

NEW *EOSTROBILOPS* PILSBRY, 1927 (EUPULMONATA: STROBILOPSIDAE) OF CHINA

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Abstract *Eostrobilops wuranicus* Zhang, n. sp. is reported as a new species herein, with information on the species' ecology. This new species can be separated from other *Eostrobilops* species distributed in China, Korea, Japan and other adjacent regions by the ribless shell, the four basal folds and the two lamellae. Inner shell structures, i. e., the basal fold and the lamella, of *Eostrobilops* distributed among China, Russia, Japan and Korea are listed.

Key words Shandong, Korea, Russia, Far East

INTRODUCTION

Eostrobilops Pilsbry, 1927, includes 14 recent species worldwide (Páll-Gergely *et al.* 2015; Chen, 2019), mainly distributed in Russian Far East (Schileyko, 1984), Korea (Pilsbry, 1908; Pilsbry, 1927; Kuroda & Miyanaga, 1939), Japan (Pilsbry, 1927; Minato & Tada, 1992), Vietnam (Maassen, 2006), Borneo (Vermeulen, 1992) and China (See references below).

Five species of *Eostrobilops* were known from China, mainly from southern China (Heude, 1885; Solem, 1968; Minato & Tada, 1992; Páll-Gergely *et al.* 2015; Chen, 2019). No *Eostrobilops* were reported from northern China, except one fossil species, *Eostrobilops sinensis* Yen, 1969, from Shandong reported by Yen (1969). However, the fossil species may not belong to *Eostrobilops* due to its flat apex. Solem (1979, 1981) reported that the fossil species and the extant species of *Eostrobilops* lived far away from each other (Manganelli *et al.* 1989; Páll-Gergely *et al.* 2015).

Little research on terrestrial Mollusca in Shandong Province has been carried out since Yen (1935), especially on micro-snails, i.e., Yen (1969). Here we describe one new species of *Eostrobilops* based on shell morphology from Shandong Peninsula, representing the first extant species distributed in northern China.

MATERIAL AND METHODS

Living adults were relaxed in 5% ethanol for six hours and then preserved in 75% ethanol. Photographs of shells were taken with a stereomicroscope (Leica S6D). Shells were measured

to the nearest 0.1mm with vernier calipers. The whorl number was recorded with 0.125 whorl accuracies as described by Kerney and Cameron (1979). The measurements and body color descriptions were based on specimens fixed in 75% ethanol. The nomenclature follows Pilsbry (1927). The angles were measured by tpsDig ver. 2.05 (Rohlf, 2005).

All type specimens are deposited in the Zoological Collection, Shandong Normal University, Jinan, China (SDNU).

ABBREVIATIONS

ANSP	The Academy of Natural Sciences of Philadelphia, Philadelphia, USA
a. s. l.	above sea level
fma	fully matured animal(s)
MCZ	Museum of Comparative Zoology at Harvard College, UK
sa	subadult animal(s)
SDNU	The Zoological Collection, Shandong Normal University, Jinan, China

RESULTS

Strobilopsidae

Genus *Eostrobilops* Pilsbry, 1927

Type species: *Strobilops hirasei* Pilsbry, 1908, by original designation

Eostrobilops wuranicus Zhang, n. sp.
Figs 1, 2E, 3–4

Holotype 1 fma, Wuransi, Kunyu Mountain, Weihai, Shandong Province, China, 37.228°N,



Figure 1 Dorsal (apical), apertural, lateral and umbilical view of the holotype of *Eostrobilops wuranicus*. Arrows point to basal folds. Bar=1mm.

121.767°E, 300m a. s. l., 16 July, 2018, coll. G. Zhang, X. Qiu & J. Qi, SDNU.GAS.0221.01.01.

Paratypes 5 fma and 5 sa, as holotype, registered nos. SDNU.GAS.0221.01.02–11. The shells of four fully mature animals were broken for describing inner shell structures, but not dissected (registered nos. SDNU.GAS.0221.01.02–05).

Diagnosis Shell undepressed, with a blunt keel. Spiral furrows present. Callus distinct. Basal folds four, outer one longer and stronger than inner two. Lamella two, parietal lamella, long, strong.

Measurements Holotype, width 2.7mm; height 1.8mm. Shell 5.25 whorls, protoconch 1.5 whorls. Paratypes, width 2.75 ± 0.009 mm, height 1.975 ± 0.062 mm, whorls 5.313 ± 0.020 , protoconch not examined (SDNU.GAS.0221.01.02–04).

