

# Morphometric analysis of the Late Famennian *Holoptychius* (Sarcopterygii, Porolepiformes) from the Ketleri Formation, Latvia

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The Upper Devonian porolepiform sarcopterygian *Holoptychius* Agassiz, 1839 is one of the most widely distributed vertebrates in the Paleozoic fossil record. *Holoptychius* is thought to exhibit a more ubiquitous lifestyle and greater dispersal potential than any other sarcopterygian taxon, consistent with its almost cosmopolitan distribution and rich fossil material, represented mainly by scales. More than 20 species, mostly represented by isolated, difficult-to-diagnose scales, were described within the genus *Holoptychius*.

Nowadays, it is agreed that the morphology of holoptychiid scales depends more on the location on the individual's body and age than on the species. Therefore, only some species are treated as valid: type species *Holoptychius nobilissimus* Agassiz and *H. flemingi* Agassiz from the Famennian of Scotland, *H. jarviki* Cloutier et Schultze from the Frasnian of Quebec, Canada, and *H. bergmanni* Downs, Daeschler, Jenkins, Shubin from the Frasnian of Arctic Canada.

W. Gross, for the first time, described fossil remains of *Holoptychius* from the Ketleri Formation (Fm) of Latvia in 1933. Since then, these remains, mostly scales, were determined by various authors as belonging to *Holoptychius* cf. *nobilissimus*, *H. cf. flemingi*?, *H. cf. giganteus*, *H. ex gr. nobilissimus* or *Holoptychius* sp. nov. The material of this study was collected during the last ten years from the three localities: the Pavāri-1 locality at the left bank of the Ciecere River opposite the destroyed farmhouse "Pavāri", Pavāri-2 site about 400 m downstream of Pavāri-1, and the Ketleri locality at the right bank of the Venta River close to the abandoned farmhouse "Ketleri". The material at the disposal of the authors contains 77 specimens (apart from scales), including disarticulated complete or fragmentary bones of the head, pectoral girdle and visceral skeleton, as well as partial jaws and separate jaw bones. Besides, several hundreds of scales of different sizes and shapes were collected, mostly from the Ketleri outcrops.

Linear and angle measurements of separate bones or skeletal elements such as the postparietal shield, as well as gular plates, cleithra and clavicles of *Holoptychius* from the Ketleri Fm were made, and the proportions were calculated. Two statistical methods, principal component analysis (PCA) and clustering, were used to perform the morphometric analysis of intraspecific variability and to compare the material with that of *H. nobilissimus*, *H. jarviki* and *H. bergmanni*. Scatter plots and cladograms were generated using the PAST programme. The comparison shows that the studied material of *Holoptychius* from the Ketleri Fm differs well from *H. nobilissimus* and *H. jarviki* by the maximal length, maximal width and two angles of the gular bone. It also differs significantly from *H. bergmanni* by the proportions of the occipital shield, as well as the proportions and shape of the cleithrum and clavicle.

The comparative morphological and morphometric analysis of the studied material and the material from some valid species of *Holoptychius* suggests that the material from the Ketleri Fm of Latvia could represent a new species.

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