A NEW SPECIES OF TROGLOBITIC FRESHWATER PRAWN OF THE GENUS MACROBRACHIUM FROM SOUTHERN CHINA (CRUSTACEA: DECAPODA: PALAEMONIDAE)

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ABSTRACT. – A new species of troglobitic freshwater prawn of the genus Macrobrachium from Guangxi Province in southern China is described and illustrated in detail. Morphological comparisons with allied epigean species and known troglobitic congeners are given. The new species is characterized by its highly degenerated eyes, smooth and slender second pereiopods, elongated telson and the unarmed preanal region.

KEY WORDS. – New species, Macrobrachium, troglobitic, freshwater prawn, Guangxi, China.

INTRODUCTION

The cone karst of the Lingyun area forms part of the inclined and elevated Yungui Plateau, a vast area of limestone and sedimentary rock extending from southern Yunnan, through the northwest of Guangxi and into Guizhou. The limestone has been highly dissected, structurally altered and geomorphically modified, leading to several cycles of karstification, as evidenced by the large caves, often with two or three levels of passages and chambers (Clarke, 2002a). During a recent international speleological expedition to caves in the cone karst region of Lingyun County in northwestern Guangxi Province, some very interesting troglobitic (cave adapted) shrimps, fishes and terrestrial organisms were collected (Clarke, 2001a, 2001b, 2002b) including two recently described carabid beetles (Dueve, 2002, 2004). Most of the new troglobitic species found during the expedition were collected from the upper level relict karst passages or chambers in these large multi-level caves (Clarke, 2001a, 2001b). A subsequent expedition by the Institute of Zoology, Chinese Academy of Science, Beijing, also collected some troglobitic shrimps from the same cave (S. Li, pers. comm.).

The new prawn belongs to the family Palaemonidae, and represents the first record of a troglobitic Macrobrachium species from China. The new species is described here and illustrated in detail jointly by an examination of all available specimens thus far. Morphological comparisons with allied epigean and known troglobitic species of Macrobrachium are highlighted. Type specimens are deposited in the Institute of Zoology, the Chinese Academy of Science (IZCAS), Zoological Reference Collection of the Raffles Museum of Biodiversity Research, National University of Singapore (ZRC) and the Tasmanian Museum in Hobart, Tasmania, Australia (TM). The abbreviation “cl” is referred to the postorbital carapace length.

Macrobrachium lingyunense, new species
(Figs. 1-3)

Material examined. – Holotype: Male, cl 13.6 mm, (IZCAS-DE-1) Shadong (Sand Cave), Guancang Village, Sicheng Town, Lingyun County, Guangxi Province, southern China (106°23' - 106°55'33"E 24°05' - 24°37'N), coll. Chunguang Zhang, 26 Nov. 2001. Paratypes: 2 males, cl 11.4-12.1 mm (IZCAS-DE-3, 4), 1 female, cl 17.2 (IZCAS-DE-2), one juvenile, cl 14.3 mm (IZCAS-DE-4), data same as holotype; one female, cl 15.1 mm (ZRC), Shadong (Sand Cave), north of Lingyun Town, Lingyun County, Guangxi Province, southern China (106°36'33.12947"E 24°25'21.42550"N), coll. Arthur Clarke, 11 Oct. 2000. 1 male, cl 12.8 mm; 1 female, cl 8.5
Fig. 1. *Macrobrachium lingyunense*, new species: A, cephalothorax; B, epistome; C, mandible; D, maxillula; E, maxilla; F, first maxilliped; G, second maxilliped; H, first two abdominal sterna with transverse ridge and median tooth. A, paratype, female, cl 15.1 mm (ZRC 2005.0138); B-H, paratype, male, cl 12.8 mm (ZRC 2005.0138). Scale bars: A = 2 mm; B-D, H = 0.5 mm; E-G = 1 mm.

**Description.** – Carapace smooth. Rostrum (Fig. 1A) straight, reaching distal end of scaphocerite, rostral formula: 2-4+5-7/3-4. Teeth more widely spaced on above orbit region than on anterior and postorbital regions. Antennular peduncle about 0.4 times as long as carapace. Antennal spine sharp, situated at lower orbital angle, not reaching anterior margin. Hepatic spine smaller than antennal spine, lying behind and slightly below latter. Carapace smooth. Fourth thoracic sternite without median process. Abdomen smooth, glabrous, first to third pleurites broadly rounded, fourth and fifth pleurites feebly produced posteriorly, fourth pleurite sub-triangular, fifth pleurite sub-rectangular, sixth abdominal somite slightly longer than fifth, with posterovertral angle feebly produced, subacute. Telson (Fig. 2G) long, slender, 3.8 times as long as wide, 1.8 times as long as sixth abdominal segment, with a shallow median groove on dorsal surface, with 2 pairs of dorsal spines, ending in a small acute median point, lateral spines slightly larger than dorsal spines, sublateral pair of spines well developed, long and stout, more than 3 times as long as lateral pair, with 2-4 pairs of intermediate plumose setae. First 2 abdominal sternites (Fig. 1H) with transverse ridge and a median tooth each, second abdominal sternite very prominent, more

