunspot will swing round to face Earth this weekend](#).
- Glacial geology: [Maritime glacier retreat and terminus area change in Kenai Fjords National Park, Alaska, between 1984 and 2021](#); Eureka Alert summary [here](#).
- Exposure of rocks: [A modern pulse of ultrafast exhumation and diachronous crustal melting in the Nanga Parbat Massif](#).

Paleontology

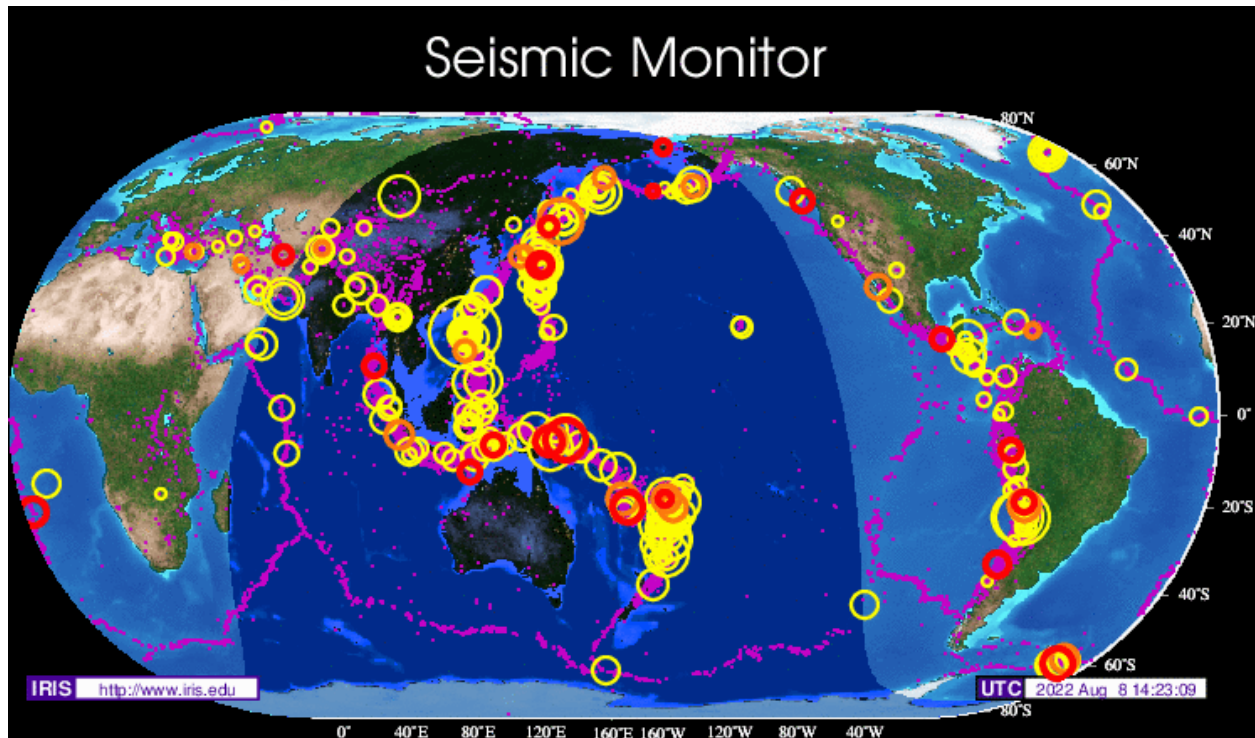
- Evolution of complex life: [The role of mitochondrial energetics in the origin and diversification of eukaryotes](#); behind paywall, Phys.org summary [here](#).
- More on the evolution of complex life: [Global patterns and rates of habitat transitions across the eukaryotic tree of life](#); Phys.org summary [here](#).
- More proof that birds are dinosaurs: [The developing bird pelvis passes through ancestral dinosaurian conditions](#); behind paywall, Phys.org summary [here](#).
- Opinion article: [Did the transition to complex societies in the Holocene drive a reduction in brain size? A reassessment of the DeSilva *et al.* \(2021\) hypothesis](#); Phys.org summary [here](#).
- Fossil fishes: [Ray-finned fishes \(Actinopterygii\) from the Upper Jurassic \(Oxfordian\) of the Atacama Desert, Northern Chile](#).
- Fossil cephalopods: [The first belemnite of boreal ancestry from the Early Cretaceous \(Valanginian\) of the western Tethys: implications for belemnite ecology](#).
- Yahoo News: [Was one creature's extinction another's opportunity?](#)

Environmental Geology and Hydrogeology

- Heavy metal contamination: [Portable X-ray fluorescence \(pXRF\) analysis of heavy metal contamination in church graveyards with contrasting soil types](#).

