Geobios 45 (2012) 335–338

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Original article

A new xandarellid arthropod from the Chengjiang Lagerstätte, Lower Cambrian of Southwest China☆

Xingliang Zhang *, Dongjing Fu, Tao Dai

Department of Geology, State Key Laboratory for Continental Dynamics, Northwest University, 710069 Xian, PR China

ARTICLE INFO

Article history:
Received 3 March 2011
Accepted 29 September 2011
Available online 19 May 2012

Keywords:
Luohuilinella nov. gen.
Xandarellida
Arthropoda
Cambrian
Chengjiang biota

ABSTRACT

A new arthropod, *Luohuilinella rarus* nov. gen., nov. sp., is described from the Lower Cambrian Chengjiang Lagerstätte (Series 2, Stage 3), Yunnan, Southwest China. *Luohuilinella* nov. gen. is extremely rare in this Lagerstätte, represented by a single specimen. It has a large cephalic shield and a tapering trunk with well-developed pleural field. The cephalic shield is crescentic in outline and its anterolateral margin has two notches. The trunk is weakly trilobate, composed of 27 distinct tergites with well-developed pleural spines and a terminal piece. *Luohuilinella* nov. gen. resembles xandarellids in overall body architecture and especially in the reduced first trunk tergite. Its ventral morphology is, however, presently unknown. Therefore, it is provisionally assigned to Xandarellida.

1. Introduction

The xandarellids (sensu stricto the Order Xandarellida Hou and Bergström, 1997) are a group of Cambrian lightly sclerotized trilobite-like arthropods with a large head shield, a tapering trunk, and a well-developed pleural fold. Representatives of the taxon Xanderellida are characterized by the reduction of the first tergite which has no pleura. Two genera (*Xandarella* Hou, Ramsköld and Bergström, 1991, and *Cindarell*a Chen, Ramsköld, Edgecome and Zhou in Chen et al., 1996) form the basis of the Xandarellida (Ramsköld et al., 1997). Another compelling support for xandarellids as a clade is the decoupling of tergites and segments in the posterior trunk. Together with *Sinoburius* Hou, Ramsköld and Bergström, 1991, the three genera from the Chengjiang biota seem to be a clade based on phylogenic analyses (Edgecombe and Ramsköld, 1999; Cotton and Braddy, 2004; Hendricks and Lieberman, 2008; Paterson et al., 2010). Their close relative may be *Phytophilaspis* Ivantsov and Yu, 1999 from the Lower Cambrian of the Siberian Platform (Bergström and Hou, 2003; Paterson et al., 2010). *Luohuilinella rarus* nov. gen., nov. sp. is here described under the Xandarellida based on its dorsal morphology.

2. Material and methods

The material described here was collected at the Mafang section (prefixed MF). It comes from the mudstone-dominated Yu'anshan Member of the Helinpu Formation (previously Qiongzhusi Formation), Cambrian Series 2, Stage 3, in Yunnan Province, China (Zhang et al., 2001, 2008). The detailed locality information was given by Zhang et al. (2007). This species is extremely rare in the Chengjiang biota and represented only by a single specimen, which is deposited in the Early Life Institute and Department of Geology, Northwest University, China (ELI prefix). The fossil is preserved as partly flattened impressions on slabs of mudstone. Photographs were taken with a tungsten lamp illumination at low angles to the plane of the specimen to enhance the relief of a compressed fossil.

Terminology for dorsal exoskeleton follows Hou and Bergström (1997) as far as possible. A tergite is a skeletal element on the dorsal side of the animal. Tergites cannot be confined to segments and decoupling of tergites and segments in the trunk may be shown. For example, one tergite may cover more than one segment. Thus, the number of tergites could not represent that of the segments in the trunk. The terminal piece refers to the posteriormost tergite and has no phylogenetic implications.

