Xenusion auerswaldae POMPECKJ 1927, a remarkable Lower Cambrian fossil in an erratic boulder from Hiddensee island – the "Halle specimen"

NORBERT HAUSCHKE[1] & SOPHIE KRETSCHMER[1]

Dedicated to Dr GÜNTER KRUMBIEGEL (1926 - 2014)

The noteworthy fossil *Xenusion auerswaldae* POMPECKJ 1927, which is embedded in an erratic boulder (Fig. 1), is one of the most valuable specimens preserved and scientifically supervised in the Geological and Palaeontological Collections of Martin Luther University Halle-Wittenberg. The sedimentary erratic boulder is a quartzitic sandstone with a characteristically red lamination, and can presumably be classified as the Lower Cambrian Kalmarsund Sandstone (File-Haidar-Formation; see RUDOLPH 2013), which crops out in southeastern Sweden.

After the first discovery of the fossil from Sewekow in Brandenburg, POMPECKJ (1927; see also JAEGER & MARTINSSON 1967) assigned it as the holotype of a new genus and species and named it *Xenusion auerswaldae*. The specimen is housed in the Palaeontological Collections of the Museum of Natural History at Humboldt University Berlin ("Berlin specimen"). In 1978 a second and well preserved find was made on Hiddensee island in the Baltic Sea. This specimen found its way into the collections of the "Geiseltalmuseum" (today: Geological and Palaeontological Collections of Martin Luther University Halle-Wittenberg; "Halle specimen"; Fig. 1) as a donation (KRUMBIEGEL, DEICHFUSS & DEICHFUSS 1980, DZIK & KRUMBIEGEL 1989, KRUMBIEGEL 1992). Both finds are therefore of special interest because in the "Berlin specimen" the back part of the fossil is preserved, and in the "Halle specimen" its front part, thus allowing a reconstruction of the animal (Fig. 2).

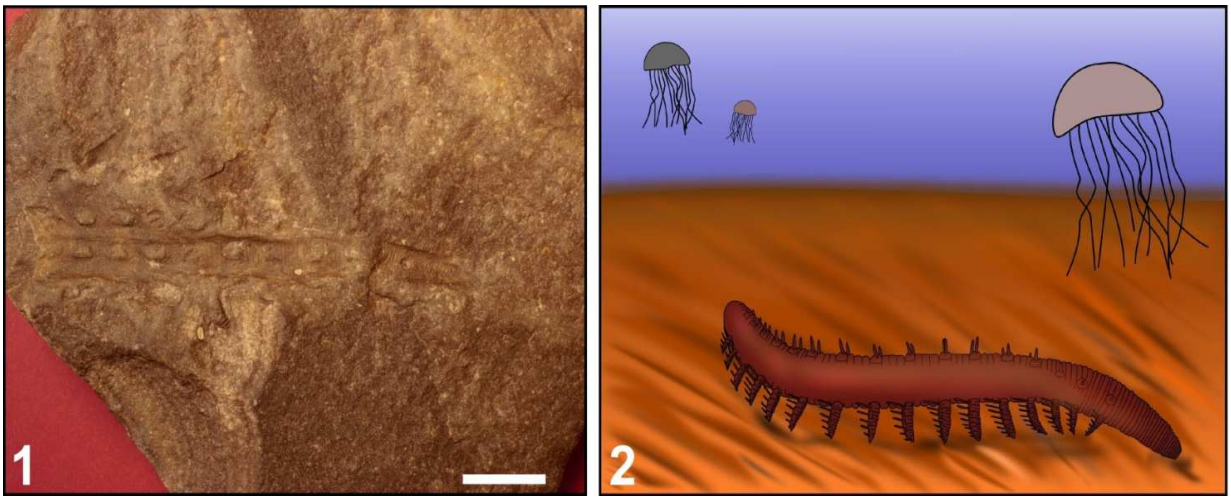

Fig. 1: *Xenusion auerswaldae* POMPECKJ 1927, the "Halle specimen". Preserved is the front part with the proboscis-like anterior end (right) and the middle part of the fossil with the dorsal cone-shaped humps and some of the lobopod limbs. Scale 2 cm.

Fig. 2: Reconstruction of *Xenusion auerswaldae*. The occurrence of jellyfish in the sedimentary environment of Lower Cambrian Kalmarsund Sandstone is hypothetical. Drawing: S. KRETSCHMER.

[1] Dr. Norbert Hauschke, Sophie Kretschmer, Martin-Luther-Universität Halle-Wittenberg, Institut für Geowissenschaften und Geographie, Von-Seckendorff-Platz 4, D-06120 Halle (Saale), E-Mail: norbert.hauschke@geo.uni-halle.de

Xenusion is one of the earliest bodily preserved fossil finds. Remarkable in these Protostomians is the bilateral symmetry of the animal, whose vermiform trunk on both sides bears lobopod limbs with backwards oriented spines. In the dorsal part of the body of *Xenusion* pairs of cone-shaped humps, which probably bore spines, are developed. In between the humps distinct transverse cuticular rings are visible, which are closely spaced at the proboscis-like anterior end. In this frontal part of the animal the cuticular rings are fully developed around the whole trunk, whereas in the middle and posterior parts the flanks remain structureless and smooth.

