ACTA PALAEONTOLOGICA POLONICA

The stem crustacean *Oelandocaris oelandica* re−visited

Martin Stein, Dieter Waloszek, Andreas Maas, Joachim T. Haug, and Klaus J. Müller
Acta Palaeontologica Polonica 53 (3), 2008: 461-484 doi:http://dx.doi.org/10.4202/app.2008.0308

The arthropod *Oelandocaris oelandica* from the upper Middle Cambrian "Orsten" of Sweden was recently recognized as a member of the early phase of crustacean evolution based on additional morphological detail from new specimens. Here we present a detailed investigation of all available material. It includes the description of a 400 μm long specimen probably representing an early developmental stage. Variation in size correlated with variation of trunk−segment numbers allowed recognition of different instars. The largest specimens do not exceed an estimated length of about 1 mm, indicating that our material may consist only of immature specimens. The characteristic, extremely long antennula of *O. oelandica* branches into three long rods. It may have served as the major structure to sweep in food, aided by the two subsequent appendages. These and the more posterior limbs were also responsible for locomotion. Minute pores on the outer edges of the posterior limbs and on the trunk tergites possibly contained sensilla originally, which may have served as water−current detectors. The presence of a minute proximal endite only on the third head appendage suggests a rather basal position of this species within Crustacea, because comparable developmental stages of other known stem crustaceans have such an endite on more of their appendages. Reconstruction of *O. oelandica* and its life attitudes (referred to the largest instar known) benefited from the application of 3D modelling. These helped, e.g., in identifying the combination of the plesiomorphic feeding function of the antennulae and the specialisation of the exopods of the next two appendages as a step toward the development of a sweep−net mode of feeding, one of the key novelties in the evolution of Crustacea. Such a mode of feeding coupled with locomotion of the three anterior appendages is still practiced in the naupliar and metanaupliar phases of many extant eucrustaceans, and even some adults.

Key words: Crustacea, Arthropoda, morphology, life habits, sweep−net feeding, evolution, phylogeny, stem lineage, computer−aided 3D modelling

Martin Stein [martin.stein@geo.uu.se], Department of Earth Sciences (Palaeobiology), Uppsala University, Villavägen 16, 75236 Uppsala, Sweden; Dieter Waloszek [dieter.waloszek@uni−ulm.de], Andreas Maas [andreas.maas@uni−ulm.de], and Joachim T. Haug [joachim.haug@uni−ulm.de], Biosystematic Documentation, University of Ulm, Helmholtzstrasse 20, 89081 Ulm, Germany; Klaus J. Müller, Institute of Palaeontology, University of Bonn, Nussallee 8, 53115 Bonn, Germany.

Full text (2,020.8 kB) |
Supplementary file (102.7 kB)