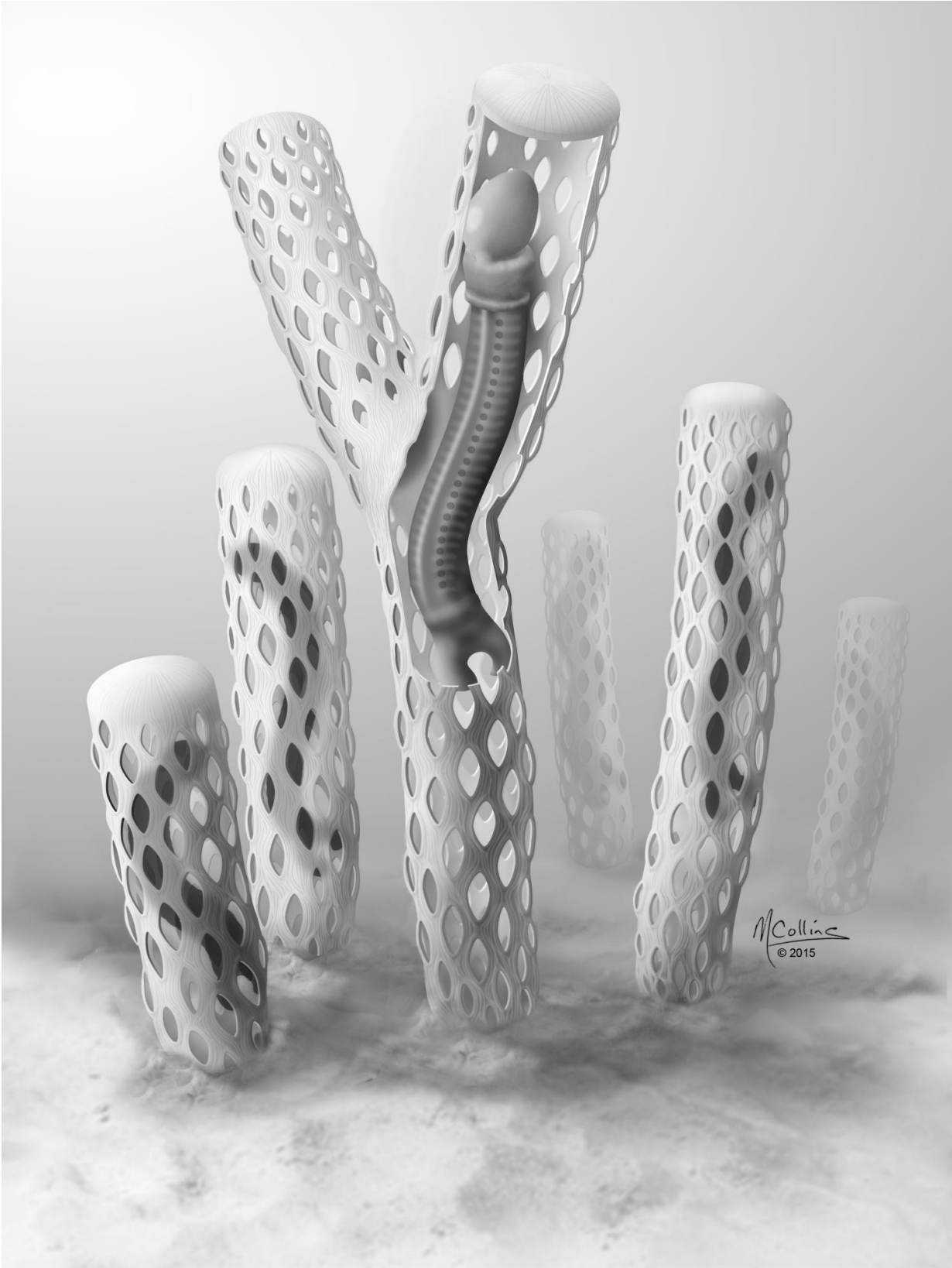


The secret to an Oesia life: Prehistoric worm built tube-like 'houses' on sea floor

July 6 2016



Artist's impression of *Oesia* in the perforated tube that scientists believe it inhabited. Credit: Drawing by Marianne Collins

The fossilised remnants of tube-like "dwellings" which housed a primitive type of prehistoric sea worm on the ocean floor have been identified in a new study.

According to researchers, the long, perforated tubes may have looked like narrow chimneys reaching up from the [sea bed](#), and were made by a creature called *Oesia*, which lived a solitary existence inside them about 500 million years ago.

