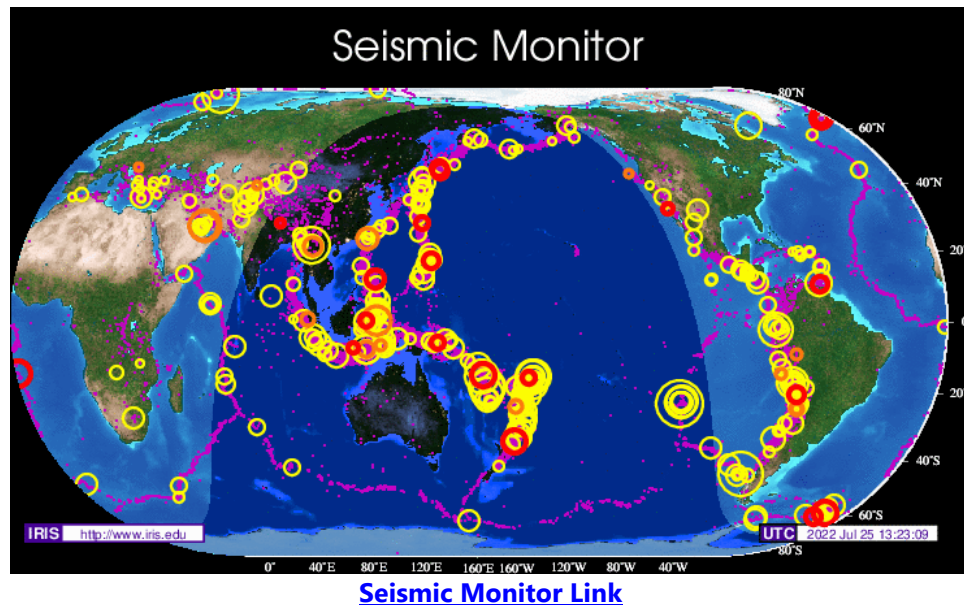


July 25, 2022

News and notes

Before taking a look at [pterosaurs](#) from the [Cretaceous Period](#), here are some news items that I thought were interesting. Also, on the [home page](#), I've added [Geology Bites](#) to the list of geology related podcasts (h/t Michael T.)

Volcanoes, Earthquakes and Geohazards



- Kaboom: [Japan puts alerts to the highest level for the Sakurajima volcano after it erupted.](#)
- More research on the effects of Hunga Tonga-Hunga Ha'apai: [Ionospheric signatures of repeated passages of atmospheric waves by the 2022 Jan. 15 Hunga Tonga-Hunga Ha'apai eruption detected by QZSS-TEC observations in Japan.](#)
- From Phys.org: [Balancing act: Can precariously perched boulders signal long-term earthquake risk?](#)
- [Editorial: Understanding the marginal seas of northeast Asia for tectonics and submarine geohazards.](#)
- Darwin awards: [American Tourist Rescued After Falling Into Mount Vesuvius Crater.](#)
- [Discovery of active off-axis hydrothermal vents at 9° 54'N East Pacific Rise;](#) Science Daily summary [here](#).
- New Zealand: [Taupō volcano's restless nature revealed by 42 years of deformation surveys, 1979–2021;](#) Science Alert summary [here](#).
- [Worldwide Volcano News and Updates.](#)

Research

- From the European Geosciences Union, mass extinction events: [Relationship between extinction magnitude and climate change during major marine and terrestrial animal crises](#).
- More research on mass extinctions: [Mercury evidence of Deccan volcanism driving the Latest Maastrichtian warming event](#); behind a paywall.
- Precambrian plate tectonics: [North America's Midcontinent Rift magma volume: A coincidental rendezvous of a plume with a rift](#); behind a paywall.
- More plate tectonics: [Symptomatic lithospheric drips triggering fast topographic rise and crustal deformation in the Central Andes](#); Phys.org summary [here](#).
- Sedimentology research: [Sedimentary conditions based on the vertical distribution of radionuclides in small dystrophic lakes: a case study of Toporowe Stawy Lakes \(Tatra Mountains, Poland\)](#).
- More on sedimentology: [Longest sediment flows yet measured show how major rivers connect efficiently to deep sea](#); Eureka Alert summary [here](#).
- Geophysics: [Earth's Wobbly Inner Core Illuminated by Nuclear Explosions](#).
- Diamonds: [Shock-formed carbon materials with intergrown sp³- and sp²-bonded nanostructured units](#); Mining.com report [here](#).

