

June 20, 2022

News and notes

Before finishing up our look at the [Jurassic Period](#) with a look at the marine invertebrates of the time, here are some news items that I thought were interesting:

Research

- [New Maps of Global Geological Provinces and Tectonic Plates](#); behind a paywall, Science Daily summary [here](#).
- Metamorphic mineralogy: [Ductile deformation during carbonation of serpentized peridotite](#).
- Looking deep in the earth: [The seismic reflection Moho across the mid-Norwegian continental rifted margin](#).
- Plate Tectonics: [The Cenozoic Multiple-Stage Uplift of the Qiangtang Terrane, Tibetan Plateau](#).
- Mineralogy and plate tectonics: [Grain-size-evolution controls on lithospheric weakening during continental rifting](#); Phys.org summary [here](#).
- [Tectonic evolution of convergent plate margins and its geological effects](#); behind a paywall, Phys.org summary [here](#).
- Sedimentology: [Quantitative relationships between river and channel-belt planform patterns](#); Eureka Alert summary [here](#).
- All shook up: [Seismological observation of Earth's oscillating inner core](#), Eureka Alert summary [here](#).
- [The International Bathymetric Chart of the Southern Ocean Version 2](#); Eureka Alert summary [here](#).
- [Geology of the Early Arikareean Sharps Formation on the Pine Ridge Indian Reservation and Surrounding Areas of South Dakota and Nebraska](#).
- From Eureka Alert: [New Geology articles published online ahead of print in May](#) and [New articles for Geosphere posted online in May](#).

Paleontology

- Permian / Triassic Mass extinction Event: [Sulfur isotopes link atmospheric sulfate aerosols from the Siberian Traps outgassing to the end-Permian extinction on land](#); behind a pay wall, Phys.org summary [here](#).
- Ediacaran fossils: [Damaged Dickinsonia specimens provide clues to Ediacaran vendobiont biology](#).

- Dinosaurs evolution in Argentina: [Paleoenvironmental and Biotic Changes in the Late Triassic of Argentina: Testing Hypotheses of Abiotic Forcing at the Basin Scale](#); Eureka Alert summary [here](#).
- Nasty dinosaurs: [Dinosaur 'reaper' with massive claws found in Japan](#).
- [Scientists have discovered a new type of fossilization](#).
- [New prehistoric plant discovery highlights the unexpected diversity of non-flowering plants](#).

Climate Change

- [Moraines in the Austrian Alps record repeated phases of glacier stabilization through the Late Glacial and the Early Holocene](#).
- [Droughts and societal change: The environmental context for the emergence of Islam in late Antique Arabia](#); Phys.org summary [here](#).
- Coastal geology and sea level rise, [Variability in marsh migration potential determined by topographic rather than anthropogenic constraints in the Chesapeake Bay region](#), Phys.org summary [here](#).
- From the European Geosciences Union: [Strong increase in thawing of subsea permafrost in the 22nd century caused by anthropogenic climate change](#).
- [Climatic and tectonic drivers shaped the tropical distribution of coral reefs](#); Science Daily summary [here](#).

Environmental Geology and Hydrogeology

- This is really research into denitrifying bacteria, from Phys.org: [Giving metal to microbes could reduce greenhouse gas](#); two original research papers: [here](#) and [here](#).
- Removing heavy metals: [Two constructed wetlands within a Mediterranean natural park immersed in an agrolandscape reduce most heavy metal water concentrations and dampen the majority of pesticide presence](#).
- Hydrogeology: [Estimating dewatering in an underground mine by using a 3D finite element model](#).

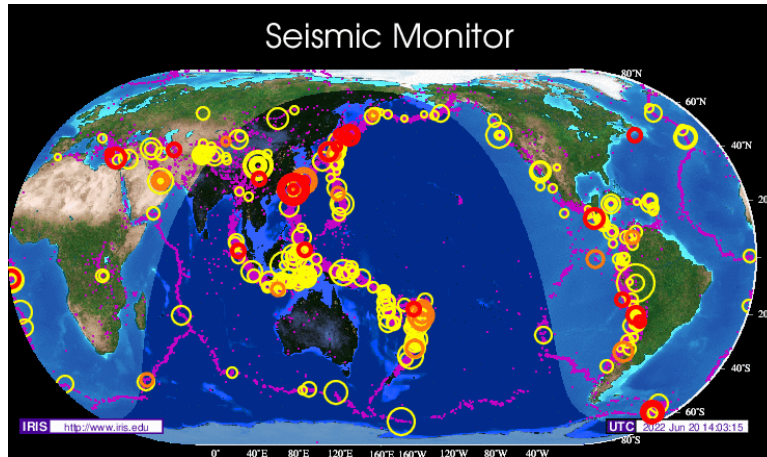
Geophysical Modeling

Caveat on modeling: garbage in, garbage out.