![Fig. 2. Macrobrachium lingyunense, new species: A, third maxilliped; B, first pereiopod; C, male major second pereiopod; D, third pereiopod; E, propodus and dactylus of third pereiopod; F, scaphocerite; G, telson, H, uropodal diaeresis. A, paratype, male, cl 12.8 mm (ZRC 2005.0138); B-H, paratype female, cl 15.1 mm (ZRC 2005.0138). Scale bars: A-D, F = 2 mm; E, H = 0.5 mm; G = 1 mm.](image-url)
developed than first abdominal sternite. Preanal region unarmed, smooth.

Eyes strongly reduced, small, rounded, lacking faceted cornea, no pigment visible, anterior end only reaching middle of basal segment of antennular peduncle. Stylocerite pointed, reaching 0.7 basal segment. Antenna with stout basiscerite and strong distoventral tooth. Carapcerite reaching to about 0.3 times of scaphocerite length. Scaphocerite (Fig. 2F), about 2.4 times as long as wide, terminating in a small claw. Fourth pereiopods as long as broad, 3.0 times as long as dactylus; dactylus 6.0 dactylus and 0.25 times of propodus length, propodus 12 times (Fig. 1D, E) slender, reaching beyond scaphocerite by entire propodus length. Scaphocerite (Fig. 2C) not sexually dimorphic; both cylindrical, reaching beyond distal end of scaphocerite length. Scaphocerite (Fig. 2F), about 2.4 times as long as wide, with straight outer margin.

Epistome (Fig. 1B) bilobed by a depression. Mouth parts typical of genus. Mandible (Fig. 1C) with 3-segmented slender palp; incisor process robust; maxillar palp bilobed (Fig. 1D), upper lobe slender, pointed, lower lobe stout; maxilla (Fig. 1E) with simple palp, basal endite deeply bilobed, scaphognathite normal; first maxilliped (Fig. 1F) with simple palp, basal and coxal endites distinct, flagellum of exopod with numerous plumose setae distally, epipod deeply bilobed; second maxilliped with normal endopod (Fig. 1G), flagellum with numerous plumose setae distally, epipod simple, with well developed podobranch; third maxilliped (Fig. 2A) with robust endopod, exopod short, with numerous plumose setae distally.

First pereiopods (Fig. 2B) very slender, reaching beyond scaphocerite by entire chela and 0.2 carpus length, equal in length, similar in form, carpus 1.5 times as long as chela, chela with fingers slightly longer than palm. Second pereiopods (Fig. 2C) not sexually dimorphic; both cylindrical, equal in length, similar in form, smooth, slightly longer than body length, reaching beyond distal end of scaphocerite by both entire carpus and chela; merus as long as carpus, both segments distinctly longer than palm but shorter than fingers; palm slightly inflated, fingers about twice as long as palm, with only 1 pair of very small teeth at base. Third pereiopods (Fig. 1D, E) slender, reaching beyond scaphocerite by entire dactylus and 0.25 times of propodus length, propodus 12 times as long as broad, 3.0 times as long as dactylus; dactylus 6.0 times as long as wide, terminating in a small claw. Fourth pereiopods slender, longer than third pereiopod, similar in form. Fifth pereiopods most slender, longest, reaching beyond scaphocerite by entire dactylus, slightly more than 0.5 times length of propodus.

Endopod of male first pleopod about 0.4 times as long as exopod, weakly broadened distally, slightly curved mesially. Appendix masculina of male second pleopod with numerous spiniform setae on dorsal surface. Appendix interna of male second pleopod slender, reaching to 0.6 length of appendix masculina.

Uropodal diaeresis (Fig. 2H) with a very small spine, distinctly shorter than outer angle.

Habitat. – Some paratypes of the present new species were collected from a one-meter deep water pool at about 1.5 km from the only known entrance of the sand cave. It was in total darkness and situated in an upper level relict karst passage where the dominant hydrology is percolation seepage (Clarke, 2002b).

Colouration. – All appendages generally transparent to translucent; carapace and abdomens whitish to yellowish (Fig. 3).

Etymology. – The new species is named after the type locality: Lingyun County, NW Guangxi Province, China.