3. Systematic paleontology

Phylum ARTHROPODA

Order? XANDARELLIDA Chen, Ramsköld, Edgecombe and Zhou in Chen, Zhou, Zhu and Yeh, 1996

☆ Corresponding editor: Jean Vannier.

* Corresponding author.
E-mail address: xzhang69@nwu.edu.cn (X. Zhang).

0016-6995/$ – see front matter © 2012 Published by Elsevier Masson SAS.
http://dx.doi.org/10.1016/j.geobios.2011.09.001

Remarks: Two families were erected under the order Xandarellida. The family Xandarellidae comprises two genera: *Xandarella* and *Cindarella*, both of which are monotypic and preserved with ventral morphology; the family Almeniidae Hou and Bergström (1997) is monogeneric, represented by the monotypic genus *Almenia* (Hou and Bergström, 1997). However, *Almenia spinosa* was regarded as synonymous with *Cindarella eucalla* by Edgecombe and Ramsköld (1999), thus Almeniidae is untenable. In addition, the new genus described below is based only on dorsal morphology and detailed comparison to other species within Xandarellida is unavailable. Therefore, its taxonomic assignment at the family level remains uncertain.

Genus **Luohuilinella** nov. gen.

Derivatio nominis: In honor of Luo Huilin, who worked extensively on the Cambrian stratigraphy and biotas in the Yunnan Province, China.

Type species: *Luohuilinella rarus* nov. gen., nov. sp.

Diagnosis: As for species.

Luohuilinella rarus nov. gen., nov. sp.

Figs. 1, 2

Derivatio nominis: *rarus*, Latin for rare, in reference to the rareness of this species.

Type and only known material: ELI-MF1002.

Occurrence: Fafang section, Yu'anshan Member, Helinpu Formation, Lower Cambrian Series 2, Stage 3, Yunnan Province, China.

Diagnosis: Arthropod with well-developed pleural fold, subelliptical shape and weakly trilobite. Head shield crescentic in outline, one-third of the total length; anterolateral margin notched. Posterior section composed of 27 distinct tergites with well-developed pleural spines and a terminal piece; anteriormost tergite reduced, tergites 2–7 almost straight, and tergites 8–27 curved in dorsal aspect compared to anterior ones, the curvature of these tergites increasing posteriorly so that the posterior 16 tergites are highly curved to semicircular in dorsal aspect.

Description: A single, nearly complete specimen (Fig. 1(a, c)), the head shield and anterior trunk in parallel aspect and the posterior trunk in oblique aspect. General shape subelliptical, about 16.8 mm long and 8.8 mm wide; maximum width at second and third tergites. Head shield crescentic in dorsal view, weakly trilobate, approximately 30% of total body length. A pair of drop-shaped notches present in the anterolateral margin, probably accommodating ventral eyes (Fig. 1(b)). Posterior margin curves slightly forward; posterolateral corners form acute genal angles. Trunk tapers backward, consisting of 27 tergites and the terminal piece. Axial region weakly defined, occupying about one-third of the tergal width in the anterior five trunk tergites, and thereafter decreases gradually to a quarter to one-fifth of the tergal width. First tergite small, lacking pleural field; the remaining tergites showing broad pleural fold and well-developed pleural spines, excepting for the terminal piece. Tergites 2–4 with roughly equal length (sag.) and width (tr.), slightly wider than the head shield. Both width and length decrease posterior to the fourth tergite. Anterior seven tergites straight or gently curved forward; the curvature of the remaining tergites increases backward, resulting in pleural regions deflected posteriorly. Pleural spines are falcate in the second to fourth tergites, grading into sickle-shaped in more posterior tergites. Length of pleural spines increases gradually backwards. Pleural regions of tergites 25–27 not revealed, and terminal piece small and rounded.

Fig. 1. *Luohuilinella rarus* nov. gen., nov. sp., type and only known specimen ELI-MF1002 with part (**a**) and counterpart (**c**); **b**. Close-up view of the right notch in the head shield; no, anterolateral notches in the head shield; rt, anteriormost reduced tergite.