- From the European Geosciences Union: [Towards hybrid modeling of the global hydrological cycle](#).
- More on modelling from the European Geosciences Union: [101 geodynamic modelling: how to design, interpret, and communicate numerical studies of the solid Earth](#).

- Ocean circulation; [Hotspots of the Stokes rotating circulation in a large marginal sea](#); Phys.org summary [here](#).

Volcanoes, Earthquakes and Geohazards



[Seismic Monitor Link](#)

- From Phys.org: [Understanding the nature of big earthquakes](#).
- Yellowstone: [The dynamic floor of Yellowstone Lake, Wyoming, USA: The last 14 k.y. of hydrothermal explosions, venting, doming, and faulting](#); Eureka Alert summary [here](#).
- Predicting volcanic eruptions: [Forecasting mechanical failure and the 26 June 2018 eruption of Sierra Negra Volcano, Galápagos, Ecuador](#); Eureka Alert summary [here](#).
- From the European Geosciences Union: [Magnitude, frequency and climate forcing of global volcanism during the last glacial period as seen in Greenland and Antarctic ice cores \(60–9 ka\)](#).
- Flooding: [USGS Crews Continue Measure and Assess Yellowstone River Flood](#); related: [Yellowstone flooding takes out bridge, washes out roads](#).

Mining and Energy

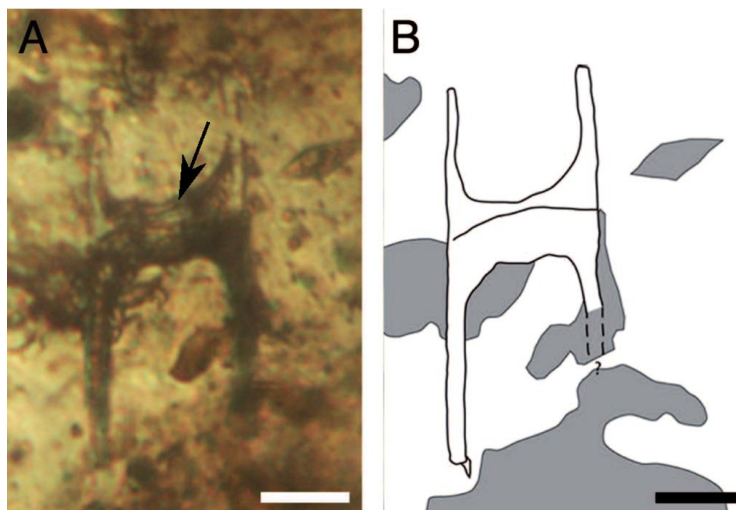
- Fluid flow and carbon dioxide storage: [Computation of vertical fluid mobility of CO₂, methane, hydrogen and hydrocarbons through sandstones and carbonates](#).
- [Canadian Kinross sells Russian assets to Highland Gold for \\$340 million](#); Western firms bailing out of Russia.
- [War derails plan to ditch coal after UK championed global cuts](#).
- From the United States Energy Information Administration (USEIA): [EIA forecasts growing liquid fuels production in Brazil, Canada, and China through 2023](#).
- [U.S. Increases Heavy Crude Imports](#).
- [Penalties for industrial accidents: The impact of the Deepwater Horizon accident on BP's reputation and stock market returns](#).

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Marine Invertebrates of the Jurassic

During the [End Triassic Mass Extinction Event](#), groups such as [Ceratitidan ammonites](#), and [Conulariids](#) went extinct. Also, [Bivalves](#), [Brachiopods](#) and [Bryozoans](#) decreased in diversity after the event and remained so throughout the [Jurassic](#).

Marine ecosystems generally flourished during the Jurassic Period. Reefs formed of [sponges](#) and [scleractinian corals](#) substantially expanded, especially during the [Late Jurassic](#), although they drastically declined at the end of the Jurassic.