Examination of the holotype of *Xenusion* pointed to a close relationship between the new find and onychophoran-like animals, and it was previously discussed whether *Xenusion* could be related to the onychophoran species *Aysheaia pedunculata* from the Middle Cambrian Burgess Shale (POMPECKJ 1927, JAEGER & MARTINSSON 1967, DZIK & KRUMBIEGEL 1989). Comparing the modern terrestrial living und trachea-breathing onychophorans (e.g. the genera *Peripatus* or *Peripatoides*) with the Palaeozoic marine and probably gill-breathing protonychophorans, it seems obvious that these different forms belong to different taxonomic units. DZIK & KRUMBIEGEL (1989) supposed that the genera *Xenusion* and *Aysheaia* were ancestors of the modern Onychophora and Tardigrada. However, these authors established the new class Xenusia DZIK & KRUMBIEGEL 1989, which is at the same hierarchical level as classes Onychophora GRUBE 1853 and Tardigrada DOYÉRE 1840. All three classes were integrated in the subphylum Lobopodia SNODGRASS 1938. Due to specific characters of the body, DZIK & KRUMBIEGEL (1989, see also KRUMBIEGEL 1992) conceded a unique rank to *Xenusion* within the phylogeny namely in the transitional field between polychaete worms and arthropods.

Subsequent to the investigations of GÜNTER KRUMBIEGEL numerous papers were published, which are of much importance for the definition of the phylogenetic rank of *Xenusion*. In the focus were three famous Cambrian "Lagerstätten": the Lower Cambrian Maotianshan Shale with the Chengjiang fauna in southern Chinese province Yunnan, and the also Lower Cambrian Buen Formation in Sirius Passet in northern Greenland. Additionally, the well-known fauna of the Middle Cambrian Burgess Shale in British Columbia in southwestern Canada has to be considered. Furthermore, the Upper Carboniferous Mazon Creek fauna in Illinois, U.S.A., is of some importance with respect to finds of onychophorans (SELDEN & NUDDS 2007).

Current research carried out on numerous of ancient and newly-discovered finds of fossils from these "Lagerstätten" make it possible to visualize relationships between different taxa on the base of morphological parameters in the form of cladograms. This approach permits us to envisage *Xenusion* in a more comprehensive context (e.g. BUDD 1996, MA et al. 2010, 2013).

References:

BUDD, G. E. (1996): The morphology of *Opabinia regalis* and the reconstruction of the arthropod stem-group. – Lethaia, **29**: 1-14.

DZIK, J. & KRUMBIEGEL, G. (1989): The oldest 'onychophoran': a link connecting phyla? – Lethaia, **22**: 169-181.

HAUSCHKE, N. & KRETSCHMER, S. (2015): Xenusion auerswaldae POMPECKJ 1927, ein außergewöhnlicher Geschiebefund in den Geologisch-Paläontologischen Sammlungen der Martin-Luther-Universität Halle-Wittenberg. – Der Geschiebesammler, **48**: 47-57.

JAEGER, H. & MARTINSSON, A. (1967): Remarks on the problematic fossil *Xenusion auerswaldae*. – Geologiska Föreningens i Stockholm Förhandlingar, 88: 435-452.

KRUMBIEGEL, G. (1992): *Xenusion* – Bindeglied zwischen Tierstämmen? – Fossilien, **4/**92: 238-242.

KRUMBIEGEL, G., DEICHFUSS, H. & DEICHFUSS, H. (1980): Ein neuer Fund von *Xenusion*. – Hallesches Jahrbuch für Geowissenschaften, **5**: 97-99.

MA, X.Y., HOU, X.G. & BAINES, D. (2010): Phylogeny and evolutionary significance of vermiform animals from the Early Cambrian Chengjiang Lagerstätte. – Science China Earth Science, **53**: 1774-1783.

MA, X.Y., EDGECOMBE, G. D., LEGG, D. A. & HOU, X. G. (2013): The morphology and phylogenetic position of the Cambrian lobopodian *Diania cactiformis*. – Journal of Systematic Palaeontology, **12**: 445-457.

POMPECKJ, J.F. (1927): Ein neues Zeugnis uralten Lebens. – Palaeontologische Zeitschrift, **9**: 287-313.

RUDOLPH, F. (2013): Kalmarsund-Sandstein. – Der Geschiebesammler, **46**: 3-10.

SELDEN, P.A. & NUDDS, J.R. (2007): Fenster zur Evolution. Berühmte Fossilfundstellen der Welt. – 160 pp. (Elsevier, Spektrum Akademischer Verlag).