

August 15, 2022

News and notes

Before finishing up our look at the [Cretaceous Period](#) with a look at fossils of fishes and marine invertebrates from that time, here are some news items that I thought were interesting.

Research

- Glacier research: [Cosmogenic nuclide dating of two stacked ice masses: Ong Valley, Antarctica](#); Phys.org summary [here](#).
- [Panthalassa](#), from Live Science: [What's the largest ocean that ever existed on Earth?](#)
- Ancient Mediterranean basin: [Sill-controlled salinity contrasts followed post-Messinian flooding of the Mediterranean](#); Phys.org summary [here](#).
- Coastal geology and erosion: [Spatial and temporal trends in California coastal cliff retreat](#); Phys.org summary [here](#).
- Plate tectonics: [Giant impacts and the origin and evolution of continents](#); behind a paywall, Phys.org summary [here](#).
- More plate tectonics: [Development of the Whitehorse trough as a strike-slip basin during Early to Middle Jurassic arc-continent collision in the Canadian Cordillera](#).
- [Discovery of active off-axis hydrothermal vents at 9° 54'N East Pacific Rise](#); Live Science summary [here](#).
- Geophysics: [Surface wave imaging using deep reflection seismic data: a study on the Cuonadong dome](#).
- More geophysics: [Deep-learning seismology](#); behind paywall.
- Surveying, correcting unavoidable errors: [A method for mixed additive and multiplicative random error models with inequality constraints in geodesy](#).

Paleontology

- Fossilization research: [Experimental analysis of organ decay and pH gradients within a carcass and the implications for phosphatization of soft tissues](#); Forbes.com summary [here](#).
- Response of life to the [Cretaceous–Paleogene extinction](#) event: [Diversity dynamics of microfossils from the Cretaceous to the Neogene show mixed responses to events](#).
- Mammalian evolution: [The earliest segmental sternum in a Permian synapsid and its implications for the evolution of mammalian locomotion and ventilation](#); Phys.org summary [here](#).
- More mammalian evolution: [Early Miocene remains of *Melissiodon* from Mokra-Quarry \(Moravia, Czech Republic\) shed light on the evolutionary history of the rare cricetid genus](#).

- Dinosaur evolution: [Functional and ecomorphological evolution of orbit shape in Mesozoic archosaurs is driven by body size and diet](#); Phys.org summary [here](#).
- More dinosaur evolution: [Softening the steps to gigantism in sauropod dinosaurs through the evolution of a pedal pad](#); Geology Page summary [here](#).
- Insects in Burmese amber: [Palaeotanyrhina exophthalma gen. et sp. nov. \(Palaeotanyrhinidae fam. nov.\) \(Reduvioidea: Hemiptera\) in mid-Cretaceous Burmese amber](#); Phys.org summary [here](#).
- Idaho National Laboratory: [Uncovering the past: Researchers create 3D images of fossils](#).

Environmental Geology and Hydrogeology

- Landfills and methane: [Using satellites to uncover large methane emissions from landfills](#); Phys.org summary [here](#).
- Cleaning up PAH's: [In situ microcosm remediation of polyaromatic hydrocarbons: influence and effectiveness of Nano-Zero Valent Iron and activated carbon](#).
- Groundwater and aquaculture: [Impacts of Coastal Shrimp Ponds on Saltwater Intrusion and Submarine Groundwater Discharge](#); Eos summary [here](#).
- Groundwater quality: [Geospatial Assessment of Karst Spring Water Quality in Northeast Tennessee, USA](#).
- Groundwater remediation research, from Oak Ridge National Laboratory: [Bifunctional Ionic Covalent Organic Networks for Enhanced Simultaneous Removal of Chromium\(VI\) and Arsenic\(V\) Oxoanions via Synergetic Ion Exchange and Redox Process](#); Mining.com summary [here](#).

