Ali Elmeligy, Mojeed Yaya, Christopher Cannady, Alexander Rodrigues

GEOL204

Characteristics

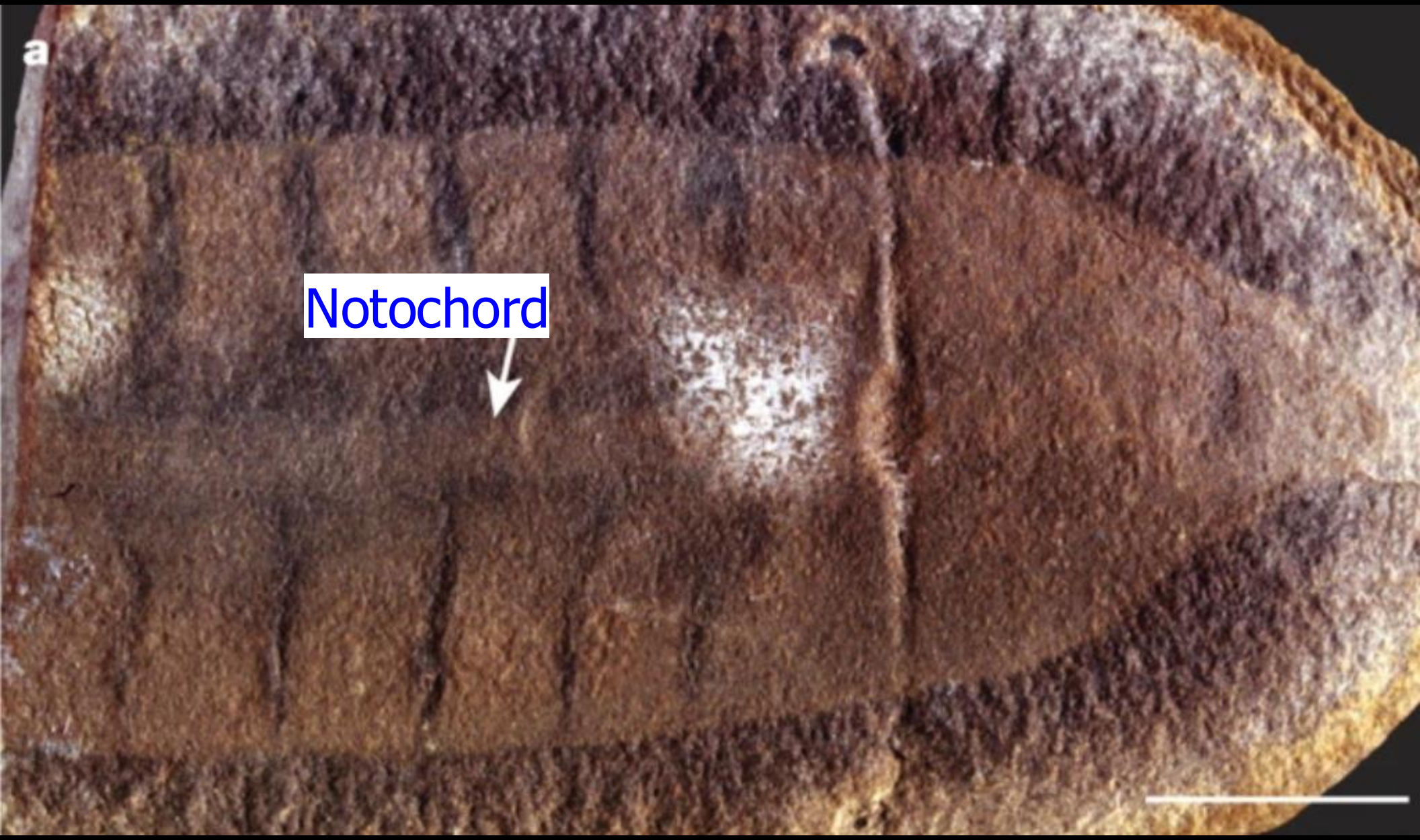
Tullimonstrum Gregarium **also known as "Tully Monster" lived in the shallow tropical coastal waters of muddy estuaries. It is assumed to be a nektonic carnivore, but their mode of hunting is still being debated among geologists. One proposition is that they were nektonic carnivores that hunted worms and other small invertebrates, on the other hand, they could have been solely a scavenger. The way they reproduce is also a subject of debate as it is still unknown if they are even vertebrates or invertebrates.**