Paleontology

- New fossil fish: [A new elpistostegalian from the Late Devonian of the Canadian Arctic](#); Eureka Alert summary [here](#).
- More weird critters from the [Cambrian](#) Period: [A Cambrian fossil from the Chengjiang fauna sharing characteristics with gilled lobopodians, opabiniids and radiodonts](#); more on the Chengjiang Fossil Site [here](#).
- Ancient reef ecology: [Rare earth element geochemistry of Middle Devonian reefal limestones of the Dianqiangui Basin, South China: implications for nutrient sources and expansion of the reef ecosystem](#).
- When did mammals' ancestors become warm blooded; [Inner ear biomechanics reveals a Late Triassic origin for mammalian endothermy](#); Science Alert summary [here](#).

Energy and Mining

- New coal mine opens in Australia: [Mining Begins at Broadmeadow East](#).
- Lead - zinc deposit research: [Combined X-Ray Computed Tomography and X-Ray Fluorescence Drill Core Scanning for 3-D Rock and Ore Characterization: Implications for the Lovisa Stratiform Zn-Pb Deposit and Its Structural Setting, Bergslagen, Sweden](#).

- Research into ore formation: [Sulfur and chlorine budgets control the ore fertility of arc magmas](#).
- Oil and gas exploration activity: [Canada Weekly Rig Count Up 4 for Week Ending July 22, 2022](#). Related: Oil [Exploration Is Accelerating as Drillers Shrug Off Recession Threat](#).
- Increasing costs of energy extraction, from the United States Energy Information Administration: [Public U.S. oil producers saw higher revenues and higher operational costs during Q1 2022](#).
- New oil exploration: [Exxon Plans Another 35 Wells Offshore Guyana](#).
- Bad management: [Nigeria Unable To Benefit From High Oil Prices](#).
- Oligarchy: [Ten financial actors own half of the world's oil, gas, coal emissions – study](#); original research [here](#).
- Geothermal energy: [Catching Fire, Past efforts to coax geothermal energy from hot, dry rock deep underground have faltered. But new techniques could crack the problem](#).

Environmental Geology and Hydrogeology

- Coastal geology: [Coastal dune dynamics in embayed settings with sea-level rise – Examples from the exposed and macrotidal north coast of SW England](#); Phys.org summary [here](#).
- Younger than expected: [Krypton-81 Dating Constrains Timing of Deep Groundwater Flow Activation](#); Phys.org summary [here](#).
- Remediation research: [Hydrocarbons removal from synthetic bilge water by adsorption onto biochars of dead *Posidonia oceanica*](#).
- American government proposed research into per- and polyfluoroalkyl substances (PFAS): [Federal Office of Science and Technology Policy Seeking Data Gaps Regarding PFAS Research](#); request for information [here](#).
- Water wells: [Well Development Is Step One in Resource Development](#).

Climate Change

- Weather prediction: [Phase Coherence Between Surrounding Oceans Enhances Precipitation Shortages in Northeast Brazil](#); Phys.org summary [here](#).
- [On the variability of the Bering Sea Cold Pool and implications for the biophysical environment](#); Phys.org summary [here](#).
- [Ecosystems at Glacier Margins Can Serve as Climate-Change Laboratories](#); Phys.org summary [here](#).

From Out of this World

- Congratulations NASA: [50 Years of Landsat](#).



[Landsat Image](#) - [Public Domain](#)

Credit: Michelle Bouchard using Landsat data from [USGS](#)

From the [Landsat website](#):

This natural color image of Eleuthera Island, the Bahamas, was taken by Landsat 9 on January 18, 2022. Between Landsat 8 and Landsat 9, the Landsat program delivers complete coverage of the Earth's surface every eight days.

July 25, 2022

Terrestrial Vertebrate Animals of the Cretaceous Part 3

Last week, we'll looked at fossils of avian and non-avian dinosaurs. The week before, we examined some of the mammals. This week, we'll look at pterosaur fossils from the Cretaceous Period because [they are really neat](#).