The *Hemiaulus* diatom found in Late Jurassic-Early Cretaceous amber from Thailand. A. Photograph of specimen within dark amber matrix. B. Interpretative drawing of the photograph. Scale bar represents 10 μm . We can clearly distinguish the central parts of the frustule and its typical elevations. They end with spines corresponding to the linking apparatus of the frustule. The black arrow on A indicates the hyaline marginal ridge.

Figure 1 - *Hemiaulus* Diatom Preserved in Amber

Credit: Figure 2 in [Girard et al., 2020](#)

Among single celled creatures [coccolithophores](#), [diatoms](#) [dinoflagellates](#) and [forams](#) diversified during the Jurassic with the foram [Globigerinina](#) first appearing in the [Tethys Ocean](#) at this time. In 2020, [researchers found a diatom preserved in amber from Thailand](#), identifying it as the diatom *Hemiaulus* (see Figure 1, above).

Examples of other groups of invertebrates from the Jurassic include:

- [Echinoderms](#), such as [Crinoids](#) and [Echinoids](#) (sea urchins);
- Crustaceans such as [Decapods](#) including the first true [crabs](#); and
- Molluscs such as [Ammonites](#), [Belemnitida](#), and [Octopodiformes](#).

Let's look at some examples of these from the fossil record.

Echinoderms - *Pentacrinites*, a Crinoid



Figure 2 - *Pentacrinites* Fossil

Credit: [Andy Dingley](#), [Creative Commons Attribution-Share Alike 1.0 Generic](#) license

Pentacrinites, was a crinoid that lived during the Jurassic, from the [Early Jurassic \(Hettangian\)](#) to the [Middle Jurassic \(Bathonian\)](#) ages. Like most crinoids, it lived a [sessile](#) existence, that is, it was rooted to one place deriving sustenance from filter feeding. Its most common habitat was shallow [epicontinental seas](#).



Figure 3 - *Pentacrinites* Reconstruction

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

Pentacrinites fossils are found in Jurassic aged formations in of [Asia](#), [Europe](#), [North America](#), and [New Zealand](#). In England, a member of the Lower [Lias Group](#) found near Lyme Regis is chocked full of its fossils and is called the *Pentacrinites* Bed.

Pentacrinites was [first named](#) by [J. F. Blumenbach](#) in 1804. Wikipedia lists five species in the genera, however, [recent research](#) has named a sixth species in the genera.

Echinoderms - *Collyrites*, a Jurassic Sea Urchin



Figure 4 - *Collyrites*

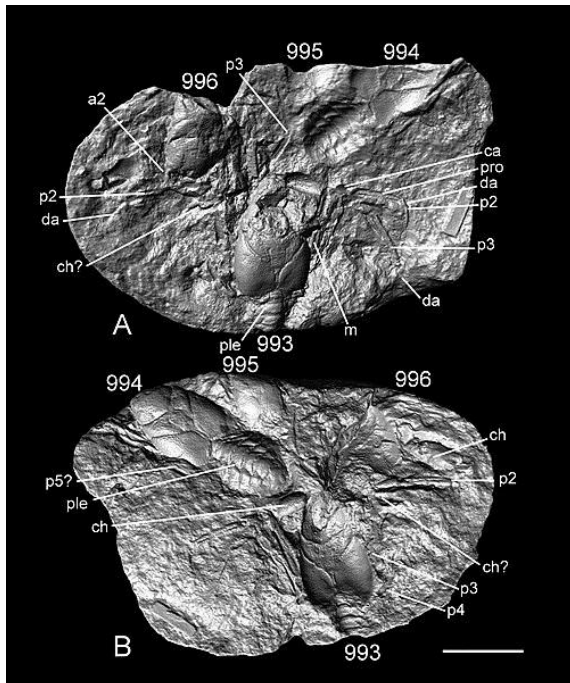
Credit: [Secteur Sciences et Technologies – AMU](#), [CC BY-NC-SA 4.0 licence](#)

[Echinoids](#), sea urchins, have been around for a long time, with the [earliest sea urchin](#) fossil dating from the [Ordovician](#). [Collyrites](#) lived during Middle to Late Jurassic (Bathonian-[Oxfordian](#)) and fossils of *Collyrites* have been found in [Europe](#), [North Africa](#), [India](#).

There are seven identified species in the genera *Collyrites*. [Jean-Baptiste Lamarck](#) first described fossils of the genus in 1816, calling it *Ananchytes*. Reanalysis by [Charles des Moulins](#) led to the assigning the fossil to its current name. (Des Moulins, C. 1835-1837. *Études sur les Échinides*. Actes de la Société Linnéenne de Bordeaux, 7 (1835), 9 (1837), 45-364, not on line).