Remarks. – Macrobrachium lingyunense, new species, is the first troglobitic Macrobrachium species found in China. Compared to epigean species, it is morphologically closest to M. guangxiense Liang and Yan, 1981, a species known only from Guangxi Province, especially when taking the slenderness of the second pereiopods into consideration. Macrobrachium lingyunense, however, differs remarkably from M. guangxiense by the highly reduced eyes and the relatively lower rostral base with smaller number of dorsal rostral teeth (7-10 vs. 12-16). The general appearance and the ratios of various segments of the second pereiopods of this new species are also similar to those of M. inflatum Liang & Yan, 1985. However, M. lingyunense can be easily distinguished from M. inflatum by the reduced eyes and proportionately shorter and less curved rostrum (vs. relatively longer and distinctly curved rostrum). Macrobrachium inflatum was originally described from Jiangsu Province, eastern China (Liang & Yan, 1985) but has subsequently been found in Yunnan (Cai & Dai, 1999). Macrobrachium lingyunense also resembles sub-adult specimens of M. nipponense (De Haan, 1849) in the form of the rostrum and the second pereiopods, but can be easily separated by the degenerated eyes and the far more elongated fingers of the second pereiopods.


Fig. 3. Color photograph of Macrobrachium lingyunense, new species: paratype, female, cl 15.1 mm (ZRC 2005.0138).
another new troglobitic species, *M. miyakoense* from the Ryukyu Islands, Japan, bringing to a total of nine troglobitic species. Of these nine mentioned species, only *M. villalobosi* from Oaxaca, Mexico, could be confused morphologically with *M. lingyunense*. In the Mexican species, the eyes have no pigment and lack faceted cornea; the chelae of the slender second pereiopods are subequal in size, lacking teeth, spines and conspicuous mats of setae on finger or palm. However, it can be distinguished by its proportionately much longer carpus of the second pereiopods, which is even longer than the chela (vs. shorter in *M. lingyunense*).

Of the remaining cave species, *M. lucifugum* and *M. gua* actually do not possess specific troglobitic characters, though the former has been found in caves of several islands in the West Indies, and the latter has only been found from a cave in Sabah, East Malaysia, Borneo. *Macrobrachium cavernicola*, *M. microps*, *M. poeti*, *M. acherontium*, and *M. miyakoense* can easily be separated from *M. lingyunense* by their less prominently reduced eyes. In particular, the American *M. acherontium* is morphologically close to *M. lingyunense* in the form of the various legs and ratios of the various joints of the second pereiopods, but in addition to its larger eyes, it also has a proportionately shorter and higher rostrum. *Macrobrachium cavernicola* from Siju Cave in Assam, India, was the first troglobitic *Macrobrachium* species to be described and it differs from all the other congeners by the peculiar two-segmented mandible palp.

*Macrobrachium microps* was originally described by Holthuis (1978) from Dammin Cave, New Ireland (Papua New Guinea) on the basis of only one adult male, collected from a fast flowing subterranean river, at altitude of 600-700 meters. *Macrobrachium microps* can be easily separated from *M. lingyunense* by the stout and spiny second pereiopods (smooth in *M. lingyunense*). Bruce & Iliffe (1993) reported a second occurrence of *M. microps* from an anchialine lava tube in Samoa. Short & Marquet (1998: 408) reported two other “immature” male specimens from a cave in the Lifou Island, New Caledonia. In a subsequent paper, Short & Meek (2000) reported one adult female and one undeveloped male of *M. microps* from Daniel Roux Cave, Christmas Island, in the Indian Ocean.

Holthuis (1984) described *M. poeti*, from a cave on the south coast of Java, Indonesia. Apart from the partially reduced eyes, *M. poeti* is similar to young specimens of *M. pilimanus* group, a group of landlocked species distributed in the Greater Sundas Islands, Peninsular Malaysia, and Indochina. Among those species, it is most similar to the Javan endemic *M. leptodactylus* (De Man, 1892). *Macrobrachium poeti* can easily be separated from *M. lingyunense* by its very short carpus of the second pereiopod.

Hobbs & Hobbs (1995) described *M. catonium* from two caves on the Vaca Plateau, Cayo District of Belize, Middle America. It could be easily separated from *M. lingyunense* by its much longer carpus of second pereiopod, which is 1.2 times as long as the chela (vs. much shorter than chela). Komai & Fujita (2005) described *M. miyakoense* from an anchialine cave in Miyako Island, the Ryukyu Islands, southern Japan. With regard to the chelips, it is superficially close to *M. lingyunense*. However, it can be easily separated by the better developed eyes, the larger number of dorsal rostral teeth (11-13 vs 7-9 in *M. lingyunense*), the proportionately stouter telson (Fig. 2F in Komai & Fujita, 2005 vs. Fig. 2G in this paper) and a relatively higher and more prominent preanal carina.

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**LITERATURE CITED**