Mining and Energy

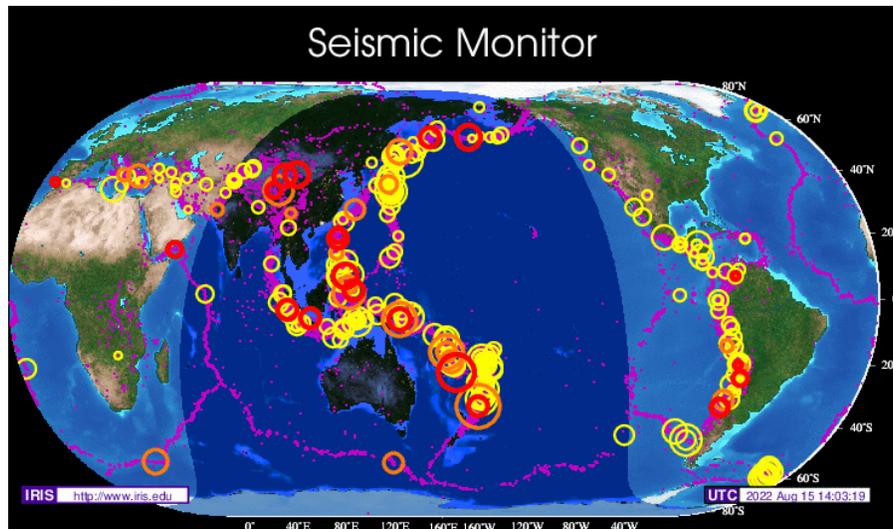
- Mining.com: [Coal giants are making mega profits as climate crisis grips the world](#).
- [Commentary: Canada Should \(Quickly\) Learn From Europe's Energy Mess – Fraser Institute](#).
- Exploration: [U.S. oil & gas rig count falls for second week in a row – Baker Hughes](#).
- [China Heralds Another Major Oil Discovery](#).
- From the U.S. Energy Information Administration: [Conflict in Libya since 2011 civil war has resulted in inconsistent crude oil production](#).
- Oil prices: [Oil Posts Weekly Gain as Traders Weigh Demand Outlook, Iran Deal](#).
- International Energy Agency: [Oil Market Report - August 2022](#).
- [Goldman Sees \\$5 Gasoline, \\$130 Brent By Year End](#).
- Oil reservoir research: [Effect of different lithological assemblages on shale reservoir properties in the Permian Longtan Formation, southeastern Sichuan Basin: Case study of Well X1](#).
- Energy research: [U.S. Department of Energy research gets a surprise boost in inflation-reduction bill](#).

- [Iron ore price falls as traders weigh demand prospects in China](#); from Mining.com.

People Acting Badly

- Market manipulation, from Mining.com: [How the US toppled the world's most powerful gold trader](#).
- More crooks, also from Mining.com: [Glencore cuts off Chinese trader caught up in missing copper scandal](#); only half a billion dollars' worth of copper went "missing".

Volcanoes, Earthquakes and Geohazards



[Seismic Monitor Link](#)

- [Magnitude 5.7 earthquake shakes part of eastern Indonesia](#).
- Canary Islands volcano geology: [Rock Magnetism of Lapilli and Lava Flows from Cumbre Vieja Volcano, 2021 Eruption \(La Palma, Canary Islands\): Initial Reports](#); Phys.org summary [here](#).
- Hot time in the town tonight: [Tens of thousands trek rugged trail to glimpse Iceland volcano](#). Related: [Why Hikers Are Clamoring to Photograph a Volcanic Eruption in Iceland, Despite Risks](#).
- Earthquake engineering: [Modeling Regional and Local Resilience of Infrastructure Networks Following Disruptions from Natural Hazards](#); Phys.org summary [here](#).
- Earthquake research: [Fluid migration in low-permeability faults driven by decoupling of fault slip and opening](#); behind a paywall.
- Landslide research: [A Quick QGIS-Based Procedure to Preliminarily Define Time-Independent Rockfall Risk: The Case Study of Sorba Valley, Italy](#).
- Tsunami research: [Upper-plate structure and tsunamigenic faults near the Kodiak Islands, Alaska, USA](#).
- [Worldwide Volcano News and Updates](#).

