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Wangshangkia, a new Devonian ostracod genus from Dushan of Guizhou, South China

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Abstract. *Wangshangkia*, a new genus of Ostracoda, from the Late Devonian in Dushan of Guizhou, South China, is described. This genus belongs to the family Bairdiocyprididae Shaver, 1961 and includes two new species, i.e. *Wangshangkia dushaniensis* and *W. bailouiensis*. The new genus is characterized by a wide ventral carina with radial striae. It is reported from the Famennian of South China and disappeared just below the Devonian-Carboniferous boundary. *Wangshangkia* is essentially a benthic crawler and is restricted to the shallow-marine depositional environment with a low hydrodynamic condition.

Wangshangkia: urn:lsid:zoobank.org:act:34BF01D4-D202-492D-8E27-BC508EF7EFFB
W. dushaniensis: urn:lsid:zoobank.org:act:D267C362-7510-4D19-996B-EA1848D7D025
W. bailouiensis: urn:lsid:zoobank.org:act:FE988AA0-7363-4D9E-A5AB-1526C8DBCDD9

1 Introduction

Late Devonian ostracods from Dushan of Guizhou, South China are highly diversified and abundant (details in Song and Gong, 2018). The new genus (*Wangshangkia* n. gen.) belongs to the family Bairdiocyprididae Shaver, 1961. Until now the geographical occurrence of this new genus is restricted to the Guizhou Province. Both of the new species (i.e. *Wangshangkia dushaniensis* n. gen., n. sp. and *Wangshangkia bailouiensis* n. gen., n. sp.) are recognized in shallow-water deposits of semi-restricted carbonate platform (Ma et al., 2016). The ostracod-bearing strata also yield brachiopods (Yang, 1964, 1978; Zhang et al., 2011a), corals (Zhang et al., 2011a) and conodonts (Jiang, 1994; Qie et al., 2016) in association with a rich assemblage of ostracods, as well as trace fossils (Wang and Wang, 1996; Zhang et al., 2011b). The main goals of the paper are to provide a detailed description of the new genus (*Wangshangkia*) and its species (*W. dushaniensis* and *W. bailouiensis*) and to discuss their palaeoecological implications.

2 Geological setting and stratal section description

During the late Palaeozoic, the palaeogeographic frame of South China consists of the Yangtze–Cathysia continent and the southern South China Sea. During the Late Devonian the basement of the South China block beneath the epicontinental sea was cut by various intersected rifts, developing into a complex palaeogeography of shallow-water platforms separated by deep-water basins (Dong, 1982; Ma and Bai, 2002) (Fig. 1a). The Baihupo section (N 25°50′14.14″, E 107°30′26.56″) is located along the road from Bailou Village (Dushan County) to Feifengjing Village (Dushan County), about 3 km southwest of Dushan City, Guizhou (Fig. 1a). It crops out along the west limb of the Dushan anticline and displays the most complete Devonian–Carboniferous (D–C) transitional beds. Biostratigraphy and sedimentology have been studied in detail at the Baihupo section (Wang and Wang, 1996; Wang, 2001; Zhang et al., 2011a, b). The studied section shows a continuous sedimentary succession from the Late Devonian to early Carboniferous with the Zhe-

