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News and Highlights

An extraordinary multielement apparatus of conodont *Nicoraella* from the Middle Triassic Luoping Biota, southwest China

Jin-yuan Huang*

Chengdu Center, China Geological Survey, Chengdu 610081, China

Conodont animal is an extinct group of marine animals. The conodont elements and their hard skeletal remains are originally from the head region of this kind of animal, and they are considered to be functioned as “teeth”. The “multielement apparatus” can also be called the “(conodont) apparatus”, “multimembrate (skeletal) apparatus”, or “(conodont) feeding apparatus”, which are composed of more than one type of conodont element. The different types of conodont elements with regular arrangement form different types of apparatus, hence there are a large number of different types of apparatus from the Late Cambrian to the end of the Triassic.

The morphology and position of elements in the apparatus are keys to understanding the taxonomy, homology, evolutionary relationships, structure, function and feeding mechanisms among the different taxa of conodont animals. However, the apparatus reconstructions of most species are equivocal due to they have been inferred from loose element collections, guided by knowledge from rare articulated “bedding plane assemblages” and fused clusters, often from distantly related taxa. Even those natural assemblages can also be difficult to interpret because the component elements can be closely juxtaposed or embedded in the matrix, making it hard to diagnose the morphology of each element and their relative positions within the architecture of the apparatus. Fortunately, lots of well-preserved conodont clusters collected from the Middle Triassic Luoping Biota provide a good chance to reconstruct a precise apparatus of the conodont *Nicoraella*. The new apparatus is significant because it could finally confirm the element position of the genera *Cypridodella* (S_1) and *Enantiognathus* (S_2) in the apparatus, and it promotes further review of the composition of

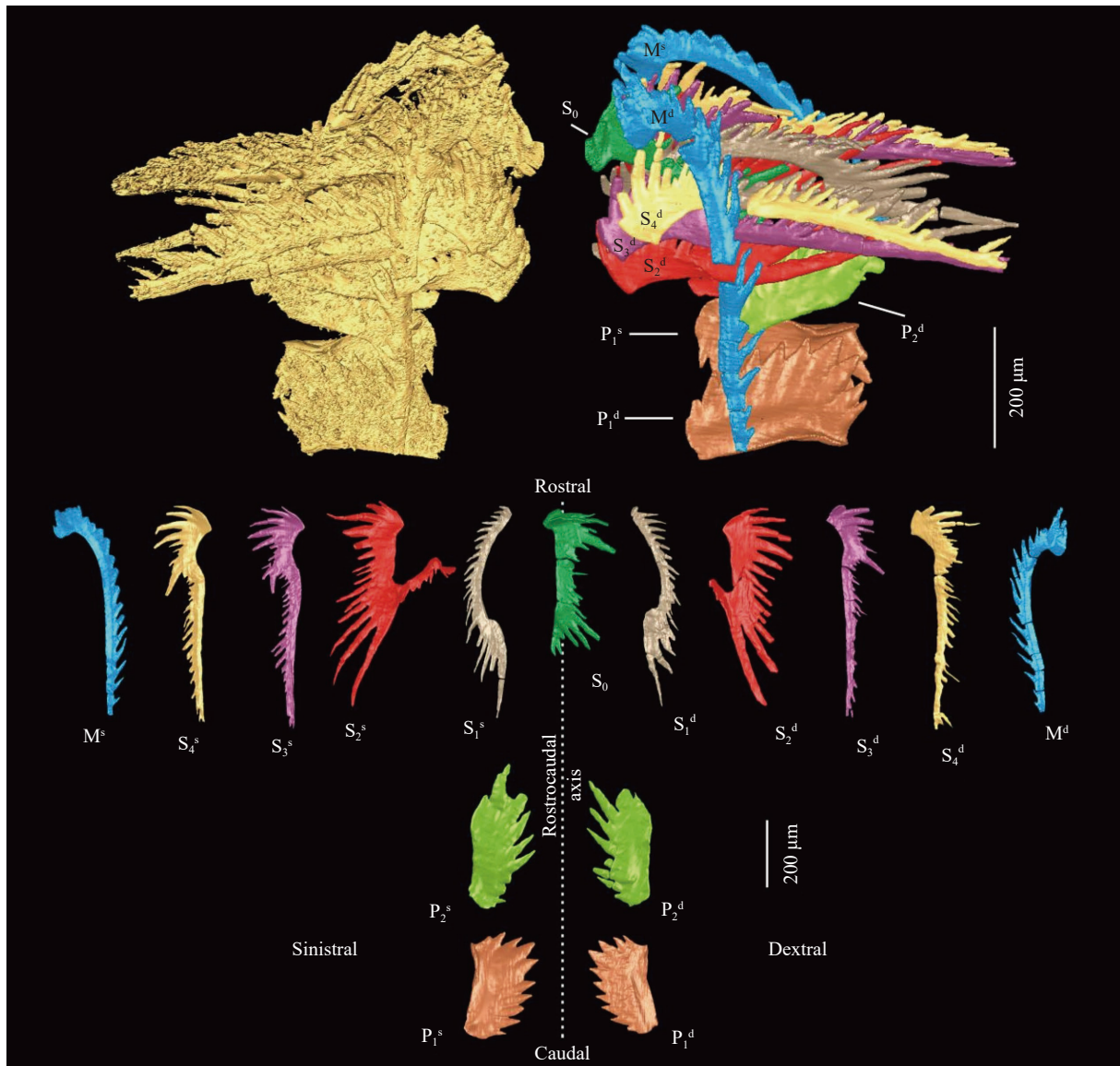
apparatus in the superfamily Gondolelloidea. It also provides an opportunity to understand the apparatus architecture beyond the interpretations based on the knowledge of Carboniferous polygnathacean ozarkodinins.

The upper part of the cover picture shows a complete conodont cluster (see the picture and cover), it comes from bed 18 in the Dawazi Section (catalogue no.: pm028-18-wy1-C1), includes nine S elements, two M elements, two P_1 elements, and two P_2 elements. The ventral surfaces of the S_2 – S_4 elements are parallel to each other in dextral and sinistral views. The S_1 elements are sandwiched between the two lateral processes of the S_2 elements. The S_0 element is located in the innermost part of the cluster, and it is oriented at an oblique angle to all of the other S elements. The dextral and sinistral denticles of the P_1 and P_2 elements are occluded, and they are fused to the S elements, connected by the only remaining process of the dextral M element, and the opposing M elements flanking the outside of ramiform S elements.

With the aid of non-invasively technology of synchrotron radiation X-ray tomographic microscopy (SRXTM), revealing the morphology and positional homology of the component elements in fused clusters. Based upon the cluster of pm028-18-wy1-C1, the skeletal plan and topological scheme of notations of the whole *Nicoraella* apparatus are presented along with the elements, as shown in the lower part of the cover picture. The *Nicoraella* apparatus consists of 15 elements, a single alate element is located at the S_0 (*Hibbardella*) position, flanked successively abaxially by pairs of breviform digyrate S_1 (*Cypridodella*) and S_2 (*Enantiognathus*) elements, bipennate S_3 and S_4 elements (*Hindeodella*), and a pair of inwardly curved breviform digyrate M (*Cypridodella*) elements. Carminate elements take the P_1 (*Nicoraella*) positions, and carminate or segminate elements occupy the P_2 (*Xaniognathus*) positions.

The related research results were published in papers by Huang JY et al. (2019a, 2019b, 2019c, 2021).

* Corresponding author: E-mail address: hjinyuan69@qq.com (Jin-yuan Huang).



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