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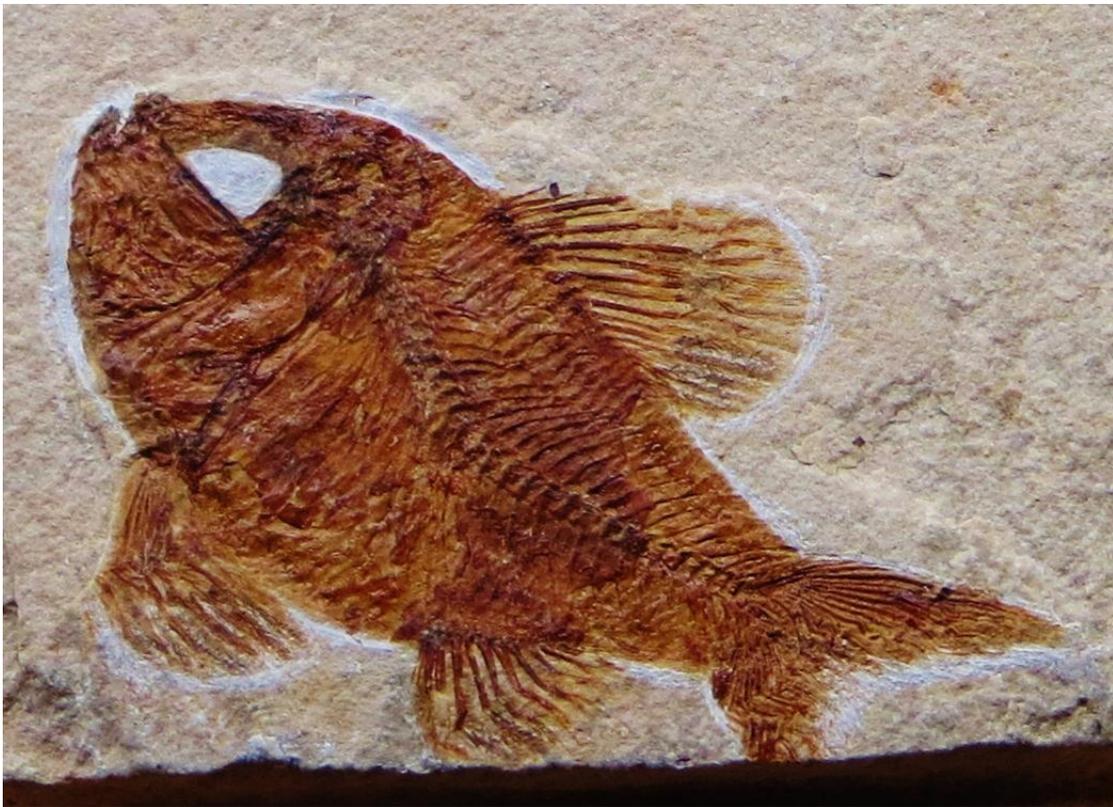
Fish and Marine Invertebrates of the Cretaceous

During the 79 million years of the [Cretaceous Period](#), life evolved and diversified. In addition to the vertebrates we looked at last week, bony and cartilaginous fish together with various marine invertebrates thrived during that time. Let's look at a few examples.

Bony Fishes

Ray finned fishes, [teleosts](#), became the most common [bony fish](#) during the Cretaceous. [Lobe finned fishes](#), such as [coelacanth](#)s and [lung fishes](#) didn't go extinct (they are still with us today) they just became less common. Here are some examples of bony fish from the Cretaceous.

Ctenothrissa



**Figure 1 - *Ctenothrissa* sp. Fossil in the [Museo di Storia naturale "Antonio Stoppani"](#)
Credit: [Ghedoghedo](#), [Creative Commons Attribution-Share Alike 4.0 International](#) license**

[Francois Jules Pictet](#) found the [first fossil](#) of *Ctenothrissa* in the [Late Cretaceous Sannine Formation](#) at [Mount Lebanon](#) in 1850. [Arthur Smith Woodward](#) [described the fossil in 1899](#) and named it *Ctenothrissa*. The genus is not well studied and its [relationship to other fish](#) is not well established. Some paleontologist dispute the validity of the [order](#) that *Ctenothrissa* was placed in. There are two species in the genus, *C. signifer* and *C. vexillifer*.