Description Shell (Fig. 1) Depressed, with low dome-shaped spire, thin, dextral, glossy, brownish-yellow. Whorls convex, suture impressed, without any zone. Umbilicus moderately wide. Columella oblique. Columella lip dilated, never covering umbilicus. Protoconch smooth. Spiral furrows present, regularly distributed on body whorl. Shell surface ribless, not perforated. Growth lines distinct, fine. Subadult shell smooth, without any periostracum derivatives. Teleoconch without other microscopic structures. Adult body whorl rounded, with blunt keel at the periphery, with bottom convex. Aperture lunate, without ring-like thickening, oblique, somewhat sinuate, not reflexed, equally expanded. Peristome thick, continuous. Callus distinct. Basal folds four; the first one and the second one short, weak; the first one extending ca. 20°; the second one extending ca. 25°; the third

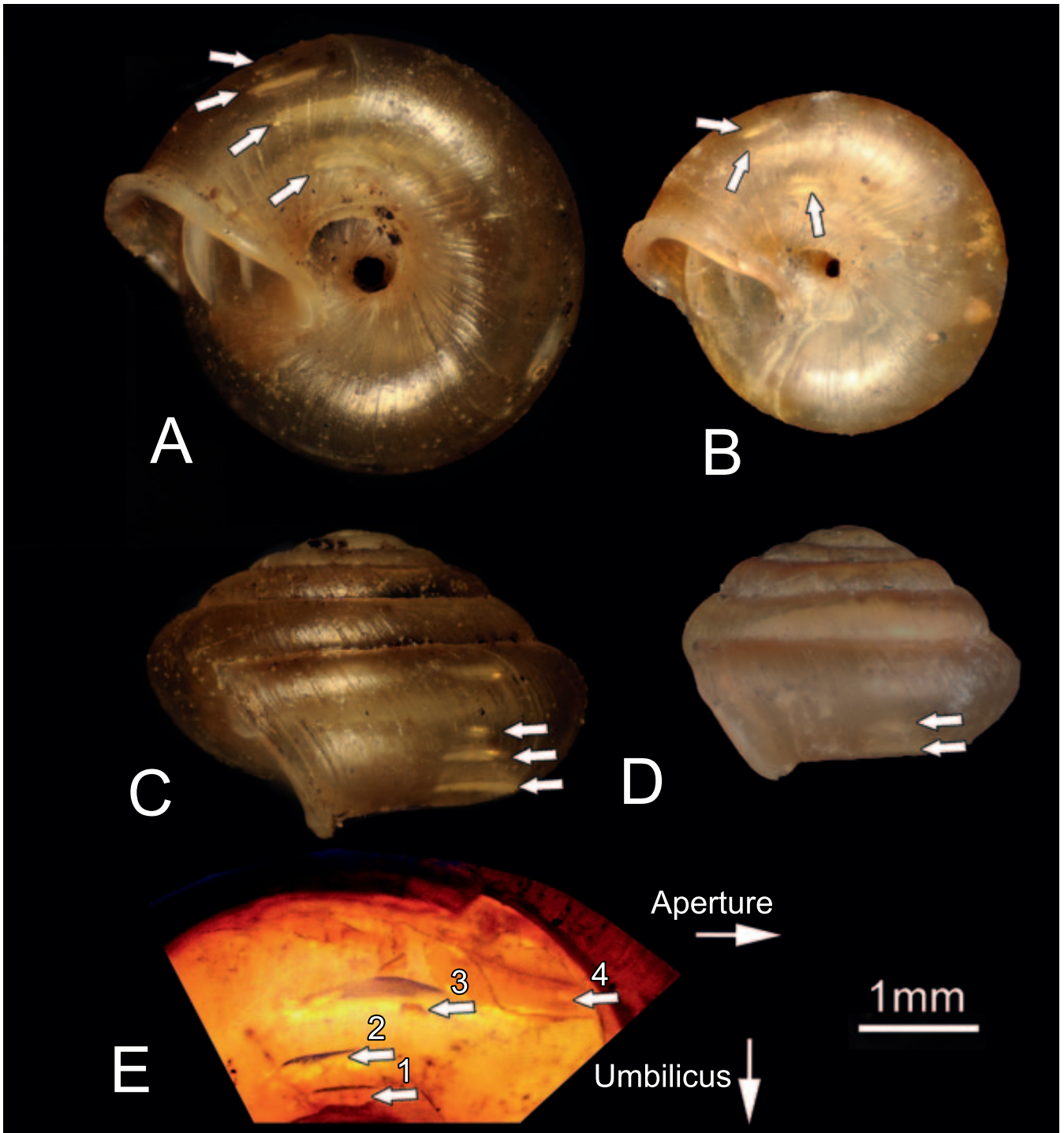


Figure 2 A & C Holotype of *Eostrobilops nipponicus nipponicus*; B & D Holotype of *E. coreanus coreanus*. E inner shell structure of *E. wuranicus* (SDNU.GAS.0221.01.04). Arrows point to basal folds. Bar=1mm.

longer than the first and the second, extending ca. 35°; the fourth longest and strongest, extending ca. 40° (Fig. 2E, Fig. 4A). Lamellae two, both towards the aperture, extending for about 1 whorl; parietal lamellae stronger than infra-parietal lamellae (Fig. 2E, Fig. 4B). Columellar lamella absent.

Animal Living animals and animals in alcohol all brownish-red.

Etymology This species is named after the type locality, Wuransi, a Buddhist temple.

Distribution Known only from the type locality.



Figure 3 A Scenery of the Wuransi temple; B Habitat of *Eostrobilops wuranicus*.

