

# Morphology and phylogenetic origin of the spinicaudatan *Neodiostheria* from the Lower Cretaceous Dalazi Formation, Yanji Basin, north-eastern China



Gang Li <sup>a,\*</sup>, Tohru Ohta <sup>b</sup>, David J. Batten <sup>c,d</sup>, Takashi Sakai <sup>e</sup>, Takeshi Kozai <sup>f</sup>

<sup>a</sup> State Key Laboratory of Palaeobiology and Stratigraphy, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing 210008, China

<sup>b</sup> Department of Earth Sciences, Faculty of Education and Integrated Arts and Sciences, Waseda University, 1-6-1 Nishiwaseda, Shinjuku-ku, Tokyo 169-8050, Japan

<sup>c</sup> School of Earth, Atmospheric and Environmental Sciences, University of Manchester, Oxford Road, Manchester M13 9PL, UK

<sup>d</sup> Department of Geography and Earth Sciences, Aberystwyth University, Aberystwyth SY23 3DB, UK

<sup>e</sup> Department of Earth and Planetary Sciences, Kyushu University, Fukuoka 810-8560, Japan

<sup>f</sup> Laboratory of Geosciences, Faculty of Science, Naruto University of Education, Tokushima 772-8502, Japan

## ARTICLE INFO

### Article history:

Received 29 April 2015

Received in revised form

13 September 2015

Accepted in revised form 23 September

2015

Available online 11 November 2015

### Keywords:

Clam shrimps

*Neodiostheria*

Palaeontology

Lower Cretaceous

Dalazi Formation

China

## ABSTRACT

The spinicaudatan *Neodiostheria* Chen is an important component of the diverse Early Cretaceous *Yanjiostheria* fauna in eastern Asia. Examination under a scanning electron microscope of newly collected and well-preserved specimens of *Neodiostheria dalaziensis* Chen from the Albian Dalazi Formation of Zhixin, Jilin Province, north-eastern China, has revealed morphological features of the carapace not recognized previously, namely that puncta are not only evenly distributed on growth bands near the umbo and gradually merge into a punctate fine reticulation and dense radial lirae on each growth band in the upper-middle part of the carapace, but also occur on growth lines and within the lumina of a fine reticulum, and between radial lirae on growth bands in the middle and lower parts of the carapace. Growth bands in anteroventral, ventral and posteroventral parts of the carapace are also ornamented with transversely elongate large pits (depressions) surrounded by swellings, appearing as a large reticulum superimposed over fine reticulation and radial lirae. These ontogenetically developing morphological patterns on the growth bands of the juvenile stage of the carapace indicate that *Neodiostheria* is closely related phylogenetically to *Triglypta* Wang.

© 2015 Elsevier Ltd. All rights reserved.

## 1. Introduction

Spinicaudatans (clam shrimps, “conchostracans”) are small, bivalved, branchiopod crustaceans with a chitinous (Tasch, 1969, p. R142) or complex chitin-mineral (Astrop & Hegna, 2015) carapace. They have a geological history that extends back to the Devonian (Tasch, 1969; Li, Hirano, Kozai, Sakai & Pan, 2009; Li et al., 2009). During the Mesozoic they diversified very rapidly (Chen, Li & Batten, 2007). Their remains are commonly abundant and widely distributed in sediments that accumulated in quiet freshwater environments. This makes them very useful indicators for both palaeoenvironmental reconstructions and biostratigraphic

subdivision and correlation of non-marine successions (Boukhalfa, Li, Ben Ali & Soussi, 2015; Chen & Shen, 1985; Gallego & Martins-Neto, 2006; Gallego, Shen, Cabaleri & Hernández, 2010; Gallego, Monferran, Astrop & Zacarias, 2013; Kobayashi, 1973; Li et al., 2014; Li & Batten, 2004a; Rohn, Shen & Dias-Brito, 2005; Scholze & Schneider, 2015; Shen & Chen, 1982; Shen, Garassino & Teruzzi, 2002; Shen, Li & Chen, 2002; Vannier, Thiéry & Racheboeuf, 2003).

Spinicaudatans do not shed their carapaces during ecdysis (Tasch, 1969). Instead, their protective “shells” bear growth lines that reflect successive moultings of an inner chitinous, skeletal duplicature (Tasch, 1969, p. R143; Li et al., 2009). The ontogenetic development of an individual is, therefore, preserved in its carapace (Li & Batten, 2004b, 2005; Stigall & Hartman, 2008). This aids understanding of the probable rate and mode of growth of species (Li et al., 2009) and determination of their phylogeny (Li, Wang & Shen, 2006).

\* Corresponding author.

E-mail address: [gangli@nigpas.ac.cn](mailto:gangli@nigpas.ac.cn) (G. Li).

The spinicaudatan genus *Neodiesteria* Chen, in Zhang, Chen and Shen (1976) is an important common associate of the *Yanjiestheria* fauna that occurs widely in the non-marine Lower Cretaceous rocks of northern and south-eastern China, Korea and south-western Japan (Chen, Li & Batten, 2007). It was erected on the basis of specimens from the Albian (Lower Cretaceous) Dalazi Formation in the Yanji Basin of the Yanbian Korean Autonomous Prefecture, Jilin Province, north-eastern China (Chen, 2003; Zhang, Chen & Shen, 1976), and has been recovered subsequently from the Lower Cretaceous in the coastal region of south-eastern China and also in the north-west of the country. During the autumn of 2008, under the auspices of a joint project between Waseda University, Japan and the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences (NIGPCAS), specimens referable to this genus were collected from the type section of the Dalazi Formation, which crops out in the vicinity of Zhixin (previously Dalazi) village, Longjing County, along a road-cut (Fig. 1). An examination of these specimens under a scanning electron microscope (SEM) revealed important morphological features not previously seen, which are inferred to have evolutionary significance.