Nematonotus



Figure 2 - *Nematonotus* Fossil

Credit: Independent03, [Creative Commons Attribution-Share Alike 4.0 International](#) license

Nematonotus was another Late Cretaceous fish found in the Late Cretaceous Sannine Formation [fish beds](#) near fossil site near [Hajoula](#), Lebanon. James W. Davis [first described](#) *Nematonotus* in 1885, originally calling it *Pseudoberyx*. The current designation of *Nematonotus* was assigned to it by Woodward in 1899.

Davis' original paper described a fish approximately 6.5 cm long with a head 2.5 cm long. there appears to be two species of *Nematonotus*: *N. bottae* and *N. longispinus*.

Cartilaginous Fish

[Chondrichthyes](#), cartilaginous fish, include [sharks](#), [rays](#), [skates](#), [sawfish](#), and [chimeras](#) (ghost sharks). They were common enough during the Cretaceous to leave some fossils. Here are a couple of examples.

Cretoxyrhina



Figure 3 - *Cretoxyrhina mantelli* Tooth, [Menuha Formation](#), Israel

Credit: [ARetzler11](#), [Creative Commons Attribution-Share Alike 3.0 Unported](#) license

Fossils of [Cretoxyrhina](#) range in age from the [Albian](#) of the [Early Cretaceous](#) to the [Campanian](#) of the Late Cretaceous. Sometimes called the Ginsu shark after the [Japanese Ginsu Knife](#), *Cretoxyrhina* was up to 8 m in length and over 4900 kg in weight, a truly formidable predator. Given its size and likely carnivorous habits, it was probably an apex predator.

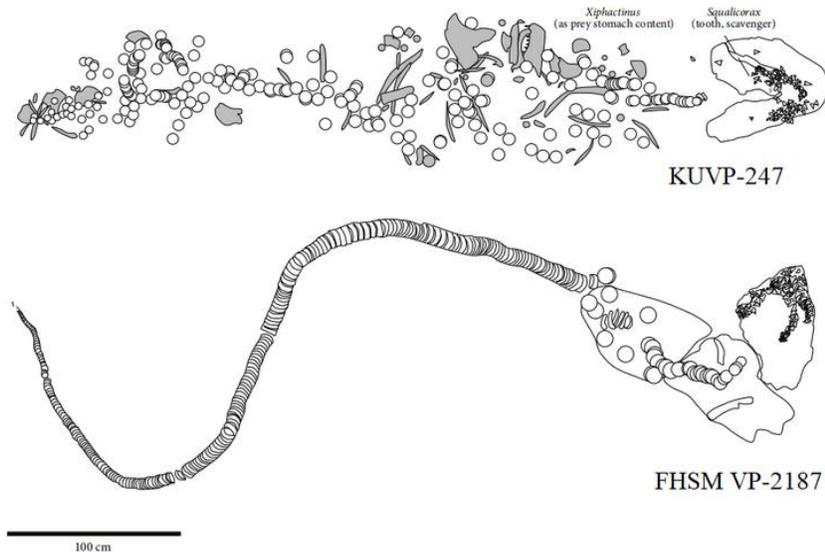


Figure 4 - *Cretoxyrhina* Skeletons

Credit: [Cajus G. Diedrich](#), [Creative Commons Attribution-Share Alike 3.0 Unported](#) license

Cretoxyrhina lived throughout all the oceans of the time as indicated by the discovery of its fossils in North America, Europe, Israel, and Kazakhstan. In North America, *Cretoxyrhina* fossils come from deposits associated with the [Western Interior Seaway](#).