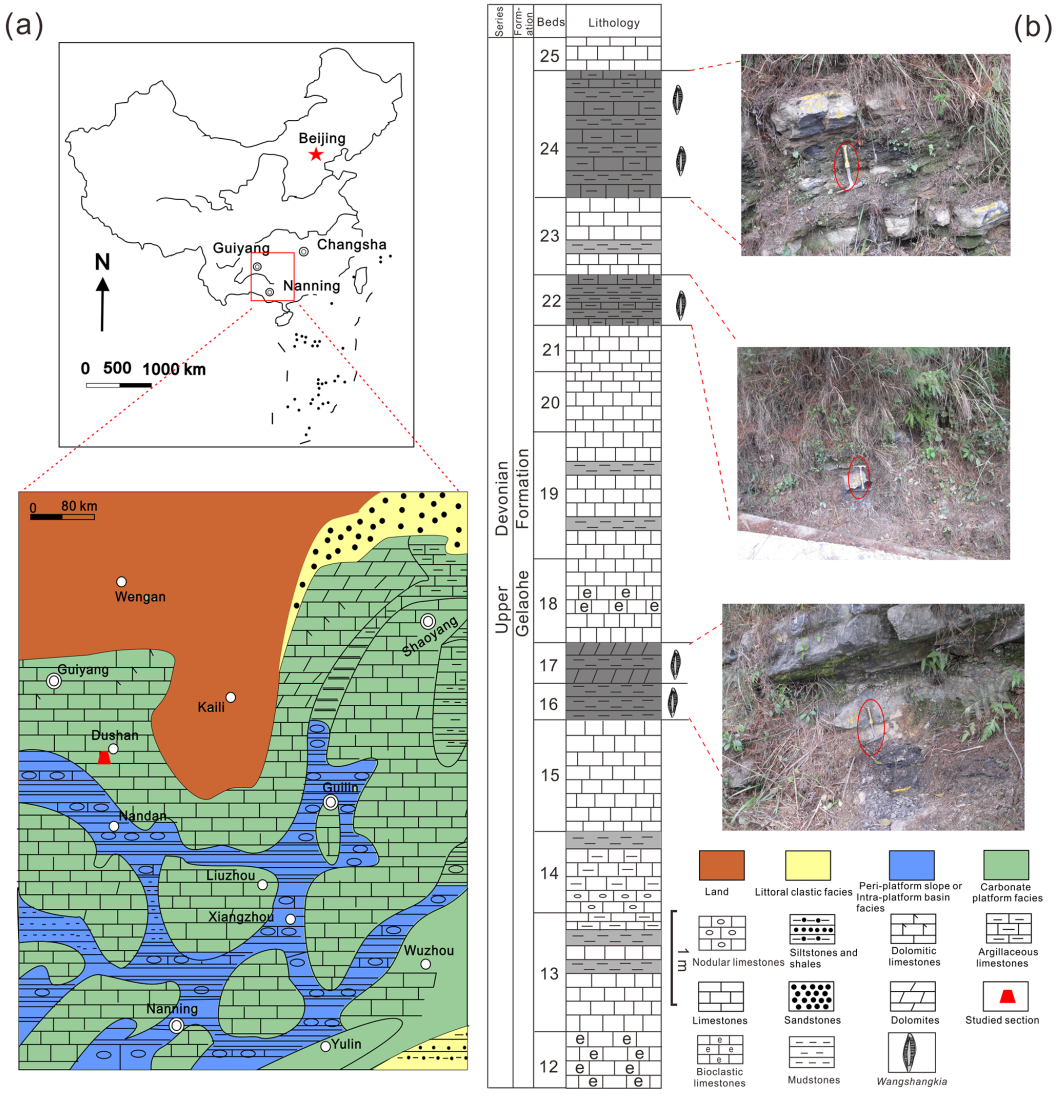

Figure 1. **(a)** Late Devonian lithofacies and palaeogeography of South China (modified after Ma et al., 2016) with the location of the studied section. **(b)** Late Devonian sequence and field photographs in the Dushan area (Guizhou, China), showing the stratigraphic position of *Wangshangkia* n. gen.

wang, Gelaohe and Tangbagou formations in ascending order. Among them, the Gelaohe Formation (58.5 m thick), which is dated to the Famennian (Zhang et al., 2011a), can be divided into three parts. The lower part (Beds 1–7) is composed of grey to dark grey thick-bedded bioclastic limestones intercalated with thin-bedded shales and mudstones; the middle part (Beds 8–20) is about 27 m thick and is characterized by dark grey thin-bedded shales interbedded with wackstones and bioclastic limestones; the upper part (Beds 21–28) is about 15.6 m thick consisting of dark grey thin-bedded argillaceous limestones intercalated with mudstones. The stratigraphic range of *Wangshangkia* is limited to the Gelaohe Formation (mainly in the Beds 16–24) (Fig. 1b).

