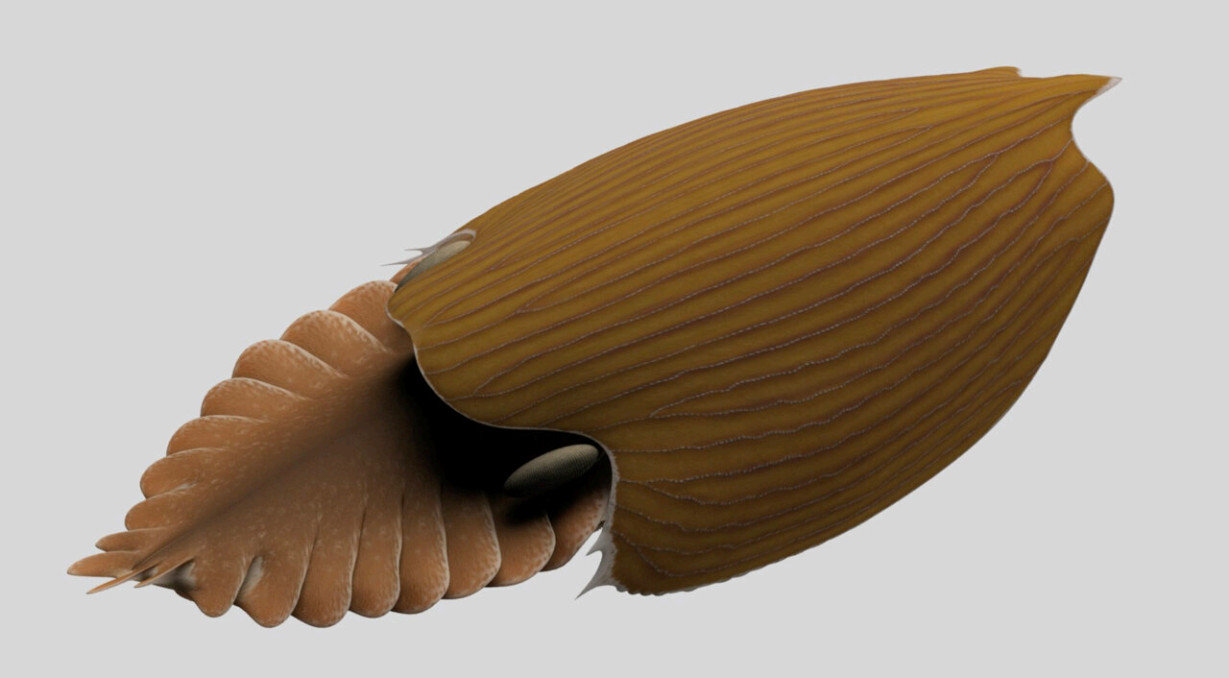
Massive new animal species discovered in half-billion-year-old Burgess Shale

September 8 2021



View of Titanokorys gainesi reconstruction. Credit: Lars Fields, © Royal Ontario Museum

Palaeontologists at the Royal Ontario Museum (ROM) have uncovered the remains of a huge new fossil species belonging to an extinct animal group in half-a-billion-year-old Cambrian rocks from Kootenay National Park in the Canadian Rockies. The findings were announced on September 8, 2021, in a study published in *Royal Society Open Science*.

Named *Titanokorys gainesi,* this new species is remarkable for its size. With an estimated total length of half a meter, *Titanokorys* was a giant compared to most animals that lived in the seas at that time, most of which barely reached the size of a pinky finger.

"The sheer size of this animal is absolutely mind-boggling, this is one of the biggest animals from the Cambrian period ever found," says Jean-Bernard Caron, ROM's Richard M. Ivey Curator of Invertebrate Palaeontology.

Evolutionarily speaking, *Titanokorys* belongs to a group of primitive arthropods called radiodonts. The most iconic representative of this group is the streamlined predator *Anomalocaris*, which may itself have approached a meter in length. Like all radiodonts, *Titanokorys* had multifaceted eyes, a pineapple slice-shaped, tooth-lined mouth, a pair of spiny claws below its head to capture prey and a body with a series of flaps for swimming. Within this group, some species also possessed large, conspicuous head carapaces, with *Titanokorys* being one of the largest ever known.

