



Ligulocamptus loffleri n.g., n.sp. (Copepoda: Harpacticoida) from Chengdong Lake in China

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Abstract

Ligulocamptus loffleri n.g., n.sp. belonging to Family Canthocamptidae Sars, 1906 is described from Chengdong Lake in China. The new genus is related to *Mesochra* Boeck, 1864 and *Ceuthonectes* Chappuis, 1924, but there are some conspicuous differences in P1, P2, P5 and P3, P4 in the male, and it is easily distinguishable from other related genera. Taxonomic relationships between the new genus and other genera are discussed after the description of the type-species.

Introduction

The fauna of freshwater harpacticoid copepoda of China is incompletely known. According to Shen & Tai (1979), 67 species were described and recorded. Afterwards, there were very few reports (Kikuchi Y. et al., 1993) about harpacticoids. In the course of research on the freshwater copepoda fauna in China, three harpacticoid species were collected in Chengdong lake on June 26, 1994, using plankton nets (112 and 64 μm) and preserved in 4% formalin, among which one is new to science, the remaining two species. *Onychocamptus mohammed* (Blanchard & Richard, 1891) and *Limnocletodes angustodes* (Shen & Tai, 1963) have not yet been recorded from the lake.

Chengdong Lake situated at 32°12'–32°22' N, 116°18'–116°28' E, within Huoqiu county, Anhui province of China, belongs to fluvial lakes with an area of ca. 120 km². It is 26.9 km long from north to south and its maximum width is 6.4 km from west to east. The average depth is 1.5 m, mean transparency 0.25 m, pH 7.8, total hardness of water 3.13 l⁻¹ (German degree of hardness, dH°), mineralization 130 mg l⁻¹ and soft mud bottom.

Generic diagnosis

Female. Antennulae 6-segmented with an aesthetasc on the third segment, reaching until or beyond the tip of the apical segment. Antenna exopodite 1-segmented with 3 setae, endopodite 2-segmented. Exopodites of P1–P4 3-segmented and endopodites 2-segmented; P1 has a large hyaline process on connecting plate, P2 without a long seta or spine on the outer margin of basis; P5 is composed of one segment with deep median incision, clearly divided into inner and outer lobes, the inner part with 5 spines and the outer part with 4 spines and 2 setae. The anal operculum carries 11–13 fine spines. Caudal ramus 1.2–1.3 times as long as wide.

Male. Antennulae 7-segmented with an aesthetasc on the fourth segment. P3 endopodite has three segments, the second segment has a peculiar spiniform process on the inner distal corner, the last segment has an inner spine and two terminal setae. P5 is composed of one segment; the inner part with two strong spines at the tip and the outer part with two strong spines and three setae.

Description

Etymology: The prefix 'Ligulo' refers to the character of tongue-like process on the connecting plate of