3 Materials and methods

A total of 30 samples were collected from the Zhewang and Gelaohe formations in the Baihupo section and each sample weighted about 1000 g. The methodology, known as "hot-acetolysis", was used to extract ostracods from limestones (Lethiers and Crasquin-Soleau, 1988; Crasquin-Soleau et al., 2005). About 3000 specimens were obtained from the Baihupo section, contributing to 37 species belonging to 25 genera (Song and Gong, 2018). Among them, the new genus is represented by about 85 specimens including single valves and carapaces from five samples (Fig. 1b). All specimens shown in this paper are deposited in the palaeontological collections of the museum of the China University of Geosciences (Wuhan) (collection DSBL2014).

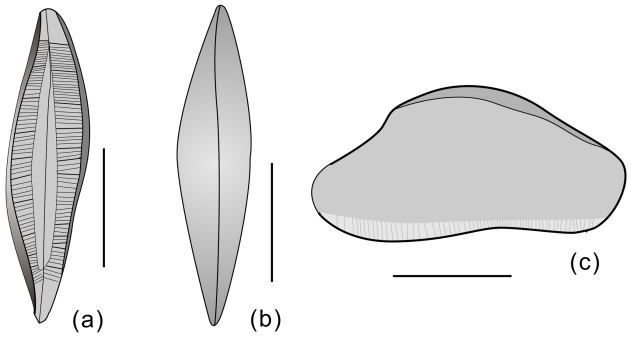

Figure 2. Interpretative drawing of the ventral view **(a)**, dorsal view **(b)** and right lateral view **(c)** of the holotype of *Wangshangkia dushaniensis*. All scale bars represent 500 µm.

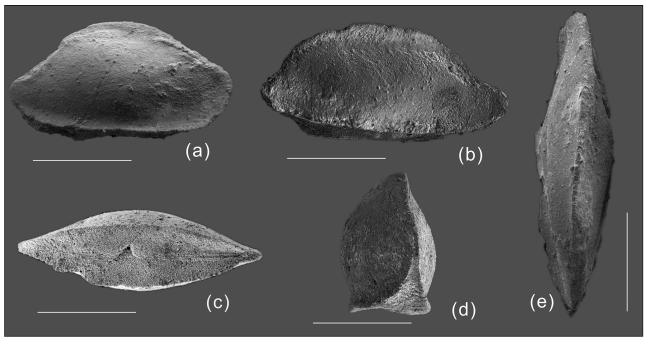

Figure 3. *Wangshangkia dushaniensis* n. gen., n. sp. **(a)** Holotype, right lateral view of complete carapace; DSBL2014001. **(b)** Paratype, left lateral view of complete carapace; DSBL2014002. **(c)** Paratype, ventral view of complete carapace; DSBL2014003. **(d, e)** Paratype, anterior and dorsal views of complete carapace, respectively; DSBL2014004. All scale bars represent 500 µm.

4 Systematic palaeontology

Abbreviations: AB, anterior border; PB, posterior border; DB, dorsal border; ADB, anterodorsal border; VB, ventral border; L, maximum length; H, maximum height; W, maximum width.

Class **Ostracoda** Latreille, 1806

Order **Podocopida** Sars, 1866

Superfamily **Bairdiocypridoidea** Shaver, 1961

Family **Bairdiocyprididae** Shaver, 1961

Genus *Wangshangkia* n. gen.

Type species: *Wangshangkia dushaniensis* n. sp.

Other species: *Wangshangkia bailouiensis* n. sp.

Diagnosis: Large Bairdiocyprididae convex-backed in lateral outline. Left valve distinctly larger than right valve. Ventral carina developed with radial striae. Wide contact surface at ventral view.

Etymology: In honour of Professor Wang Shangqi from the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, who made a contribution to Palaeozoic ostracod study of South China.