Ecology This species inhabits deep layers of leaves in the shade (Fig. 3). The number of colonies in the type locality is fewer than other species of micro-snails, for example, *Kaliella* sp.

Taxonomic remarks This is the first ribless species among the *Eostrobilops* distributed in mainland China (Heude, 1885; Páll-Gergely *et al.* 2015; Chen, 2019). The inner structure of *E. diodontinus* is unknown, but the basal fold extends for 1/4 body whorl (Syntype, MCZ 167133). The new species is closely related to those from Korea and the Russian Far East based on geographical history (Hay *et al.* 1999). The inner structures of all these species are listed (Table 1).

Compared to *E. coreanus coreanus* (Pilsbry, 1927) (Holotype, ANSP 99967) (Fig. 2B, D) and *E. nipponicus nipponicus* (Pilsbry, 1927) (Holotype, ANSP 99966) (Fig. 2A, C), *E. wuranicus* lacks the columellar lamella which is present in the former

two species. And the fourth fold of *E. wuranicus* is the longest and strongest, instead of the second fold in *E. coreanus coreanus* and *E. nipponicus nipponicus*. *E. kongoensis* (Kuroda & Miyanaga, 1939) shares the same quantities of folds and lamellae with *E. wuranicus*. The third and the fourth folds are stronger than the first one and the second one, but central fold(s) (the third or the second and the third) of *E. kongoensis* is (are) longest. And the height-width ratio of *E. kongoensis* is 0.597 which is lower than *E. wuranicus* (the mean height-width ratio is 0.716, the standard deviation is 0.005). From *E. kanjiokuboi* (Minato & Tada, 1992) (mean height-width ratio is 0.608), *E. taiwanicus* (Minato & Tada, 1992) (the mean height-width ratio is 0.5625) and *E. nipponicus reikoae* Matsumura & Minato, 1998 (the mean height-width ratio is 0.593), which have the same quantities of the lamellae to *E. wuranicus*, the new species can be separated by the higher spire