- [The Role of Hydrogeological Monitoring in a Multidisciplinary Context for the Preservation of the Critical Zone in the Natural Reserve of Castelporziano Estate.](#)
- [Perchlorate contamination: EPA Announces \\$2.5 million Grant for Investigating Groundwater Contamination following Fireworks Shows.](#)

Volcanoes, Earthquakes and Geohazards



[Seismic Monitor Link](#)

- Hot night in Iceland: [Red Lava Spews From Iceland Volcano Eruption At Night.](#)
- Related: [Diverse mantle components with invariant oxygen isotopes in the 2021 Fagradalsfjall eruption, Iceland;](#) Geology Page summary [here.](#)
- Research into volcanic eruptions: [Simultaneous fall and flow during pyroclastic eruptions: A novel proximal hybrid facies.](#)
- [Timescales for pluton growth, magma-chamber formation and super-eruptions;](#) behind paywall, Phys.org summary [here.](#)
- Sinkholes: [Chile sinkhole puzzles authorities, National Service of Geology and Mining sends team to inspect area.](#)
- [Worldwide Volcano News and Updates.](#)

Mining and Energy

- [Hundreds of new mines required to meet 2030 battery metals demand — IEA report.](#)
- Gold mineralogy: [Native gold enrichment process during growth of chalcopyrite-lined conduits within a modern hydrothermal chimney \(Manus Basin, PNG\);](#) behind a paywall.

- Geology rules: [The Importance of Geology in Assessing By- and Coproduct Metal Supply Potential; A Case Study Of Antimony, Bismuth, Selenium, and Tellurium Within the Copper Production Stream](#); behind a paywall.
- [Plate Tectonics as a Tool For Global Screening of Magmatic Arcs and Predictions for Related Porphyry Deposits](#); behind a paywall.
- Crude oil prices drop: [Oil Posts Biggest Weekly Loss Since April On Demand Concerns](#).
- And exploration activity drops: [U.S. oil rig count falls by the most since September, Baker Hughes says](#).
- Safety concerns: [Suncor must stop diagnosing and start executing workplace safety changes: Interim CEO](#).
- Coal mining dangers, from Reuters: [Day after Mexico mine collapse, families fret over 10 trapped miners](#).
- From Mining.com: [Canada sends mining equipment, personnel to the Dominican Republic to help rescue trapped miners](#).
- From the U.S. Energy Information Administration: [Pipeline projects announced to expand Permian natural gas capacity](#).
- On second thought: [German Chancellor: Germany Could Keep Nuclear Power Plants Operating After All](#).

For Your Summer Vacation



[Manitoba Museum Link](#)

- Also in Manitoba: the [Canadian Fossil Discovery Centre](#), Morden.
- New England: [Understanding Vermont's geology one map at a time](#).
- Shetland Islands: [New society formed to appreciate Shetland's 'extraordinary' geology](#).

August 8, 2022

Marine Reptiles and Dinosaurs of the Cretaceous



Figure 1 - Bruce, a *Tylosaurus peminensis* on display at the [Canadian Fossil Discovery Centre](#)
Credit: [Shahnoor Habib Munmun](#), [Creative Commons Attribution 3.0 Unported license](#)

The vertebrates that lived in the oceans and seas of the [Cretaceous Period](#) included marine reptiles such as [mosasaurs](#), [plesiosaurs](#), [turtles](#), and [ichthyosaurs](#) as well marine avian dinosaurs such as [Hesperornis](#). ([Birds are dinosaurs!](#)) We'll take a look at these this week; next week we'll look at fishes and marine invertebrates.

Mosasaurs

[Mosasaurs](#) first [appear in the fossil record](#) during the [Cenomanian](#) Age of the [Late Cretaceous](#) and probably evolved from an extinct group of aquatic lizards known as [aigialosaurs](#). They thrived until the end of the [Late Cretaceous](#), dying out during the [Cretaceous/Paleogene Mass Extinction](#).