Pterosaurs



**Figure 1 - Pterosaur Models at the University of Saskatchewan Geology Building
Photo by R. Reichelt, July 2021**

Found in fossils from the [Late Triassic](#) to the [Cretaceous/Paleogene Mass Extinction](#) event, [Pterosaurs](#) are among the iconic fossils of the [Mesozoic Era](#). During the Cretaceous Period they evolved into some of their most interesting forms. Pterosaur fossils are found throughout the world.

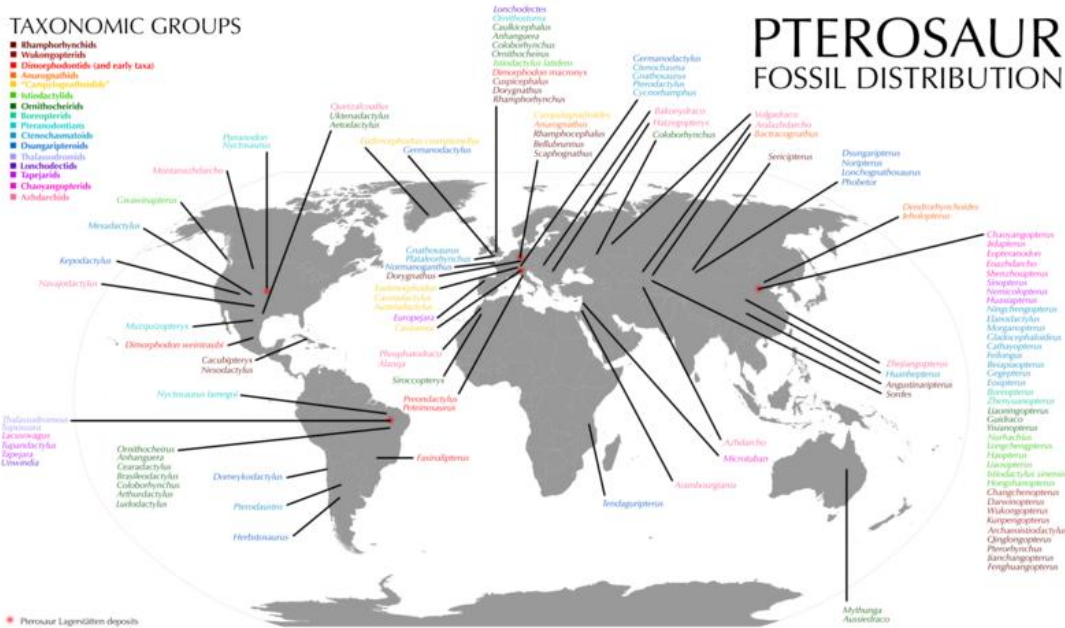


Figure 2 - Pterosaur Fossil Distribution Map

Credit: Andrew Z. Colvin, Creative Commons Attribution-Share Alike 4.0 International license

Let's look at some examples.

Aerodraco

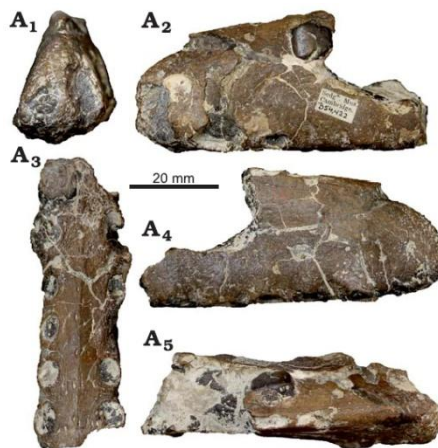


Figure 3 - Aerodraco sedgwickii Fossils

Credit: Borja Holgado and Rodrigo V. Pêgas, Creative Commons Attribution-Share Alike 4.0 International license

Aerodraco is a genus of [anhanguerid](#) pterosaur that lived during the last age of the [Early Cretaceous](#), the [Albian](#), until the earliest age of the [Late Cretaceous](#), the [Cenomanian](#). All fossils of *Aerodraco* come from the [Cambridge Greensand](#) formation of England.