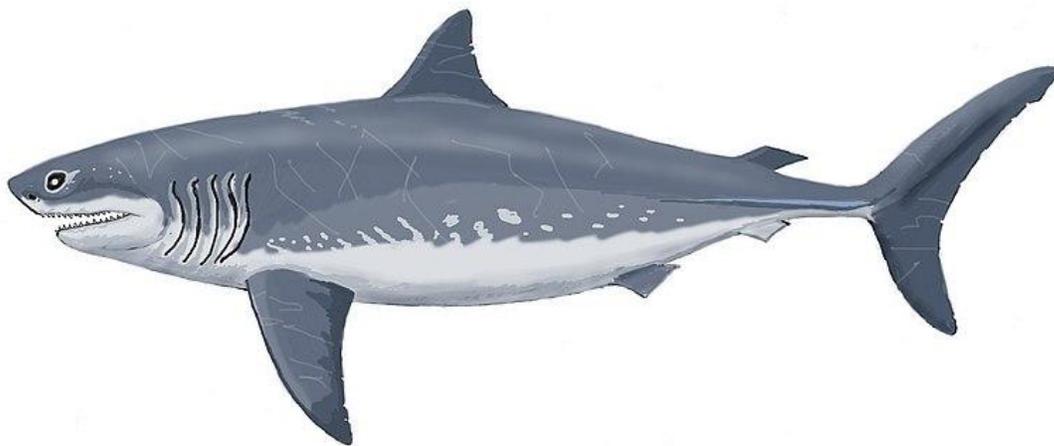


Figure 5 - *Cretoxyrhina mantelli* Reconstruction

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

English paleontologist [Gideon Mantell](#) first [described](#) *Cretoxyrhina* in 1822 and [Louis Agassiz](#) [gave the genera its present name](#) in 1835. There are four species in the genera: *C. mantelli*, *C. denticulata*, *C. vraconensis*, and *C. agassizensis*.

Leptostyrax



Figure 6 - *Leptostyrax* Reconstruction

Credit: [Joseph Frederickson](#), [Creative Commons CC0 1.0 Universal Public Domain Dedication](#)

Another big shark, ranging in length from 6.3 to 8.3 m, [Leptostyrax](#) lived [from the Early Cretaceous](#) until the [Cenomanian](#) age of the Late Cretaceous. *Leptostyrax* fossils [come from formations](#) in n North America, Europe, Africa, and Australia.

[Edward Drinker Cope](#), famous for the [Bone Wars](#), discovered and [described](#) *Leptostyrax* teeth in 1875. [Samuel Wendell Williston](#) first [named](#) the genus *Leptostyrax* in 1900.

Leptostyrax also features in game playing. [This site](#) gives tips on using it role playing games.

Invertebrates - Ammonites

The Cretaceous was the [last hurrah](#) of the [ammonites](#). They went extinct during, or shortly after, the [mass extinction at the end of the Cretaceous](#). Here are a couple of examples.

Baculites



**Figure 7 - *Baculites grandis* Shell at the [North American Museum of Ancient Life](#)
Credit: [Ninjatacoshell](#), [Creative Commons Attribution-Share Alike 3.0 Unported](#) license**

Baculites fossils are found throughout the Late Cretaceous and possibly into the earliest age of the [Paleogene](#), the [Danian](#). They are also found throughout the world in places such as:

- The Cenomanian [Britton Formation](#) of Texas, and the [Mancos Shale](#) of Colorado;
- [Turonian](#) aged rocks in Europe and [Kansas](#);
- Campanian aged rocks from the Western Interior Seaway, [Vancouver Island](#) and Europe;
- [Maastrichtian](#) rocks in the [Netherlands](#), [Poland](#), [Turkmenistan](#), and [New Jersey](#).

[Some researchers have found](#) *Baculites* fossils in Paleogene (Danian) aged rocks in [Denmark](#). However, this is [still open to debate](#).

Baculites has even made it to Twitter.