Occurrence: Known only from the Gelaohe Formation (Late Devonian) exposed in the Baihupo section in Dushan, Guizhou, South China.

Remarks: *Wangshangkia* n. gen. has some resemblance to *Xixionopsis* Becker and Sanchez de Posada, 1977, but the new genus is distinguished from *Xixionopsis* by the wide ventral carina with radial striae, and without spines or flanges anteriorly.

Wangshangkia dushaniensis n. sp.

(Figs. 2, 3)

Holotype: One complete carapace (Figs. 2, 3a), DSBL2014001.

Diagnosis: The same as the genus.

Occurrence: Known only from the Gelaohe Formation (Late Devonian) exposed in the Baihupo section in Dushan, Guizhou, South China.

Description: Large and convex-backed in lateral outline. DB regularly convex. AB with relatively large radius of curvature with maximum located a little below mid-H; PB with small radius of curvature with maximum located at lower third of H, a little tapering; VB slightly curved. Wide ventral carina developed with radial striae. Left valve overlaps the right one with maximum at DB and ADB. Wide contact surface at ventral view. Surface smooth.

Etymology: From the locality Dushan County.

Other material: Three paratypes (Fig. 3b–e): DSBL2014002, DSBL2014003 and DSBL2014004. Other specimens: 12 complete carapaces and 15 valves, DSBL2014010-036.

Dimensions: Holotype: $L = 1.1$ mm, $H = 0.60$ mm, $W = 0.36$ mm; paratypes: $L = 1.06$–1.48 mm, $H = 0.58$–0.80 mm, $W = 0.35$–0.40 mm.

Remarks: *Wangshangkia dushaniensis* n. gen., n. sp. resembles *Xixionopsis subtrapezoidalis* (Wang and Shi, 1982) from the Middle Devonian of Guangxi, South China, in the outline, but differs from it by the ventral carina with radial striae and shorter DB.

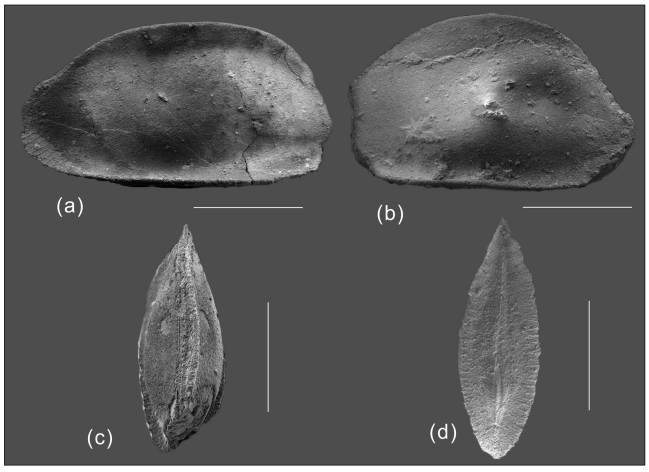

Figure 4. *Wangshangkia bailouiensis* n. gen., n. sp. **(a)** Holotype, right lateral view of complete carapace; DSBL2014006. **(b)** Paratype, left lateral view of complete carapace; DSBL2014007. **(c)** Paratype, dorsal view of complete carapace; DSBL2014008. **(d)** Paratype, ventral view of complete carapace; DSBL2014009. All scale bars represent 500 µm.

Wangshangkia bailouiensis n. sp.

(Fig. 4)

Holotype: One complete carapace (Fig. 4a), DSBL2014006.

Diagnosis: A species of *Wangshangkia* with long and convex DB and straight VB.

Occurrence: Known only from the Gelaohe Formation (Late Devonian) exposed in the Baihupo section in Dushan, Guizhou, South China.

Description: Carapace large and relatively elongate in lateral view. DB long and regularly convex. AB with relatively large radius of curvature with maximum located at mid-H; PB with large radius of curvature with maximum located a little below mid-H, and radial striae exited along PB in some specimens; VB nearly straight with wide carina. Left valve slightly overlaps the right one with maximum at DB. Wide contact surface at ventral view. Surface smooth.