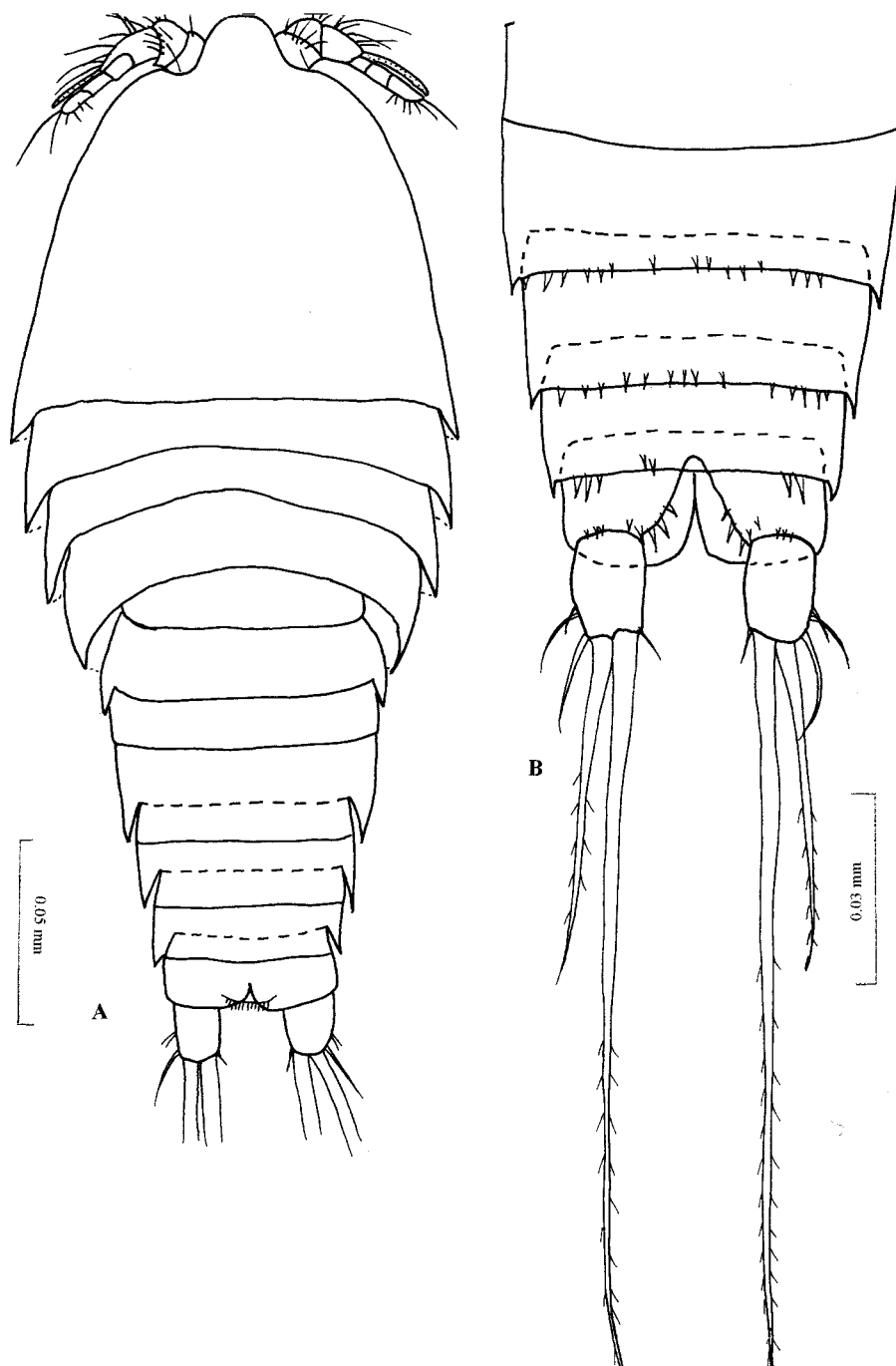


Figure 1. *Ligulocampus loffleri* n. sp., female. A: Habitus, dorsal; B: abdomen, ventral.

