

The largest Eugaleaspiform *Nochelaspis* reoccurred in the 420-million-year-old 'ancient fish kingdom'

November 1 2021, by Li Yuan

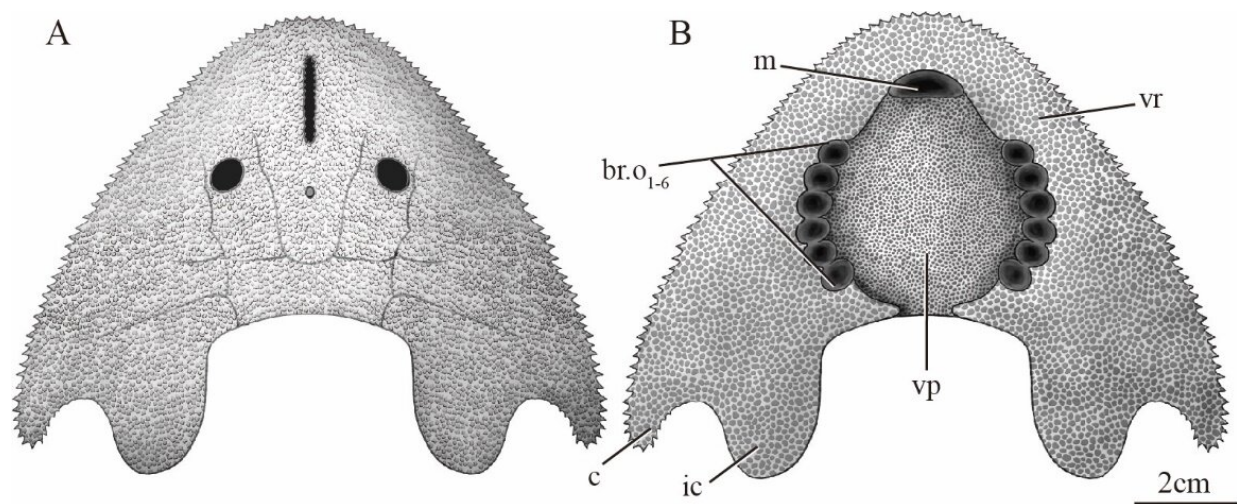


Fig. 1 Restoration of *Nochelaspis maeandrine* in dorsal (A) and ventral (B) views. Credit: YANG Dinghua

New findings concerning the ~420-million-year-old fossil *Nochelaspis maeandrine* found in Qujing have helped unveil the mystery of the largest known eugaleaspiform, according to researchers from the Institute of Vertebrate Paleontology and Paleoanthropology (IVPP) of the Chinese Academy of Sciences.

Their study was published in *Vertebrata Palasiatica* as a cover story.

Qujing, located in Yunnan Province, southwestern China, has been acclaimed as the "lost ancient fish kingdom." Its [fossil](#) resources, especially its abundant ancient [fish](#) fossil resources, have decoded numerous secrets of [vertebrate](#) evolution.

In 1987, ZHU Min, a paleoichthyologist from IVPP, found a complete galeaspid headshield in Qujing. He named it *Nochelaspis maeandrine* in *Vertebrata PalAsiatica*. The generic name derived from its large charmingly naive headshield, while its specific name meant roaming in the water for food.

The holotype of *N. maeandrine* was a nearly complete headshield, which revealed the key morphological characteristics of the dorsal side of the headshield. However, because of the scarcity of material, morphological information from the ventral side of the headshield was absent.

"Over the past 30 years, we've been trying to find new fossils of *N. maeandrine*. But it is impossible to carry out excavation, since the south gate of Qujing, where the fossil site is located, has become a cultural site," said GAI Zhikun, an associate researcher at IVPP and corresponding author of the study.

Fortunately, the researchers found a previously unnoticed specimen of *N. maeandrine* among the specimens collected by ZHU Min in 1987. In 2018, they also found another nearly complete headshield from the Xishancun Formation near the Miandian Reservoir, where a large amount of dark gray siltstone piled up along with the construction of a tunnel through the Liaokuo Hill.

These new findings helped the researchers obtain morphological information from the ventral side of the headshield of *N. maeandrine*.

The early diversified eugaleaspid forms are all small-sized fishes with their

headshield length less than 40 mm. The maximum length of the headshield of *N. maeandrine* is about 160 mm, indicating that *N. maeandrine* is the largest known eugaleaspiform, to our knowledge.

The two new specimens redefined the characteristics of *N. maeandrine*, including its triangular headshield, slit-like median dorsal opening (length/width > 6) with a sawtooth-like edge, dermal ornamentations composed of coarse stellate tubercles, and a more robust inner cornual process with the posterior end far beyond the posterior margin of the cornual process.

Moreover, the new specimens have unraveled the mystery of the ventral side of the headshield in *N. maeandrine* for the first time. The headshield curves ventrally to form a flat ventral rim, embracing a large pear-shaped oralbranchial fenestra. The branchial fenestra is covered by a ventral plate.

There are six pairs of successive round branchial openings symmetrically aligned along the lateral margins of the branchial fenestra. The mouth is assumed to be located at the front end of the oralbranchial fenestra. The ventral plate of *N. maeandrine* is large enough to have close contact with the ventral rim to shape the branchial openings.

"The new evidence suggests that the pouch-like gills of *N. maeandrine* open to the exterior ventrally by six separated, large, and circular branchial openings," said Meng Xinyuan, the first author of the study.

The external branchial openings or slits are distributed on both sides of the body in extant lampreys, hagfishes, and most jawed fishes. By contrast, the branchial openings of *N. maeandrine* are located ventrally, as in modern rays, which indicates a benthic lifestyle dwelling on sandy or muddy substrates in a quiet marine environment.

More information: Meng Xin-Yuan, Zhu Min, Gai Zhi-Kun, Redescription of *Nochelaspis maeandrine*, the largest eugaleaspiform from the Lower Devonian of Qujing, Yunnan, *Vertebrata Palasiatica* (2021). [DOI: 10.19615/j.cnki.2096-9899.210727](https://doi.org/10.19615/j.cnki.2096-9899.210727)

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