## 2. Sedimentological and palaeoenvironmental analysis

The Dalazi Formation crops out in both Longjing County within the Yanji Basin and Wangqing County (Fig. 1). The type section of the formation was examined in 2008, as noted above, and exposures of both the Longjing and Dalazi formations along a road cut were logged (Fig. 1). The results of our sedimentological study and the palaeoenvironmental conclusions drawn are shown in Fig. 2.

The Longjing Formation exhibits a marked upward-fining and bed-thinning cycle. The lower thick-bedded breccias are capped by alternating beds of conglomerate and red siltstone. The breccias in the lower part are mostly composed of matrix-supported debris-flow and trough-cross-stratified, traction-current deposits. This association probably represents alluvial-fan and braided-stream depositional environments. The upper part of the formation consists of lenses of conglomerate and coarse sandstone within red mudstone and siltstone. The red mudstone–siltstone facies occasionally contain traces of rootlets and calcrete nodules. These characters suggest a fluvial environment with deposition in meandering channels and over a floodplain.

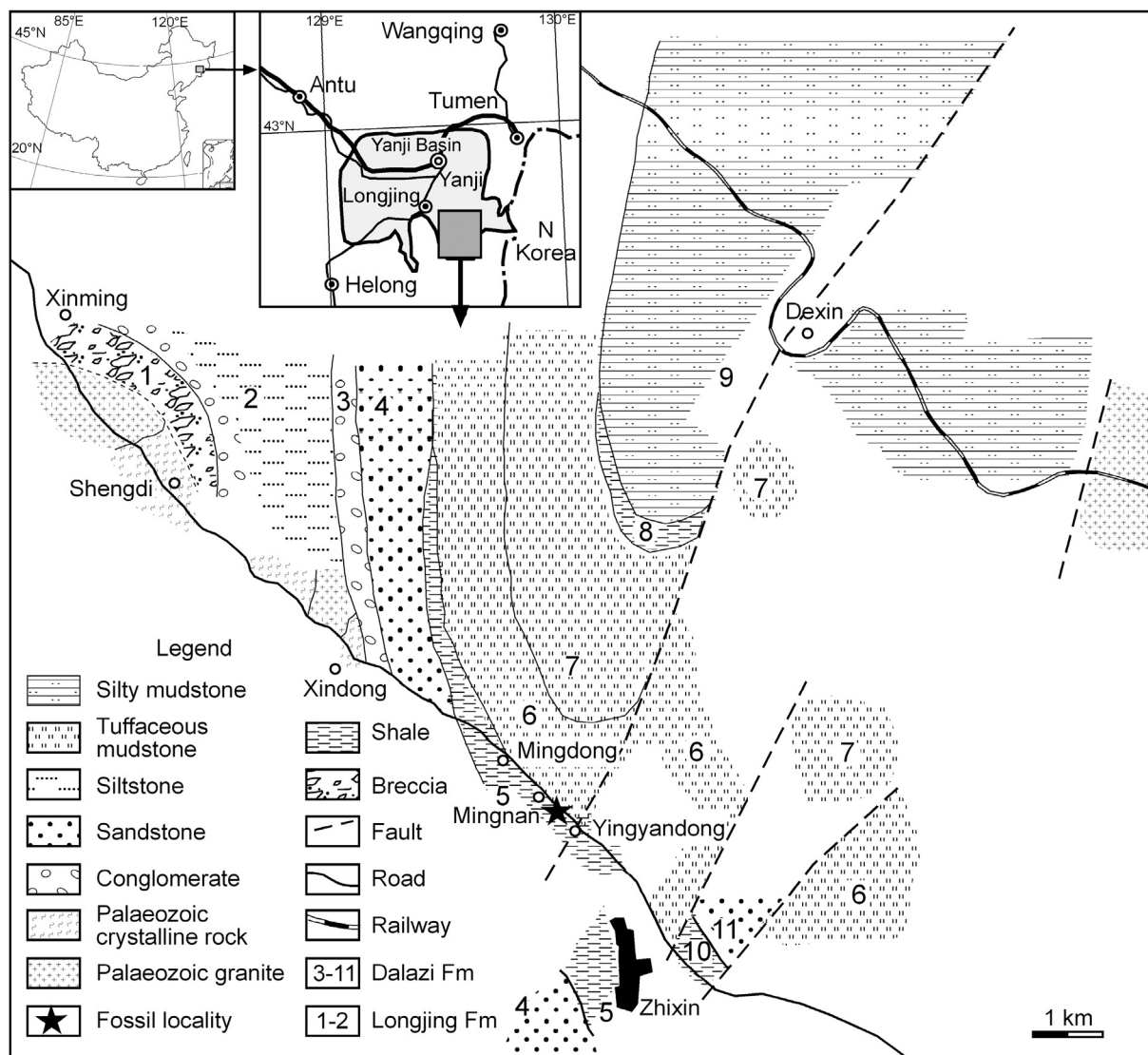


Fig. 1. Sketch maps showing the location of the road-cut section and fossil site to the south-east of Longjing, Jilin Province, north-eastern China (after Zhou et al., 1980).

Download English Version:

<https://daneshyari.com/en/article/4746652>

Download Persian Version:

<https://daneshyari.com/article/4746652>

[Daneshyari.com](https://daneshyari.com)