***Eocarcinus* the Earliest True Crab**

The first true [crabs](#) appeared during the Early Jurassic and [Eocarcinus](#) is the earliest found, so far. [First described](#) by [Thomas H. Withers](#) in 1932, recent [research by Gerhard Scholtz](#) has shown that it is representative of the [stem-group](#) of all true crabs. There is only one species in the genera: *Eocarcinus praecursor*.



996). Concretion bearing four individuals and several remains of additional individuals. A) Part. The individuals YM 993 and YM 996 are three-dimensionally preserved. YM 993 with a large part of its pleon (ple). YM 994 and YM 995 are just impressions. Individual YM 993 shows the merus (m), carpus (ca), propodus (pro), and dactylus (da) of the achelate 2nd and 3rd pereopods (p2, p3) on the right side. On the left, there are remains of a chela (ch?) of unclear affinity. It could be the smashed left chela of YM 996 that lies underneath the left 2nd pereopod (p2) of YM 996 (compare with B). The left 3rd pereopod (p3) of YM 996 shows the same morphology as that of YM 993. YM 996 possesses two basal parts of the peduncle of its right 2nd antenna (a2) (see Fig. 5A'). B) Counterpart with individuals YM 994 and YM 995 in three-dimensional preservation. The same is true for the right chela of YM 993 (ch) and the right chela of YM 996 (ch). YM 994 possesses the most complete pleon (ple), which is much wider than that of YM 993. The putative left chela (or part of it) of YM 996 (ch?) lies on top of the merus of the left 2nd pereopod (p2) of YM 993 (compare with Fig. 5I). The putative merus of the left 5th pereopod (p5?) of YM 994, and the merus of the left 3rd and 4th pereopods of YM 993 are visible. Scale bar: 20 mm.

Figure 5 - *Eocarcinus praecursor*
Credit: Gerhard Scholtz, [Creative Commons Attribution 4.0 International](#) license

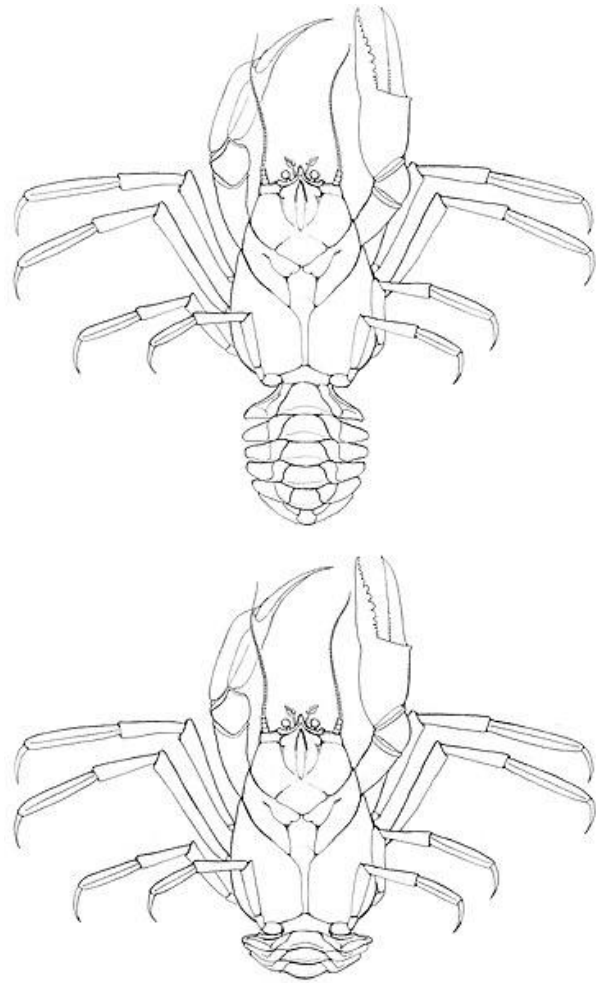


Figure 6 - Reconstruction *Eocarcinus*
Credit: Gerhard Scholtz, [Creative Commons Attribution 4.0 International](#) license

[Eocarcinus fossils](#) have been found in Early Jurassic ([Pliensbachian](#) age) rocks at two sites in the United Kingdom: in the Mickelton Tunnel (near [Aston Magna](#)), Gloucestershire and near [Runswick Bay](#), Yorkshire.