Air breathing reptiles, mosasaurs had short necks and appeared to be powerful swimmers. [Research indicates](#) that they were [viviparous](#) (giving birth to live young). Their overall body plan

resembles modern day [monitor lizards](#). Mosasaurs ranged in size from less than 1 m ([Dallasaurus turneri](#)) to over 13 m ("Bruce" at the [Canadian Fossil Discovery Centre](#)).

Tylosaurus

There are [quite a few mosasaurs in the fossil record](#), [Tylosaurus](#) was one of them.

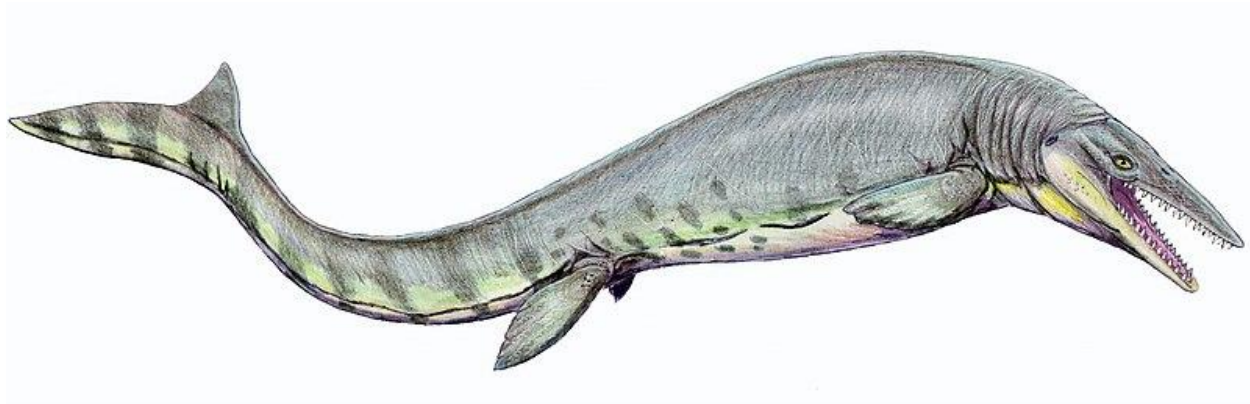


Figure 2 - *Tylosaurus peminensis* Reconstruction

Credit: [Dmitry Bogdanov](#), [Creative Commons Attribution 3.0 Unported](#) license



Tylosaurus was one of the largest mosasaurs in the fossil record, Bruce, a specimen of *Tylosaurus peminensis* [is on record](#) as the largest, at 13.05 m long. *Tylosaurus* lived from the [Turonian Age](#) until the end of the Cretaceous in the [Western Interior Seaway](#).

The earliest discovery of *Tylosaurus* goes back the rivalry between [Edward Drinker Cope](#) and [Othniel Charles Marsh](#) during the [Bone Wars](#) of the late 19th Century. Cope got credit for the [first description](#) of *Tylosaurus* in 1869 using a specimen given to him by [Louis Agassiz](#).

Figure 4 - Western Interior Seaway

Credit: [Sampson et al, 2010](#), [Creative Commons Attribution 4.0 International](#) license

There are eight recognised species in the genus *Tylosaurus*, with *T. proriger* as the type species.