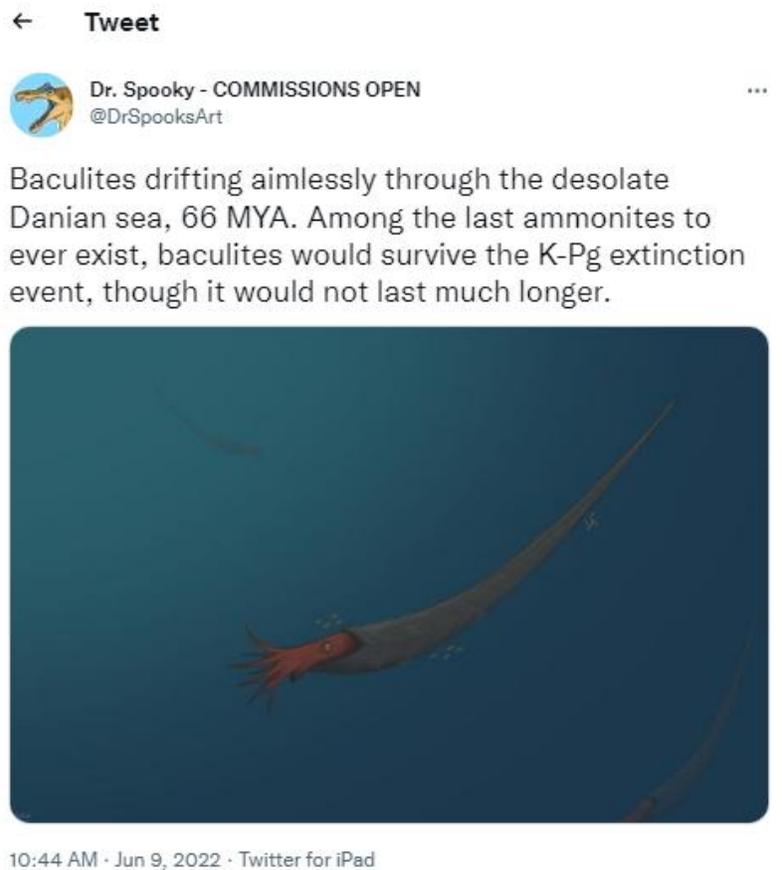


Figure 8 - *Baculites* drifting aimlessly through the desolate Danian sea
Credit: [@DrSpooksArt, 10:44 AM · Jun 9, 2022](#)

Baculites is unusual for an ammonite in that its shell is almost straight rather than coiled as in most other ammonites. As well, there may have been sexual dimorphism among *Baculites* with males about half the size of females.

[Jean-Baptiste Lamarck](#) was the [first to describe *Baculites*](#) in 1799; there are [at least 17](#) recognised species of *Baculites*.