A Fossil Crab - *Eryon*

[Eryon](#) was another early example of early crab. Fossils of *Eryon* were found in Jurassic aged rocks from [France, Germany, Switzerland and the United Kingdom](#). Some of the best preserved fossils of *Eryon* come from the [Solnhofen Limestone](#), a [Lagerstätte](#). *Eryon* appears to have lived like a modern crab, as a scavenger and [epifaunal](#) carnivore. *Eryon* was [first described](#) by [Anselme G. Desmarest](#) in 1822. There are 10 species in the genera.



Figure 7 - *Eryon arctiformis*
Credit: [Woudloper](#), [Creative Commons Attribution-Share Alike 1.0 Generic](#) license



Figure 8 - Reconstruction of *Eryon*
Credit: [Satoshi Kawasaki](#), [Creative Commons Attribution-Share Alike 3.0 Unported](#) license

An interesting question that comes up in paleontological circles is that: why are there many creatures in the fossil record that resemble crabs in form and lifestyle such as [horseshoe crabs](#) and [trilobites](#)? One answer is the process of [parallel evolution](#) where living things in similar ecological niches will evolve similar body forms. A good discussion of why do things keep evolving into crabs is found [here](#).

Ammonites - *Arietites conybear*



Figure 9 - *Arietites conybear*, Early Jurassic
Credit: [James St. John](#), [Creative Commons Attribution 2.0 Generic](#) license

The End Triassic Extinction Event was hard on the Ammonites, with only a handful of genera belonging to the family [Psiloceratidae](#) of the suborder [Phylloceratina](#) surviving. As is often the case, the survivors diversified to take advantage of newly vacant ecological niches. Among the many ammonites in the Jurassic was [Arietites](#).

[First described](#) by [Wilhelm H. Waagen](#) in 1869, [Arietites fossils are found](#) in Albania, Austria, Canada, China, England, France, Germany, Greece, Indonesia, Italy, Switzerland, and Turkey in rocks from the Early Jurassic ([Sinemurium](#) age).

Ammonites - *Pleuroceras spinatum*



Figure 10 - *Pleuroceras spinatum*, Pyritized Fossil

[Credit: James St. John, , Creative Commons Attribution 2.0 Generic license](#)

Another interesting fossil ammonite is the [Pleuroceras spinatum](#) specimen in Figure 10. This fossil was recovered from Early Jurassic (Pliensbachian Age) rocks near [Unterstürmig, Bavaria, Germany](#). What is particularly interesting is the mode of preservation where the original material in the ammonite shell, [aragonite](#), has been [replaced](#) with [pyrite](#).

[Pleuroceras spinatum fossils are found through much of Europe](#) with fossils coming from France, Germany, Hungary, Italy, Montenegro, Serbia, Spain and Ukraine. The animal seems to have lived the life of a fast-moving [nektonic](#) carnivore. A French zoologist, [J. G. Bruguière](#), first described [Pleuroceras spinatum](#) in 1789.

Belemnites *Passaloteuthis bisulcata*

Belemnites first appeared in the fossil record in the Early Jurassic ([Hettangian](#) to Sinemurian) and were found in fossils from Europe and Japan. Belemnite fossils are often the [belemnite "pen" or](#)

rostra. Later in the Jurassic, belemnites spread throughout the world and diversified into many species, of which one was [Passaloteuthis bisulcata](#).



Figure 11 - *Passaloteuthis bisulcata*, a Belemnite

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

Fossils of the genus [Passaloteuthis](#) can be found in England, France, Germany, Greenland, Ireland Italy, Switzerland, and Tunisia. The fossil in Figure 11 comes from the Early Jurassic [Posidonia Shale](#) in Germany. Much of the documentation on the genus comes from [The Belemnite Marls of Charmouth, a Series in the Lias of the Dorset Coast, Quarterly Journal of the Geological Society, 84, 179-222, 1 April 1928](#). The genera name was established by a someone called Lissajous in 1915 but the earliest description of a species in the genera was for [Passaloteuthis elongata](#) in 1826 by someone called Miller. No biographical information is available on either Miller or Lissajous.