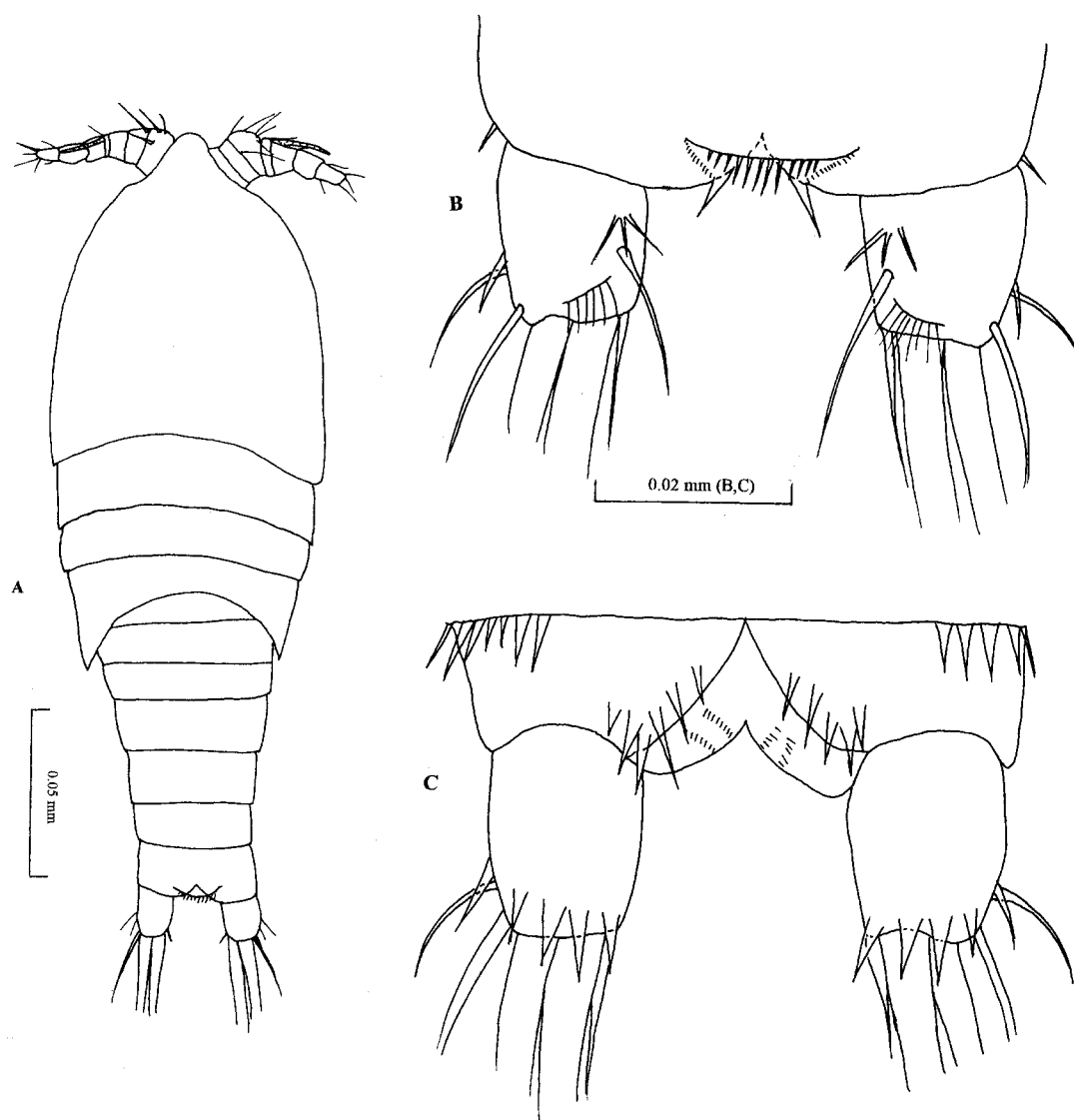


Figure 2. *Ligulocamptus loffleri* n. sp., male. A: Habitus, dorsal; female. B: Anal operculum flat and Furcal rami, dorsal; C: Furcal rami, ventral.

Table 1. Setation formula of Leg 1–5.

	Exopod Spine No.	Seta No	Endopod Spine No.	Seta No	Exopod Spine No.	Seta No	Endopod Spine No.	Seta No
	Female				Male			
Leg 1	1-1-2	0-1-2	0-1	1-2	1-1-2	0-1-2	0-1	1-2
Leg 2	1-1-2	0-1-3	0-1	1-4	1-1-2	0-1-3	0-1	1-4
Leg 3	1-1-2	0-1-4	0-1	1-4	1-1-2	0-1-4	0-1-0	0-0-3
Leg 4	1-1-2	0-1-4	0-1	1-4	1-1-2	0-1-4	0-1	0-4
Leg 5		6		5		5		2