Discoscaphites



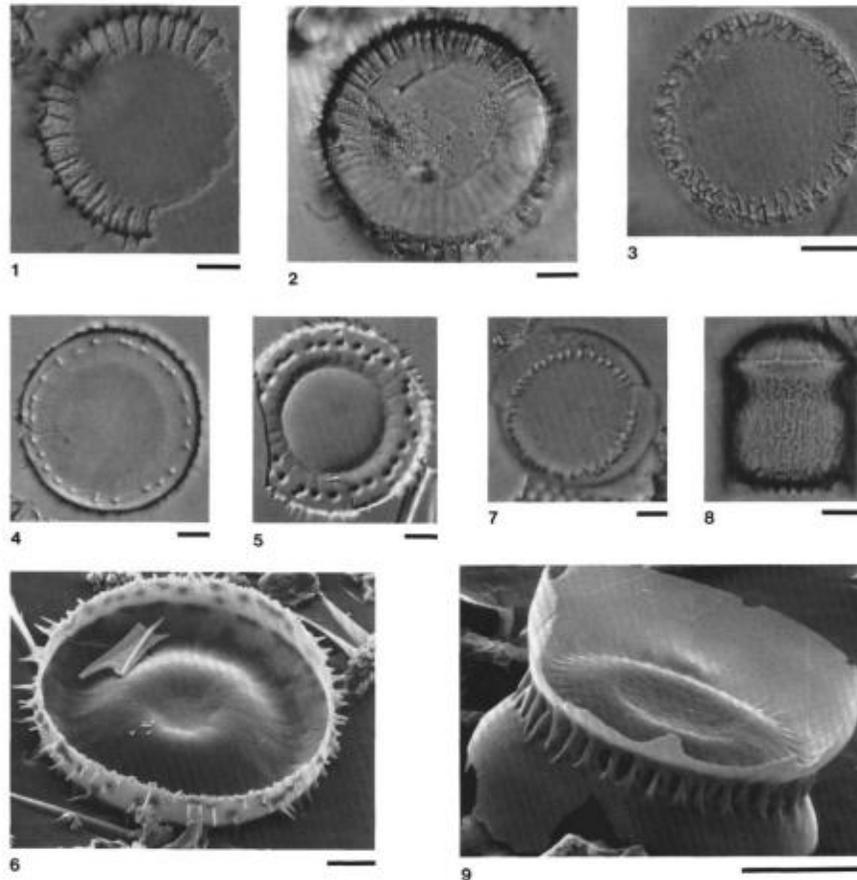
Figure 9 - *Discoscaphites conradi*

[Credit: Luna04, Creative Commons Attribution-Share Alike 3.0 Unported license](#)

[Discoscaphites](#) fossils have been found in Cretaceous rocks from Alabama, Arkansas, California, Colorado, Kansas, Maryland, Mississippi, Missouri, New Jersey, South Dakota, Texas and Wyoming in the United States as well as Greenland and Alberta. Another ammonite that may have survived the mass extinction at the end of the Cretaceous, [Discoscaphites fossils occur](#) above the [iridium anomaly](#) in the [Tinton Formation](#) of New Jersey.

[Fielding Bradford Meek](#) first [named *Discoscaphites*](#) in 1870. There are three species in the genus: *D. conradi*, *D. gulosus*, and *D. rossi*.

Diatoms



(Scale bars = 10 μm)

1-3. *Crossophialus paterus* n. sp.; 4-6. *Crossophialus gyroscolus* n. sp.;
7, 9. *Crossophialus glabrus* n. sp.; 8. *Calyptosporium effalum* n. sp.

Figure 10 - Cretaceous Diatoms

Credit: [Plate 3 in Harwood & Gersonde, 1990](#)

[Diatoms](#) are single celled algae that create siliceous porous cell walls called [frustules](#). Diatoms live throughout the oceans and form approximately **half the biomass** found there. During the Cretaceous, diatoms were restricted to the oceans. They appear in freshwater deposits from the [Miocene](#).

Diatoms [may have first appeared](#) during the [Jurassic Period](#) or even the [Triassic](#) following the [end-Permian mass extinction](#). [Some dispute this](#) while others suggest that [they evolved earlier](#). The earliest unambiguous occurrence of diatoms is in the Cretaceous (Albian) [sediments of Antarctica](#).

Benetoraceae, Benetorus fantamus

Benetorus fantamus is a member of the [Benetoraceae](#) family of diatoms. *Benetorus fantamus* was first described by [G. Dallas Hanna](#) in 1927 from specimens found in the [Moreno Gulch](#) near Fresno, California. He described it as "circular, almost flat valve with an outer annular zone of coarse, radiating rows of beads and a central circular zone, hyaline at least in part and enclosing almost a pear-shaped beaded zone in the center".