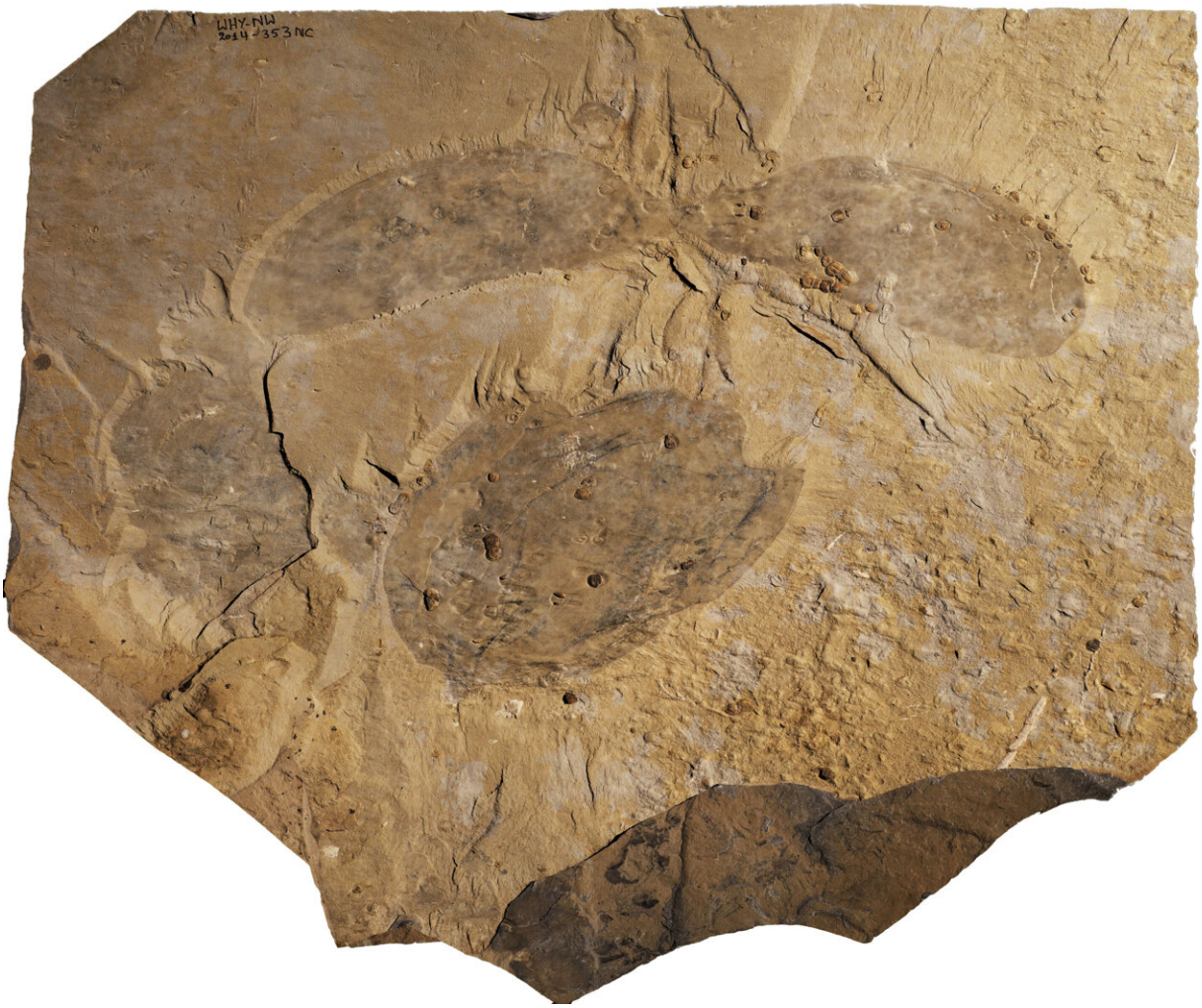
Fossil of Titanokorys gainesi carapace close up. Credit: Jean-Bernard Caron, © Royal Ontario Museum

"*Titanokorys* is part of a subgroup of radiodonts, called hurdiids, characterized by an incredibly long head covered by a three-part carapace that took on myriad shapes. The head is so long relative to the

body that these animals are really little more than swimming heads," added Joe Moysiuk, co-author of the study, and a ROM-based Ph.D. student in Ecology & Evolutionary Biology at the University of Toronto.

Why some radiodonts evolved such a bewildering array of head carapace shapes and sizes is still poorly understood and was likely driven by a variety of factors, but the broad flattened carapace form in *Titanokorys* suggests this species was adapted to life near the seafloor.

"These enigmatic animals certainly had a big impact on Cambrian seafloor ecosystems. Their limbs at the front looked like multiple stacked rakes and would have been very efficient at bringing anything they captured in their tiny spines towards the mouth. The huge dorsal carapace might have functioned like a plough," added Dr. Caron, who is also an Associate Professor in Ecology & Evolutionary Biology and Earth Sciences at the University of Toronto, and Moysiuk's Ph.D. advisor.



The carapace of Titanokorys gainesi (lower) along with two symmetrical rigid plates (upper) that covered the head from the underside. All together they form a three-part set of armour that protected the head from all sides. The illustration "Titanokorys gainesi, viewed from the front" shows them wrapping around behind the mouth and claws. Credit: Jean-Bernard Caron, © Royal Ontario Museum

All fossils in this study were collected around Marble Canyon in northern Kootenay National Park by successive ROM expeditions. Discovered less than a decade ago, this area has yielded a great variety of

Burgess Shale animals dating back to the Cambrian period, including a smaller, more abundant relative of *Titanokorys* named *Cambroraster falcatus* in reference to its Millennium Falcon-shaped head carapace. According to the authors, the two species might have competed for similar bottom-dwelling prey.

The Burgess Shale fossil sites are located within Yoho and Kootenay National Parks and are managed by Parks Canada. Parks Canada is proud to work with leading scientific researchers to expand knowledge and understanding of this key period of earth history and to share these sites with the world through award-winning guided hikes. The Burgess Shale was designated a UNESCO World Heritage Site in 1980 due to its outstanding universal value and is now part of the larger Canadian Rocky Mountain Parks World Heritage Site.

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Dr. Jean-Bernard Caron, Richard M. Ivey Curator of Invertebrate Palaeontology, Royal Ontario Museum, seated above a fossil of Titanokorys gainesi at the quarry site located in Kootenay National Park. Credit: Joe Moysiuk, © Joseph Moysiuk

The discovery of *Titanokorys gainesi* was profiled in the CBC's *The Nature of Things* episode "First Animals." These and other Burgess Shale specimens will be showcased in a new gallery at ROM, the Willner Madge Gallery, Dawn of Life, opening in December 2021.

More information: A giant nektobenthic radiodont from the Burgess Shale and the significance of hurdiid carapace diversity, *Royal Society Open Science*, royalsocietypublishing.org/doi/10.1098/rsos.210664

Provided by Royal Ontario Museum

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