Plesiosaurs

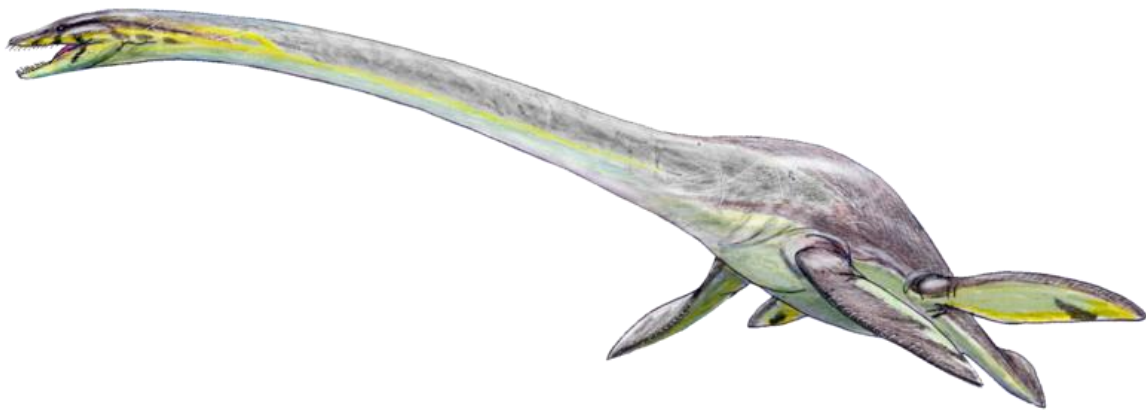
Elasmosaurus

Plesiosaurs were long necked marine reptiles that lived from the [Rhaetian Age](#) of the [Triassic](#) until the end of the Cretaceous. They appear to have evolved from the [Sauropterygia](#). There are [many](#) plesiosaurs, [Elasmosaurus](#) is one that lived during the Cretaceous.



**Figure 4 - *Elasmosaurus* in the [Rocky Mountain Dinosaur Resource Center](#)
Credit: MCDinosaurhunter, [Creative Commons Attribution 3.0 Unported](#) license**

Elasmosaurus was another denizen of the Western Interior Seaway and lived during the [Campanian](#) Age of the Late Cretaceous. A big predator, *Elasmosaurus* was approximately 10.3 m long and weighed about two tonnes.



**Figure 5 - *Elasmosaurus platyurus* Reconstruction
Credit: DiBgd, [Creative Commons Attribution 4.0 International](#) license**

E. D. Cope is credited with the [first description](#) of *Elasmosaurus* in 1868. U.S. Army surgeon Dr. Theophilus Hunt Turner and the army scout William Comstock first discovered *Elasmosaurus*

bones in 1867 in the [Pierre Shale](#) near Fort Wallace, Kansas and gave them to Cope for study. A more recent study ([Sachs, 2005](#)) expanded on Cope's original description of *Elasmosaurus*. There is only one species in the genus, *Elasmosaurus platyurus*.

Kronosaurus



**Figure 6 - *Kronosaurus queenslandicus* at the [Harvard Museum of Natural History](#)
Credit: [Tim Sackton](#), [Creative Commons Attribution-Share Alike 2.0 Generic](#) license**

Kronosaurus was a marine reptile that lived during in the [Early Cretaceous Albian Age](#) in what is now Australia. It was around 9 to 10.9 meters in length and weighed in at 10.6 to 12.1 tonnes. a carnivore, *Kronosaurus* had an elongated head, a short neck, a stiff body propelled by four flippers, and a relatively short tail.

Andrew Crombie of [Hughenden](#), Queensland found the first fossils of *Kronosaurus* in 1899. [Heber Longman](#) described the species in 1924 in *A new gigantic marine reptile from the Queensland Cretaceous, Kronosaurus queenslandicus new genus and species*; *Memoirs of the Queensland Museum* 8: 26–28 (not on line). There is only one species in the genus: *Kronosaurus queenslandicus*.



**Figure 7 - *Kronosaurus* Hunting a *Woolungasaurus*
Credit: [Dmitry Bogdanov](#), [Creative Commons Attribution 3.0 Unported](#) license**

Some researchers like to present "[nature red in tooth and claw](#)" in their illustrations of what ancient creatures looked like. Figure 7, above is a dramatic example.

The relationship between *Kronosaurus* and other marine reptiles is disputed. As well, some researchers think that its taxonomic validity is dubious. The Australians claim it as their own, so for now, I'll agree with them.

Turtles

Archelon



Figure 8 - *Archelon ischyros*

Credit: [Ghedoghedo](#), [Creative Commons Attribution 3.0 Unported](#) license

The biggest turtle in the fossil record, *Archelon* lived in the Western Interior Seaway during the Late Cretaceous (Campanian). The largest specimen (Brigitta at the [Vienna Natural History Museum](#)), is 4.6 m long and [probably weighed](#) 2,200 kg. It seems to have fed on various invertebrates such as jellyfish, molluscs, etc.

Paleontologist [George Reber Wieland](#) first found *Archelon* in 1895 in the Pierre Shale along the Cheyenne River in Custer County, South Dakota and [described it in 1896](#). There is one species in the genus, *Archelon ischyros*.