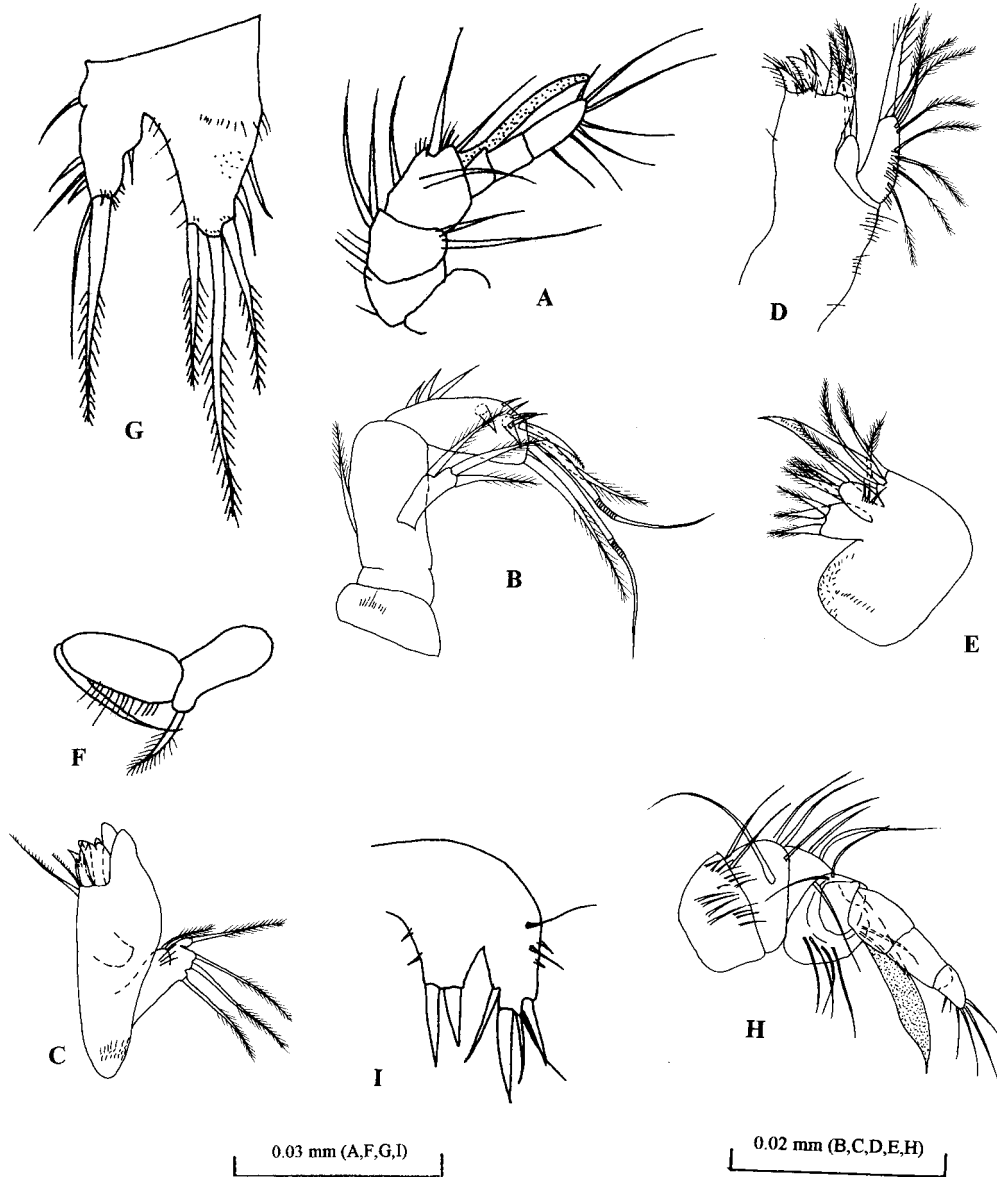


Figure 3. *Ligulocamptus loffleri* n. sp., female. A: antennule; B: antenna; C: mandible; D: maxillula; E: maxilla; F: maxillipede; G: P5, male; H: antennule; I: P5.