Habitat

Tullimonstrum lived during the late Carboniferous period. Very little is known about how it lived or its place within the ecosystem. The oceans during this period were ever changing with placoderms having been largely wiped out during the previous period and chondrichthyans being brought in as the dominant species. The Carboniferous had also seen a loss of reefs in the ocean creating a world very alien to that which we know today. *Tullimonstrum* would have had fierce competition in the carboniferous oceans with large and dangerous chondrichthyans like Helicoprion and other ancient sharks on the hunt for small creatures such as itself. Meanwhile, the sea floor was covered with small crinoids and blastoids which could have possibly provided the Tully Monster with a source of food.

A Vertebrate?

Some evidence points to *Tullimonstrum* as being a vertebrate. Its eyes have a retinal pigment epithelium which keeps the retina alive and enables photoreceptor cells to detect light. This is a synapomorphy of vertebrates. In a handful of specimens there is a light-colored linear trail which is positioned where an expected notochord would be. This trail, unlike a possible gut trail, extends all the way through the tail of the critter, providing further evidence that it is a possible notochord. A series of phylogenetic analyses places Tullimonstrum in the lamprey stem lineage due to traits such as pronounced arcualia (cartilaginous tissue which forms around notochord); a dorsal fin and asymmetric caudal fin; keratinous teeth; and a single nostril.



McCoy et al. 2016

Maybe not…

Even though this creature hasn't been identified to perfectly fit into any groups of species, the most common relation is to snails and other mollusks. Mollusks are all invertebrates, meaning none of them have a backbone. A more recent scientific study also claims that the "Tully Monster" is an invertebrate, while acknowledging previous studies that claim it is a vertebrate and looks to disprove them. The experiment used 3D data and determined that it contracted the vertebrate theory; it refuted the presence of vertebrate synapomorphies which had been previously proposed. It also found that the body segmentation in its head to body was different from any vertebrate.

Bibliography

Clements, T., Dolocan, A., Martin, P., Purnell, M. A., Vinther, J., & Gabbott, S. E. (2016). The eyes of tullimonstrum reveal a vertebrate affinity. *Nature*, *532*(7600), 500–503. https://doi.org/10.1038/nature17647

I. Thompson, 1978, *The Audubon Society Guide to North American Fossils*, New York: Alfred A.. Knopf, Inc.846pp. https://www.isgs.uiuc.edu/fossils/mainpage.htm Fossils of Illinois Page of the Illinois Geological Survey.

Johnson, R. G., & Richardson, E. S. (1969). *Pennsylvanian invertebrates of the Mazon Creek area, Illinois: The morphology and affinities of Tullimonstrum*. Field Museum of Natural History.

McCoy, V. E., Saupe, E. E., Lamsdell, J. C., Tarhan, L. G., McMahon, S., Lidgard, S., Mayer, P., Whalen, C. D., Soriano, C., Finney, L., Vogt, S., Clark, E. G., Anderson, R. P., Petermann, H., Locatelli, E. R., & Briggs, D. E. (2016). The 'Tully Monster' is a vertebrate. *Nature*, *532*(7600), 496–499. https://doi.org/10.1038/nature16992

Mikami, T., Ikeda, T., Muramiya, Y., Hirasawa, T., & Iwasaki, W. (2023). Three-dimensional anatomy of the tully monster casts doubt on its presumed vertebrate affinities. *Palaeontology*, *66*(2). https://doi.org/10.1111/pala.12646

Molluscs. Natural History Museum. (n.d.). http://www.nhm.ac.uk/discover/molluscs.html#:~:text=Molluscs%20are%20invertebrates%2C%20which%20means,%2C%20squid%2C%20nudibranchs%20and%20oysters.

R. L. Leary, 1987, "The Tully Monster: mystery animal of Illinois", *The Living Museum*, 49: 26-27. M. H. Nitecki (editor), 1979, *Mazon Creek Fossils*, New York: Academic Press, Inc. 581pp.

Sallan, L., Giles, S., Sansom, R. S., Clarke, J. T., Johanson, Z., Sansom, I. J., & Janvier, P. (2017). The 'Tully Monster' is not a vertebrate: Characters, convergence and taphonomy in Palaeozoic problematic animals. *Palaeontology*, *60*(2), 149–157. https://doi.org/10.1111/pala.12282