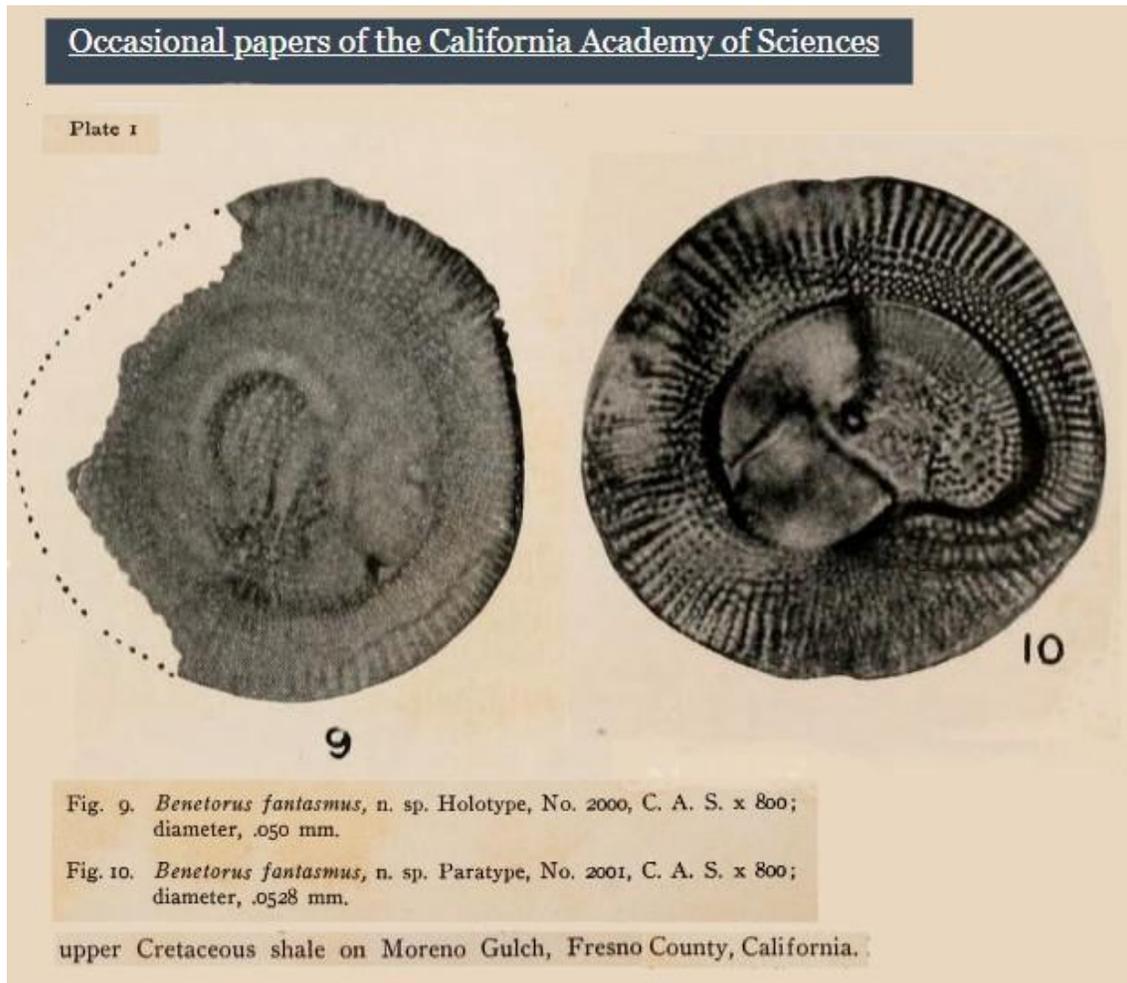


Figure 11 - *Benetorus fantamus* Fossils from Moreno Gulch, CA

Credit: [G.D.Hanna](#), [Creative Commons CC0 1.0 Universal Public Domain Dedication](#)

Diatomaceous Earth

Diatoms are the source of [diatomaceous earth](#) and, as I discussed in [my blog last year](#), diatoms also form silica muds in deep sea abyssal environments. Diatomaceous earth has many uses, one of which is to kill insect pests in the garden. The fine dust of the diatomaceous earth clogs up the breathing pores of the insects.

I've tried diatomaceous earth in my garden to control [Colorado Potato Beetles](#). Below is one of these beetles happily munching on my potato plants, oblivious to the diatomaceous earth potato dust. The beetle was removed by hand for destruction.



**Figure 12 - Colorado Potato Beetle on Potato Leaf Dusted with Diatomaceous Earth
R. Reichelt, August 11, 2022**

Wrapping it Up

That wraps it up for the Cretaceous Period, at least for now. Next week we'll begin our look at the [Cenozoic Era](#).

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.