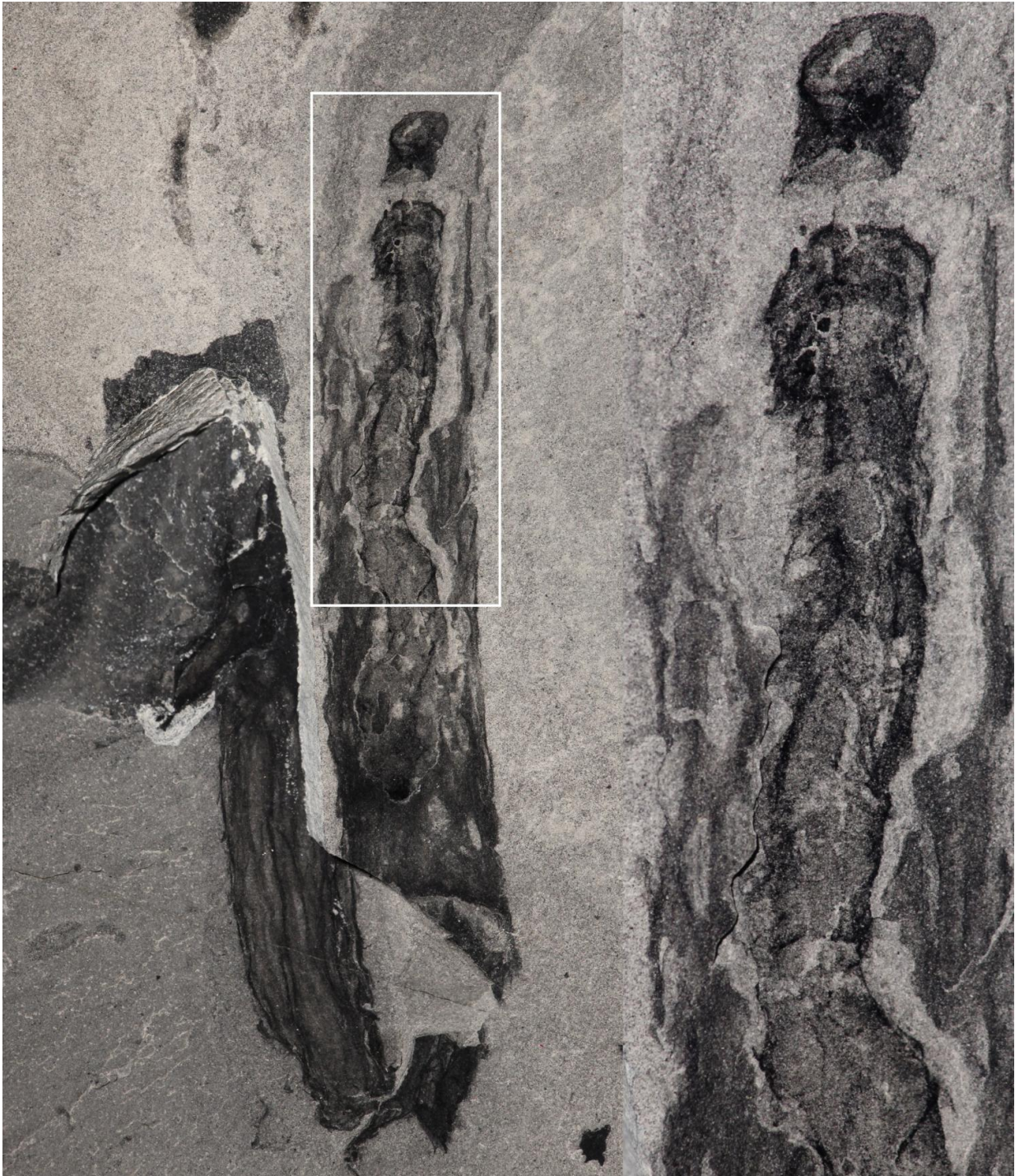
The findings emerge from a study undertaken by academics from Canada and the UK, in which they reassess fossils originally believed to have come from a type of seaweed called *Margaretia*. Instead, they found that these were the vestiges of tubular structures which protected these ancient worms.

The research, which is published in the journal *BMC Biology*, was carried out by academics from the Universities of Cambridge, Toronto and Montréal, and at the Royal Ontario Museum in Toronto.