Etymology: After the locality, Bailou Village.

Other material: Three paratypes (Fig. 4b–d): DSBL2014007, DSBL2014008 and DSBL2014009. Other specimens include eight complete carapaces and 10 valves, DSBL2014037-054.

Dimensions: Holotype: $L = 1.42$ mm, $H = 0.70$ mm, $W = 0.60$ mm; paratypes: $L = 1.01$–1.42 mm, $H = 0.40$–0.71 mm, $W = 0.40$–0.58 mm.

Remarks: *Wangshangkia bailouiensis* n. gen., n. sp. is different from *Wangshangkia dushaniensis* by its longer DB and straighter VB, and less overlap on DB.

5 Discussion

Originally, Bairdiocyprididae was described as follows:

> convex-backed ostracods of bythocypridid shapes, mostly without ornamentation and sculpturing left valve larger, with overlap and overreach of left valve over right valve; lacking separated calcified inner lamella but with short hinges and contact margins simply ridged and grooved in platycopine fashion (Moore, 1961).

However, the modern view (see Becker, 2000) did not support the original view that "Bairdiocyprididae are intermediate morphologically between Healdiidae and Bairdiidae". Bairdiocyprididae was characterized by "subtriangular carapace outlines, hinge-line straight or lightly arched, not significantly depressed; hinge tripartite or undivided, apical region high to low; bow-shaped projection mostly distinct, stop ridges in the larger valve". *Wangshangkia* n. gen. meets the main characteristics (e.g. shape, overlap and hinge structures) of Bairdiocyprididae. However, it is a little confused that both new species own a wide ventral carina with radial striae, which is rarely detected in the family of Bairdiocyprididae. Bairdiocyprids like *Bairdiocypris, Baschkirina, Praepilatina* and *Xixionopsis* are known to be typical Devonian genera, which also range up to the Carboniferous (Moore, 1961; Becker, 2000). Most of the species of the four mentioned genera are reported from worldwide Devonian deposits. So far *Wangshangkia* is only reported in the Famennian of South China. Moreover, the new genus may sensitively respond to the D–C event, which is emphasized to be one of the most severe bio-events in the Phanerozoic (Walliser, 1996) because both of the two new species disappeared just below the Devonian–Carboniferous boundary in the study section.

Morphologically, *Wangshangkia* n. gen. is characterized by the middle-large size (the length is more than 0.90 mm; Becker, 1971), thin dorsal border and thick ventral border with a low centroid, which suggest a benthic crawler. The well-developed ventral carina and some forms of marginal structures might prevent the shell from sinking into the soft ground during the benthic crawling (Wang, 1988). In the field, the new-species-bearing strata are dark thin-bedded shales or wackstones, implying a low energy with abundant organic matter (Wang and Wang, 1996). The trace fossils from the Gelaohe Formation also suggest the shallow-marine low-energy environment (Wang and Wang, 1996; Zhang et al., 2011b). As we know, most of the species of Bairdiocypridoidea are considered to be deposit feeders for their well-developed muscle scars (Adamczak, 1969; Lethiers and

Whatley, 1994). In summary, we suggest that *Wangshangkia* n. gen. is essentially a benthic crawler and deposit feeder living in the shallow-marine, low-energy waters with abundant food supply.

6 Conclusions

Wangshangkia n. gen. from the Late Devonian of Dushan, Guizhou, South China, represents a new member of the family Bairdiocyprididae Shaver, 1961 with distinct radial striae on the wide ventral carina. Two new species belonging to *Wangshangkia*, i.e. *W. dushaniensis* and *W. bailouiensis*, are recognized. The morphological features of the new genus indicate that it is essentially a benthic crawler living in the shallow-marine low-energy waters with abundant food supply. The new genus is so far only reported in the Famennian of South China, which disappeared just below the Devonian–Carboniferous boundary.

Data availability. No data sets were used in this article.

Competing interests. The authors declare that they have no conflict of interest.

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