[Richard Owen](#) first [described *Aerodraco*](#) in 1859, calling it *Pterodactylus sedgwickii*; naming the species after the British geologist, [Adam Sedgwick](#). After being kicked around various genera, [Borja Holgado and Rodrigo V. Pêgas](#) analysed the available fossils and assigned it to its own genus, *Aerodraco* in 2020. There is only one species in the genus *Aerodraco*, *A. sedgwickii*.



If you like role playing games, you can [adopt an *Aerodraco sedgwickii*](#) at the [Dragon Cave website](#). According to Dragon Cave, you can "collect eggs, raise them to adulthood, and then breed them to create interesting lineages." Probably safer, and more fun, than stealing items from [Smaug's](#) cave.

Figure 4 - A Pet Aerodraco
Credit: [Dragon Cave](#)

Anhanguera



Figure 5 - *Anhanguera* Fossil

Credit: [Zach Tirrell](#), [Creative Commons](#), [Attribution-Share Alike 2.0 Generic](#) license

Another anhanguerid pterosaur, [Anhanguera](#) fossils come from the Early Cretaceous (Albian Age) [Romualdo Formation](#) of Brazil and the Late Cretaceous (Cenomanian Age) [Kem Kem Beds](#)

of Morocco. While that seems like a wide distribution, Brazil and Morocco were much closer during the Cretaceous Period, see Figure 6.

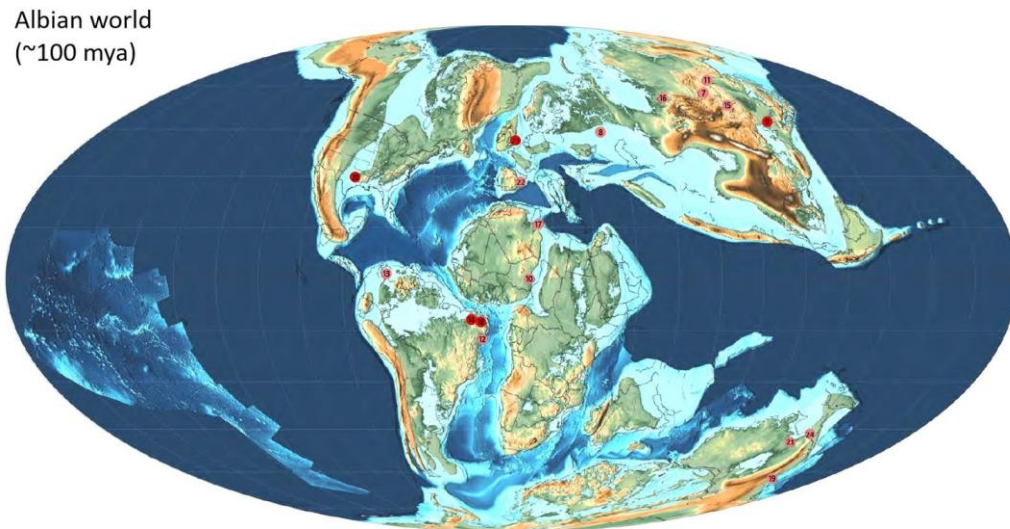


Figure 6 - Albian World Map Showing the Distribution of the Localities with Anhanguera Remains
Credit: [Figure 5 in Holgado et al, 2019, Creative Commons Attribution-Share Alike 4.0 International license](#)

The teeth of *Anhanguera* [suggest that it ate fish](#) and that it had a wingspread of about 4.5 m. Given the location of its fossils, it is easy to imagine *Anhanguera* flying over the early South Atlantic Ocean, catching fish and living a lifestyle similar to modern seabirds.



Figure 7 - *Anhanguera blittersdorffi* Life Restoration
Credit: [Matt Martyniuk, Creative Commons Attribution-Share Alike 3.0 Unported license](#)

Two Brazilian paleontologists D. Campos and A. Kellner, first described *Anhanguera* in 1985 in the publication *Um novo exemplar de Anhanguera blittersdorffi (Reptilia, Pterosauria) da formação Santana, Cretaceo Inferior do Nordeste do Brasil*, Congresso Brasileiro de Paleontologia, Rio de Janeiro, Resumos, p. 13 (not on line). Since then, geologists have identified five other species of *Anhanguera*.

