Marine worms reveal the deepest evolutionary patterns

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Priapulus caudatus, one of the worms studied by the research team. Credit: Bruno Vellutini, Sars Centre, Bergen Norway

(Phys.org)—The study of ancient worms could offer a more solid understanding of evolutionary patterns and processes, according to new research.

Scientists from the universities of Bath and Lincoln have revealed new findings on the evolutionary relationships and structure of priapulids – a group of carnivorous mud-dwelling worms living in shallow marine waters.

The research, carried out by evolutionary biologists Dr Matthew Wills, Dr Sylvain Gerber, Mr Martin Hughes (all University of Bath) and Dr

Marcello Ruta (University of Lincoln), features in the October issue of Journal of Evolutionary Biology.

Dr Wills first pioneered a study on existing and extinct priapulids in 1998. Fourteen years on, the team looked at a new and expanded data set of anatomical features to see how knowledge of these worms has been affected by new fossil finds.

He explained: "The fossils from the Cambrian period can cause a real headache for evolutionary biologists. Instinct tells us to expect simple organisms evolving over time to become increasingly more complex. However during the Cambrian period there was an apparent explosion of different major groups of animals, all appearing simultaneously in the fossil record. We looked at priapulid worms, which were among the first ever predators.

"What's remarkable is that they had already evolved into a diverse array of forms – comparable to the morphological variety of their living cousins – when we first encounter them in the Cambrian fossil record. It's precisely this apparent explosion of anatomical diversity that vexed Darwin and famously attracted the attention of Harvard biologist Stephen Jay Gould."

Dr Ruta, from the School of Life Sciences at the University of Lincoln, continued: "Our work has shown that despite many new fossil finds, including many from China in the last decade, the picture remains largely unchanged. This is really important because the fossil record is notoriously incomplete. It is often difficult to know whether a pattern is just an artifact of this incompleteness, or biologically meaningful. Our study resolutely confirms the latter.

"Priapulids are fascinating animals with much potential in evolutionary studies. They have a long history, with the earliest known species being

505 million years old, and with some of their extinct relatives being even older.

They were important components of ancient bottom-dwelling marine invertebrate communities, and their predatory habits are well documented in the fossil record. However, for all their abundance and diversity, priapulids are a remarkable and often cited example of a morphologically conservative group, their overall shape and proportions having changed relatively little during their history.

"This research will help us to understand evolutionary patterns in 'deep time'. This is looking at the tempo (evolutionary rates) and mode (the study of the way, manner or pattern of evolution) to uncover the ancient events when organisms first began to diversify and break from one another. For example, what makes a mammal a mammal and so on."

The research gives prominence to the importance of an adequate and unbiased inclusion of data, where possible, from both fossil and living species in assembling evolutionary family trees. Fossils inform our understanding of evolutionary patterns and processes, and show unique morphological traits that are no longer observed in living species.

Dr Ruta added: "Detailed scrutiny of other groups of organisms is needed, in order to decipher the rate at which structural, functional and ecological changes occur and how acquisition of new traits impact on group diversification. Ultimately, combined results from these investigations will offer a solid framework for understanding the very roots of Life's grandeur and the astounding variety of species alive today."

More information: onlinelibrary.wiley.com/doi/10 … 25.issue-10/issuetoc

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