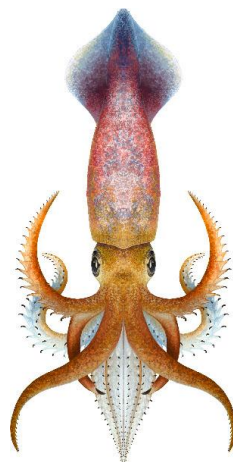


Figure 12 - *Passaloteuthis* Reconstruction

Credit: Franz Anthony, [Creative Commons Attribution 4.0 International](#) license

In lifestyle, *Passaloteuthis* seems to have been a [predator](#) similar to modern day squids. an interesting feature of *Passaloteuthis* are the pair of hook-like appendages called [onychites](#). These appear to be only on males and their exact function s unknown.

***Proteroctopus* an Early Octopus**

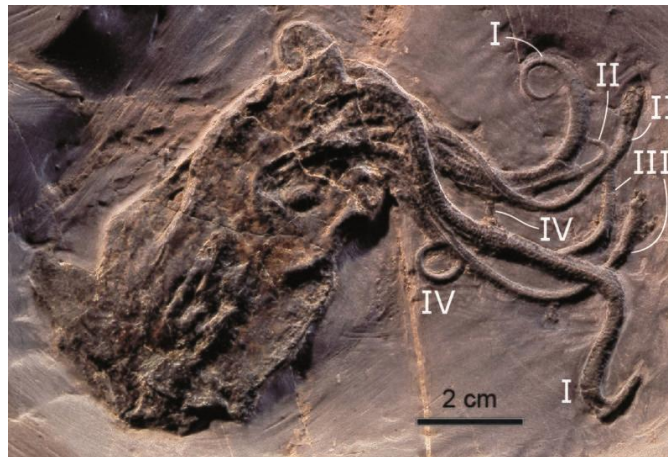


Figure 13 - *Proteroctopus ribeti*

Credit: [Kruta et al, 2015](#), [Creative Commons CC0 1.0 Universal Public Domain Dedication](#)

First found by [Jean Claude Fischer and Bernard Riou](#) in Middle Jurassic ([Callovian](#)) outcrops in the [Ardèche Department](#) of France [near La Voulte-sur-Rhône](#) in 1982, *Proteroctopus ribeti* is one of the oldest octopus fossil ever found. Given that octopus have no hard parts, the preservation of the fossil is remarkable. Fischer and Riou suggest that, given its morphology, *Proteroctopus ribeti* lived a necto-epipelagic lifestyle, i.e. a free-floating way of life in the [epipelagic](#) zone.

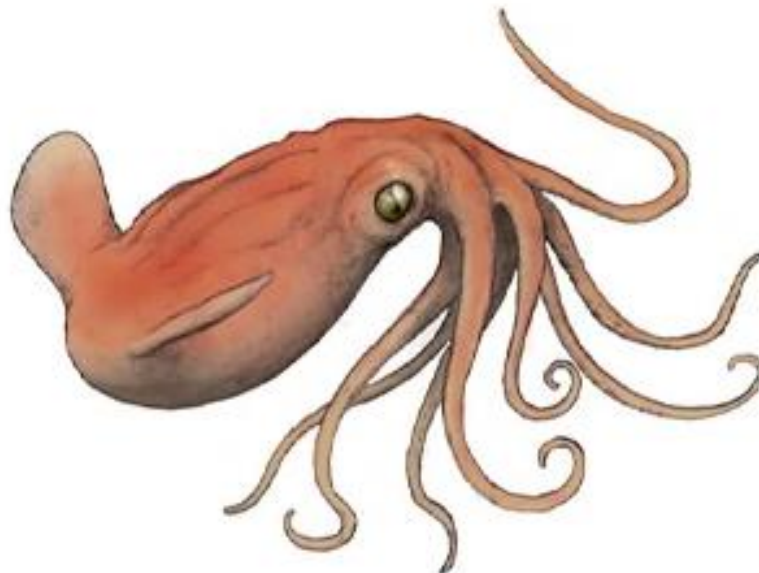


Figure 14 - Reconstruction of *Proteroctopus ribeti*

Credit: No artist attributed, [CC-BY-SA](#)

Wrapping it Up

There are lots more marine invertebrate fossils from the Jurassic, we've only scratched the surface here. For example, researchers have identified more than [10,000 species of ammonites](#). If these critters intrigue you, follow up on the links here and enjoy the search. This also wraps up our look at the Jurassic Period, next week we'll start on the Cretaceous.

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.