Eosipterus



Figure 8 - *Eosipterus* Fossil

**[Credit: Ross A. Elgin, David W.E. Hone, and Eberhard Frey](#)
[Creative Commons Attribution-Share Alike 4.0 International](#) license**

Eosipterus was a [ctenochasmatid](#) pterosaur from the Early Cretaceous ([Aptian](#)) whose fossils come from the [Yixian Formation](#) of Liaoning Province, China. It had a wingspan of about 1.2 m. The depositional environment of the Yixian Formation suggests that it was a creature of the temperate forest.

Ji Shu'an and Ji Qiang [first described *Eosipterus*](#) in 1997 (published in English in 2010). There is only one species in the genus, *E. yangi*.



Figure 9 - Reconstruction of *Eosipterus*
Credit: [Midiaou Diallo](#), [Pteros.com](#)

Ferrodraco

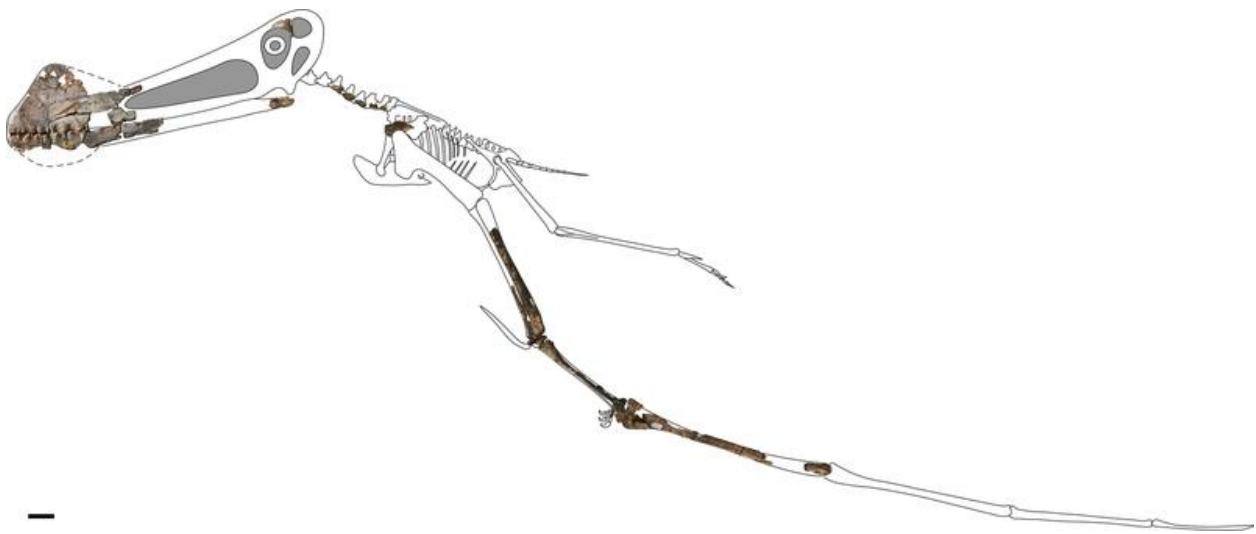


Figure 10 - *Ferrodraco* Fossil
Credit: [Pentland et al, 2019](#), [Creative Commons Attribution-Share Alike 4.0 International](#) license

[*Ferrodraco*](#), also an anhanguerid pterosaur, lived during the Late Cretaceous (Cenomanian to [Turonian](#)). An Australian farmer first found fossils of *Ferrodraco* in the [Winton Formation](#) of

Queensland, Australia. The Winton Formation is an [ironstone](#), hence the name *Ferrodraco* i.e. iron dragon. The fossil indicates that, in life, *Ferrodraco* had a wingspan of four metres.

Robert A. Elliott, a farmer from Belmont Station, Queensland, found the first fossil of *Ferrodraco* in 2017. A team (Adele H. Pentland, Stephen F. Poropat, Travis R. Tischler, Trish Sloan, Robert A. Elliott, Harry A. Elliott, Judy A. Elliott & David A. Elliott) from the Swinburne University of Technology and the Australian Age of Dinosaurs Natural History Museum excavated the fossil and [described it in a paper published](#) in 2019. Currently, there is only one species of the genus *Ferrodraco*, *F. lentoni*.