Part of its importance is that it confirms *Oesia* was a primitive specimen from a group of creatures called hemichordates. These belong to a bigger group called deuterostomes, of which vertebrates (including humans) form a separate branch. By finding out more about these early creatures, researchers hope eventually to be able to identify and characterise a distant ancestor common to all deuterostomes, from sea worms to humans.

In particular, the research supports the increasingly common view that

this ancestor was probably a "filter feeder", which ate by sucking in water and straining out nutrients. *Oesia* was one such filter feeder, with gills down most of its body to expel water afterwards, and holes in the walls of its tubular home to let the water in and out.



Detail of the *Oesia* fossil remains in margaretia 'tube'. Credit: Karma Nanglu

Karma Nanglu, from the University of Toronto and the study's lead author, said: "Hemichordates are central to our understanding of how deuterostomes evolved. Through them, we can get clues about the anatomy and lifestyle of the last common ancestor that we all share, and this adds further evidence to the hypothesis that the ancestor was a filter-feeder like *Oesia*."

Professor Simon Conway Morris, from St John's College, University of Cambridge and a co-author, said: "*Oesia* fossils are pretty enigmatic - they are very rare and until now we could not prove which group they belonged to. Now we know that they were primitive hemichordates - perhaps the most primitive of all."

The study was possible thanks to the discovery of a rich source of fossilised remains near Marble Canyon, in the Canadian Rockies (Kootenay National Park, B.C.), which is run by Parks Canada.

"Marble Canyon is one of the most recently discovered fossil localities in the Burgess Shale, a geological formation known for its exceptional quality of fossil preservation," said co-author Dr. Jean-Bernard Caron, Senior Curator of Invertebrate Palaeontology at the Royal Ontario Museum and Associate Professor at the University of Toronto. "*Oesia* has been known from an older Burgess Shale site for over 100 years, but the specimens from Marble Canyon are far more abundant and better preserved, giving us unprecedented details of the animal's internal anatomy."

The research establishes that *Oesia* was a rather phallic-shaped creature, similar to modern acorn worms with a proboscis, a collar, and a long trunk. Co-author Christopher B. Cameron, Associate Professor at the Université de Montréal said: "Acorn worms are notoriously sparse in the fossil record. Only a handful of fossil species have been described, making the recognition of such an ancient representative of the group particularly noteworthy."

The average *Oesia* was about 53mm long, and rarely more than 10mm wide. Unusually, these worms had U-shaped gills running down most the length of their bodies to enable filter feeding. Gill slits seem to be a characteristic common to all deuterostomes; even humans have slits in their necks at an early stage in their embryonic development, and this is seen as evidence that all deuterostomes are related to a distant, [common ancestor](#).



Researchers working at the Marble Canyon quarry site where the fossil remains were found. Credit: Karma Nanglu

The researchers realised that *Oesia* must have lived in tubes because among the Marble Canyon finds there are dozens of examples where the fossil remains of the worm are found within those of *Margaretia*.

Since the 1920s, *Margaretia* has been classified as a type of algae, albeit one unlike any other known species from this period in prehistory. The direct association with *Oesia* explains why *Margaretia* looks so exotic: This was no seaweed, but rather a perforated tube-like structure that the worm inhabited.

The study suggests that in some cases these structures exceeded 50cm in height and that they were typically at least twice the width of the worm, giving it plenty of room. The ends were sealed off, making life inside a rather lonely experience. "Only single worms are found within tubes, suggesting a solitary mode of life," Nanglu added.

At some point, the [fossil record](#) suggests that acorn worms underwent a transition, leaving their tubes and instead opting for a life under the sea bed. The study argues that as evolution gathered pace and more predators appeared on the scene, digging into the sea floor may simply have been a safer option. Certainly, modern-day acorn worms have adopted this lifestyle; rather than filter feeding they live in the sediment and eat nutrients within it.

"In its own depressing way this is a story of Darwinian competition," Conway Morris explained. "The levels of competition and predation

increased, life sped up and got harder, and animals had to protect themselves more. One way of doing this was to abandon life filter feeding in a tube, and instead to dig into the sediment and eat mud. Once there, they found a new niche and were able to make a perfectly good life for themselves."

More information: The study, Cambrian suspension-feeding tubicolous hemichordates, is published in the journal *BMC Biology*.

Provided by University of Cambridge

Citation: The secret to an Oesia life: Prehistoric worm built tube-like 'houses' on sea floor (2016, July 6) retrieved 11 May 2024 from <https://phys.org/news/2016-07-secret-oesia-life-prehistoric-worm.html>

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