P1, and 'loffleri' is named in honour of my supervisor Prof. Dr. Heinz Löffler, who made many contribution to copepods and has been giving me much guidance and help.

Type material: The following descriptions are based on the dissection of one mature female (holotype USNM 243558), one mature male (allotype USNM 243592) with additional observations from two fe-

males and two males (paratypes USNM 243599). The specimens have been deposited in the National Museum of Natural History, Smithsonian Institution (USNM). Remaining paratype material in the author's collection.

Female: Average body length is 0.32 mm ($n=16$), range 0.30–0.37 mm, excluding rostrum and furcal rami, and with them, the length is 0.35 mm, range

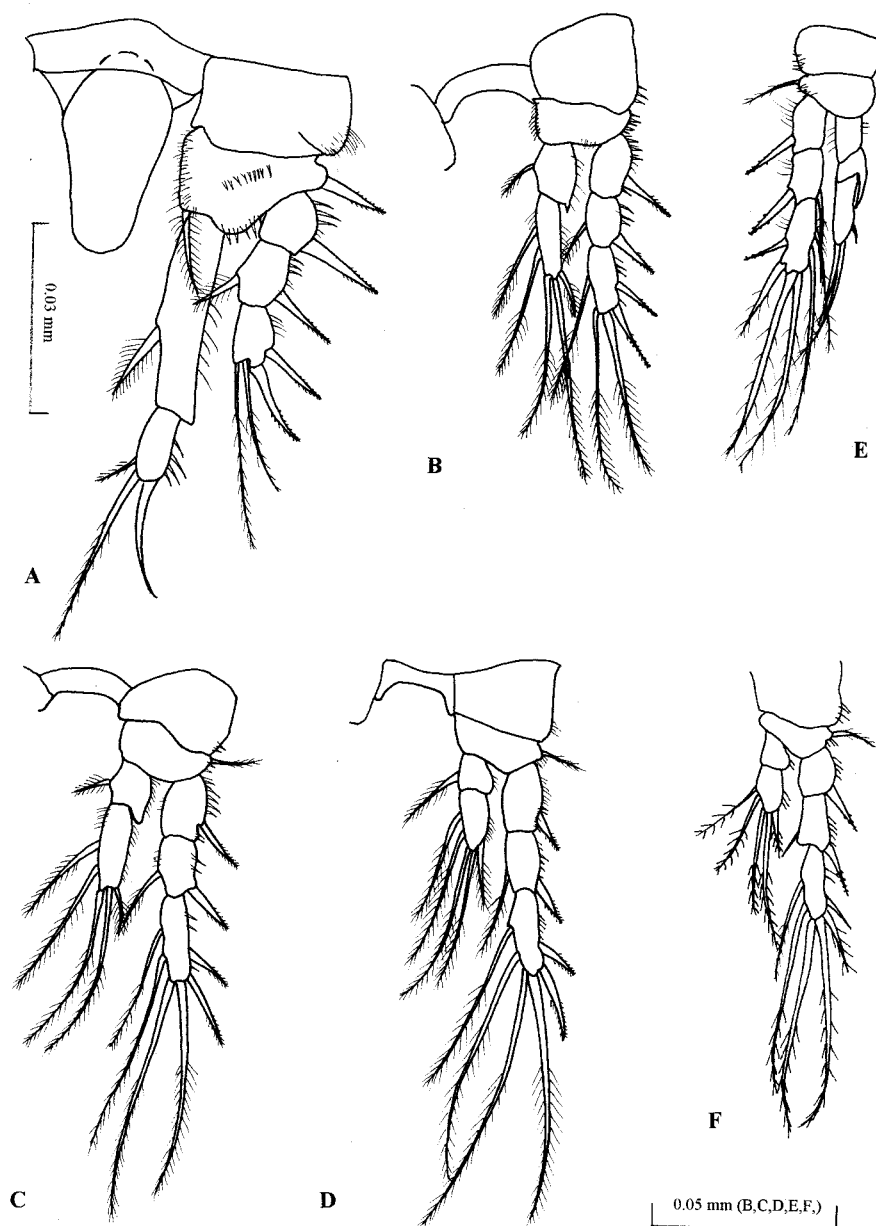


Figure 4. *Ligulocamptus loffleri* n. sp., female. A: P1; B: P2; C: P3; D: P4, male; E: P3; F: P4.