Figure 11 - *Ferrodraco* restoration

Credit: [Pentland et al, 2019, Creative Commons Attribution-Share Alike 4.0 International license](#)

Liaoningopterus

[Liaoningopterus](#) was a anhanguerid pterosaur that lived during the Early Cretaceous in what is now Liaoning Province, China. Geologists Wang Xiaolin and Zhou Zhonghe found the first fossil of *Liaoningopterus* in the [Jiufotang Formation](#) and described it in a [paper published](#) in 2003. In their paper, Wang Xiaolin and Zhou Zhonghe estimated that *Liaoningopterus* had a wingspan of about five metres and probably weighed 20 kg. Based on its teeth, it was probably a fish eater.



Figure 12 - *Liaoningopterus* Fossil
 Credit: [Figure 2 in Wang & Zhou, 2003](#)



Figure 13 - *Liaoningopterus* Reconstruction
 Credit: [Dmitry Bogdanov, Creative Commons Attribution-Share Alike 3.0 Unported license](#)

There is only one species in the genus *Liaoningopterus*, *L. gui*.

Mistralazhdarcho

An [azhdarchid pterosaur](#) from the Late Cretaceous period (Campanian), *Mistralazhdarcho* lived in what is now France. First excavated by Xavier Valentin at Velaux–La Bastide Neuve, in southeastern France, paleontologists Aude Cincotta, Johan Yans, Pascal Godefroit, Géraldine Garcia, Jean Dejax, Mouloud Benammi, Sauveur Amico and Xavier Valentin first described *Mistralazhdarcho* in 2015. In 2018, Romain Vullo, Géraldine Garcia, Pascal Godefroit, Aude Cincotta and Xavier Valentin [named the species](#) *Mistralazhdarcho maggi*, the only species in the genera.

A large pterosaur, *Mistralazhdarcho* had a wingspread of five to six metres. The [depositional environment of the formation](#) hosting the fossils suggests that *Mistralazhdarcho* lived next to moderately fast rivers.



Figure 14 - *Mistralazhdarcho* Reconstruction

Credit: [PaleoEqui](#), [Creative Commons Attribution-Share Alike 4.0 International](#) license

Quetzalcoatlus



Figure 15 - *Quetzalcoatlus* Skeleton

Credit: [Yinan Chen](#), [Creative Commons Public Domain Dedication](#)

[Quetzalcoatlus](#) was one of the largest pterosaurs that's been found, so far. With a wingspan of up to 15.9 m and a weight of 200 to 250 kg, *Quetzalcoatlus northropi*, the larger of the two species in the genus, was about the size a [Cessna 172](#) aircraft. The smaller species in the genera, *Q. lawsoni* had a wingspan of only 5 m and an estimated weight of 65 kg.



Figure 16 - Comparison of Quetzalcoatlus and Cessna 172

Credit: [The Nature Box](#), [Creative Commons Attribution-Share Alike 4.0 International](#) license

Everything is supposed to be bigger in Texas, so it's appropriate that [Douglas A. Lawson](#), from the [Jackson School of Geosciences](#) at the [University of Texas at Austin](#), found the first fossil of *Quetzalcoatlus* in 1975 there. Lawson found the first *Quetzalcoatlus* fossil in the Late Cretaceous ([Maastrichtian](#)) [Javelina Formation](#) in the [Big Bend National Park](#) in West Texas. The first [complete description](#) of *Quetzalcoatlus* was in 2021.



**Figure 17 - *Quetzalcoatlus northropi* Model, [Natural History Museum, Karlsruhe](#)
Credit: [Ghedoghedo](#), [Creative Commons Attribution-Share Alike 4.0 International](#) license**

There has been lots of speculation of the lifestyle of *Quetzalcoatlus*, if you are curious, check out the [Wikipedia article on the genera](#). Briefly, the speculation includes the lifestyle of scavengers, skimmer hunting and terrestrial predator. Check it out yourself and make up your own mind.

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.