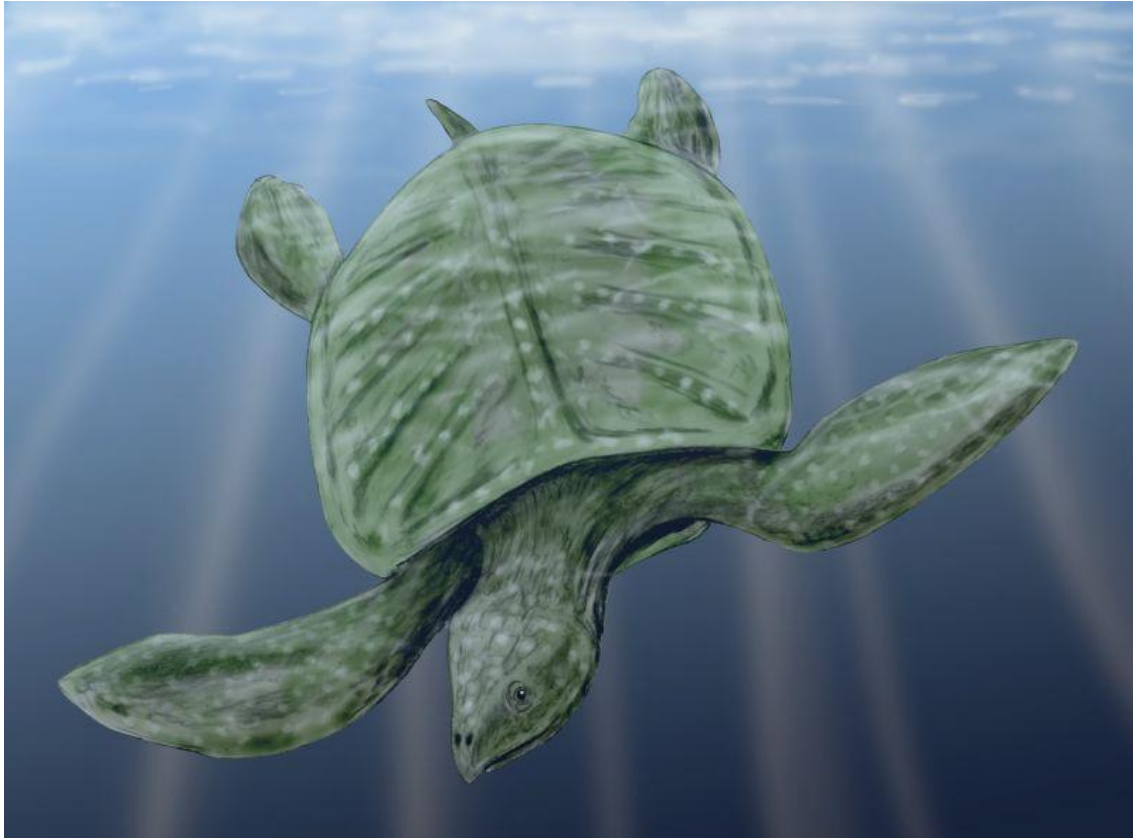


Figure 9 - *Archelon ischyros* Reconstruction

Credit: [Nobu Tamura](#), [Creative Commons Attribution 3.0 Unported](#) license

Ichthyosaurs

Athabascasaurus



Figure 10 - *Athabascasaurus bitumeneus* in the [Royal Tyrell Museum](#), Drumheller AB

Credit: [Roland Tanglao](#), [Creative Commons Attribution 2.0 Generic](#) license

One of the benefits of the excavation of the [Athabasca Oil Sands](#) has been the occasional discovery of fossils. One of these is the fossil of an ichthyosaur, [Athabascasaurus bitumineus](#) found in 2000 at the [Syncrude Canada's Base Mine](#). The fossil came out of the [Wabiskaw Member](#) of the Early Cretaceous (Albian) [Clearwater Formation](#) and was 3.5 m long.

Paleontologists [Patrick S. Druckenmiller and Erin E. Maxwell](#) described [Athabascasaurus](#) in 2010, naming it after the Athabasca region and the giving it the species name, *bitumineus*, after the oil sands (bitumen deposit). *Athabascasaurus bitumineus* is the only species in the genus.