0.33–0.40 mm. Body cylindrical, tapering gently towards the posterior end; head segment wide and rounded, with a small rostrum in front, not distinctly divided from head segment; on dorsal view, segments with smooth posterior margins and the last three abdominal segments with several spinules on the ventral side (Figure 1A, B). Anal operculum flat, rear margin with 11–13 fine spines. Furcal rami 1.2–1.3 times as long as wide; outer margin with one long and one short

lateral seta, apical setae normally developed, median apical seta 2.3–2.5 times as long as the outer apical seta and 7.4–7.6 times as long as the external seta, internal seta short; dorsal seta situated in the middle inner part and as long as the internal seta; on the dorsal face (Figure 2B), there are three spinules on the proximal inner part and a row of 6–8 setae running to inner-distal part; on the distal margin of the ventral

side, four spines are inserted (Figure 2C). One egg sac contained six eggs.

Antennulae (Figure 3A): Composed of six segments, with an aesthetasc on the third segment, reaching to or over the tip of the apical segment. Antenna (Figure 3B); Coxa short, with several setae on outside; allobasis with one seta on the proximal outer margin; exopodite onesegmented with three setae, two terminally implanted and one subterminally; endopodite with nine lateral spines, one spine and four setae, of which two are geniculate, attached to the distal end. Mandible (Figure 3C): Praecoxa armed with a row of setae proximally, basally enlarged and with a teeth-like process on the terminal outer margin dorsally; pars incisiva bidentate and furnished with a bare slim seta; endopodite one joint bearing five setae, four terminally implanted and one subterminally. Maxillula (Figure 3D): Arthrite of paraecoxa armed with six unguiform spines, coxa slightly prolonged and bearing two slender setae, basis with nine setae and a row of small setulae. Maxilla (Figure 3E): Syncoxa with two endites, each armed with three short setae apically, basis forming as a strong claw which is accompanied by one seta; endopodite represented by three juxtaposed setae. Maxilliped (Figure 3F) prehensil, basis with one plumose seta on the inner distal end, the first endopodite segment is ornamented with a row of setae on the inner margin, the second endopodital claw is smooth.

Leg 1 (Figure 4A) has a large tongue-like hyaline process on the connecting plate, the outer part of the coxa is convex with setae; basis armed with an outer spine and a long inner seta, and there is a row of spinules in the middle, 5–6 spines on the distal margin and some small setae on the inner margin, exopodite three-segmented, the first segment with a single outer spine, the second segment with an outer spine and an inner seta, the last segment with two spines and two setae; endopodite two-segmented, the first segment longer than exopodite and with an inner seta, the last segment with one slightly curved claw-like seta and a long seta at the tip and a short seta at the inner subterminal.

Leg 2 (Figure 4B) coxa with 3–4 spinules on the outer margin, basis with 4–5 spinules instead of a long seta or spine on the outer margin and armed with setae on inner and distal margin; exopodite three-segmented, the last segment with two spines and three setae; endopodite two-segmented, the first segment with an inner seta and a sharp outer-terminal angle, the last segment with one spine and four setae. Leg 3–4 (Figure 4C–D) basis with an outer seta; ex-

opodite three-segmented, the last segment with two spines and four setae; endopodite two-segmented, the outer-terminal angle of the first segment is somewhat swelling, the last segment with one spine and four setae.

Leg 5 (Figure 3G) is composed of one segment with a deep median incision, clearly dividing into an inner and outer lobe, both of lobes elongated; the inner part, corresponding to proximal segment with a row of spinules on base, several spinules on the inner margin and five spines, two outer and three terminal; the outer part, corresponding to distal segment with one inner spine, two outer spines, one terminal spine and 2 setae, one outer and one terminal.