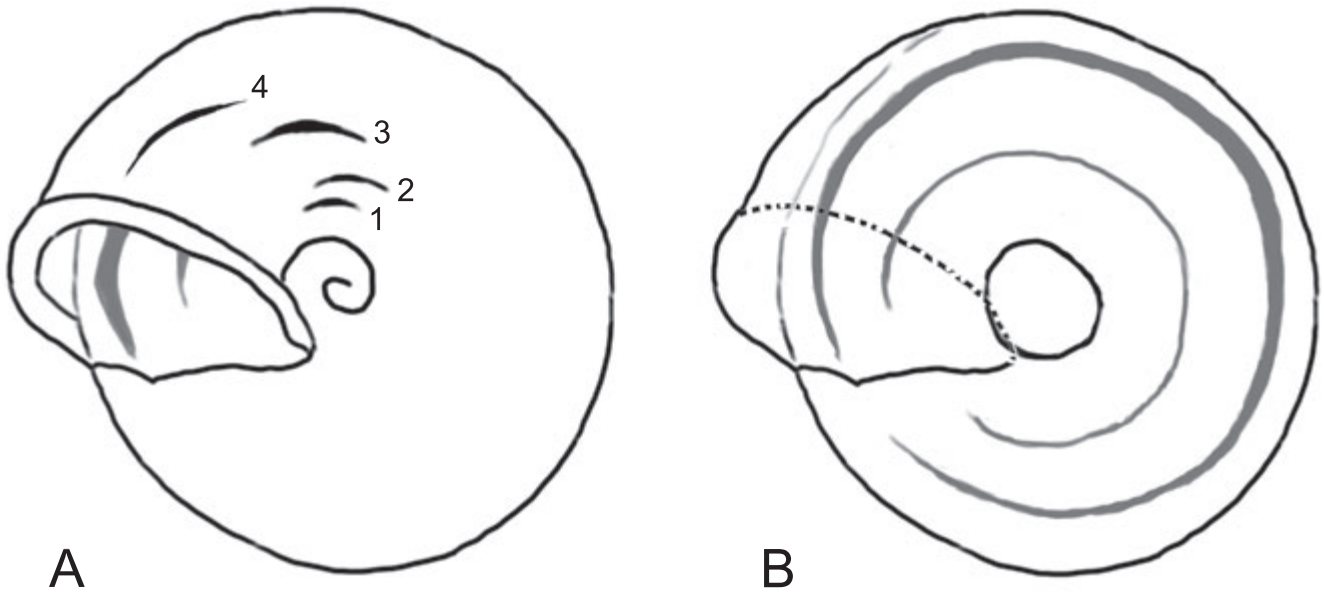


Figure 4 A Basal folds of *Eostrobilops wuranicus*, paratypes, registered nos. SDNU.GAS.0221.01.02–05; B lamella of *E. wuranicus*, paratype, registered nos. SDNU.GAS.0221.01.02–05. The line drawing mainly based on SDNU.GAS.0221.01.04.

Table 1 Inner shell structures of *Eostrobilops* distributed in China, Russia, Korea and Japan

<i>Eostrobilops</i>	Folds	Lamella	Distribution	Reference
<i>E. coreanus coreanus</i> (Pilsbry, 1927)	3	3	Pyong, Korea; Cedar, Russia	Pilsbry, 1927; Schileyko, 1984
<i>E. coreanus echo</i> (Kuroda & Miyanaga, 1939)	4	3	outer Kungang Mountains, Korea	Kuroda & Miyanaga, 1939
<i>E. diodontinus</i> (Heude, 1885)	–	–	Chengkou, Chongqing, China	–
<i>E. hirasei</i> (Pilsbry, 1908)	2	3	Quelpart Island, Korea	Pilsbry, 1908
<i>E. humicolus</i> Páll-Gergely & Hunyadi, 2015	3	4	Hechi, Guangxi, China	Páll-Gergely <i>et al.</i> 2015
<i>E. kanjiokuboi</i> (Minato & Tada, 1992)	3	2	Nantou, Taiwan, China	Minato & Tada, 1992
<i>E. kongoensis</i> (Kuroda & Miyanaga, 1939)	4–5	2	Kungang Mountains, Korea	Kuroda & Miyanaga, 1939
<i>E. nipponicus nipponicus</i> (Pilsbry, 1927)	3–4	3	Yonezawa, Japan	Pilsbry, 1927
<i>E. nipponicus reikoeae</i> Matsumura & Minato, 1998	3	2	Takatsuki-shi, Osaka, Japan	Matsumura & Mino, 1998
<i>E. taiwanicus</i> (Minato & Tada, 1992)	3	2	Nantou, Taiwan, China	Minato & Tada, 1992
<i>E. wuranicus</i> Zhang, n. sp.	4	2	Yantai or Weihai, Shandong, China	This study
<i>E. yaeyamensis</i> (Habe & Chinen, 1974)	2	2	Irimote Island, Ishigaki Island, Japan	Habe & Chinen, 1974
<i>E. zijinshanicus</i> Chen, 2019	3	3	Nanjing, Jiangsu, China	Chen, 2019

and the number of folds. From *E. koreans echo* (Kuroda & Miyanaga, 1939), which has the same numbers of folds as the new species, the latter can be distinguished by the numbers of lamellae.

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