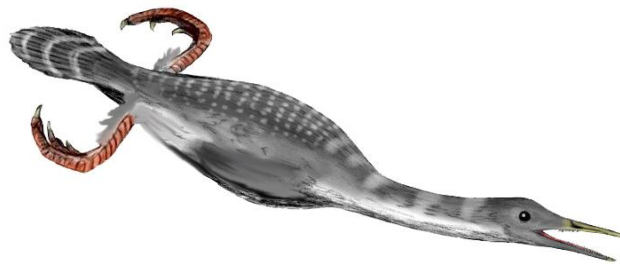
Avian Dinosaurs - Birds

Hesperornis



**Figure 11 - *Hesperornis gracilis* Skeleton in the [Natural History Museum, Karlsruhe](#)
Credit: [Ghedoghedo](#), [Creative Commons Attribution 4.0 International](#) license**

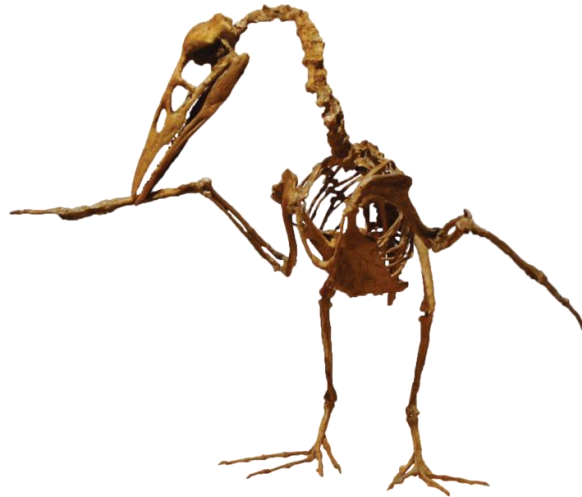
[Hesperornis](#) is a genus of birds that lived in marine environments during the Campanian age of the Late Cretaceous. Most fossils of *Hesperornis* came from deposits formed in the as the Western Interior Seaway(e.g. Pierre Shale, [Judith River](#) and [Niobrara](#) formations) , the [Turgai Strait](#), and the [North Sea](#). Some fossils of *Hesperornis* come from the [Foremost Formation](#), a freshwater aquatic environment. From their body morphology, *Hesperornis* probably lived a life similar to modern day [cormorants](#) and [loons](#). Like many birds from the Cretaceous, it had teeth.



**Figure 12 - *Hesperornis* Reconstruction
Credit: [Nobu Tamura](#), [Creative Commons Attribution 3.0 Unported](#) license**

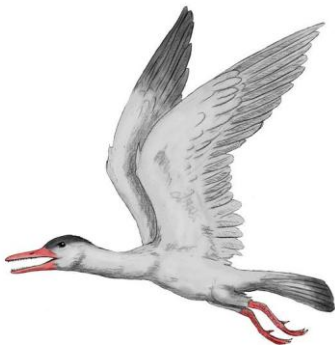
Another discovery of the Bone Wars, O.C. Marsh first described *Hesperornis* in 1872. There are 11 species in the genus.

Ichthyornis



**Figure 13 - *Ichthyornis* Skeleton, [Rocky Mountain Dinosaur Resource Center](#)
Credit: MCDinosaurhunter, [Creative Commons Attribution 3.0 Unported](#) license**

A small bird about the size of a pigeon, *Ichthyornis* lived in marine environments during the Cretaceous Period. Paleontologists found fossils of *Ichthyornis* in Turonian to Campanian aged deposits from the Western Interior Seaway of Alabama, Alberta, Kansas, New Mexico, Saskatchewan, and Texas. The formations containing *Ichthyornis* include the Niobrara and the [Greenhorn Limestone](#).



[Benjamin Franklin Mudge](#), a professor from Kansas State Agricultural College, recovered the first fossils of *Ichthyornis* in 1870. Since Mudge asked both E. D. Cope and O.C. Marsh to look at the fossil, *Ichthyornis* became part of the Bone Wars. Marsh kind of dropped the ball on describing the fossil and publishing his observations. As a result, O.C. Marsh published first and [got the credit for naming *Ichthyornis* in 1872](#). There is only one species in the genus, *Ichthyornis dispar*.

**Figure 14 - *Ichthyornis* Reconstruction
Credit: Nobu Tamura, [Creative Commons Attribution 3.0 Unported](#) license**

Standard Caveat

The purpose of my weblog postings is to spark people's curiosity in geology. Don't entirely believe me until you've done your own research and checked the evidence. If I have sparked

your curiosity in the subject of this posting, follow up with some of the links provided here. If you want to, go out into the field and examine some rocks on your own with the help of a good field guide. Follow the evidence and make up your own mind.

In science, the only authority is the evidence.