Male: Average body length is 0.27 mm ($n=4$), range 0.26–0.28 mm, excluding rostrum and furcal rami, and with them, the length is 0.30 mm, range 0.29–0.30 mm. Body shape is thinner than female's (Figure 2A). Sexual dimorphism occurs in the antennulae, the third, fourth and fifth legs and in the genital segmentation.

Antennulae (Figure 3H) are composed of seven segments and geniculate, the fourth segment bearing the aesthetasc. Leg 3 (Figure 4E) endopodite has three segments, the second segment with a peculiar spini-form process on the inner distal corner and the length is about half as long as the last segment, the last segment with an inner spine and two terminal setae. Leg 4 (Figure 4F) is similar to that of female except no inner seta on the first segment of the endopodite and a little swelling on the inner-terminal angle of the second segment of the exopodite. Leg 5 (Figure 3I) is composed of one segment; the inner part, corresponding to proximal segment with two spinules on the inner margin and two strong spines at the tip; the outer part, corresponding to distal segment with two setae and two spinules on base and one inner seta, two strong spines and two setae at the tip.

Discussion

It is evident that the present new species described as the type-species of the new genus *Ligulocampus* belongs to the family Canthocamptidae because it possesses its general characteristics as follows: Maxilliped is composed of two segments and a terminal movable claw; the endopodite of P2–P4 is 2-segmented and the exopodite is 3-segmented; the terminal segment of endopodite P1 armed with three

setae at the tip (one long, one short, the third slightly curved and clawlike); the endopodite of P3 is sexually dimorphic; antennulae 6-segmented (seven in male) with an aesthetasc on the third segment (the fourth in male); the exopodite of antenna is one-segmented and has three terminal setae.

Among the genera so far assigned to the family, the genus *Mesochra* Boeck, 1864, which contains 22 freshwater species (Dussart & Defaye, 1990), including three recorded species in China, *Mesochra suifunensis* (Borutzky, 1952), *M. prowazeki* (Douwe, 1907) and *M. quadrispinosa* (Shen & Tai, 1965), is the closest relative of the present new genus. A comparison between the genera *Mesochra* and *Ligulocamptus*, shows some similar characteristics. For example, the segmentation of thoracic legs of *M. lilljeborgi* (except for the endopodite of P3 of male) and *M. suifunensis*, agrees with that of *L. loffleri*; moreover, *M. suifunensis* agrees with this new species concerning antennulae, antennal appendage, mandibular palp.

These two genera, however, are well distinguished from each other since *Ligulocamptus* has a large hyaline process on the connecting plate of P1 and P5 is composed of one segment, with the proximal and distal segments fused to form a single plate, whereas the P5 of *Mesochra* consists of two segments and P1 is normal. Furthermore, *Mesochra* has no sexual dimorphism concerning P4, while *Ligulocamptus*, apart from antennulae and P3, displays P4 differences of male and female, which there is no the inner seta on the first segment of the endopodite and a little swelling on the inner-terminal angle of the second segment of the exopodite in male. Another difference is that P1 is much smaller than other swimming legs (P2–P4) and missing a long seta or spine on the outer margin of the basis of P2 in the present new species.

On the other hand, the present new species resembles *Ceuthonectes* Chappuis, 1924 in limb structure, especially P5 (one-segmented), but differs not only the connecting plate of P1 and P4 in male, but also in less antennular segments, better developed first segment of the endopodite of P1, P3 and P4 of male and different shape of P5. So, it is impossible to locate the present new species in any genus of the family. Based on these differences, it is necessary to establish a new genus, of which so far, only one species, *Ligulocamptus loffleri* n.sp., has been found. The present new genus shows a close affinity to *Mesochra* and *Ceuthonectes*. It is possible to place *Ligulocamptus* between *Mesochra* and *Ceuthonectes*.

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