

Two new species of the genus *Paragonylopus* Chen & He, 1997 (Phasmida: Diapheromeridae: Pachymorphinae) from China

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ABSTRACT

Two new species, *Paragonylopus* (*Paragonylopus*) *brevicornis* **sp. nov.** and *P.* (*Paragonylopus*) *obtusidentatus* **sp. nov.**, from Yunnan, China, are described. A key to *Paragonylopus* (*Paragonylopus*) is given.

Key words: Stick insects, *Paragonylopus*, new species, China

中國仿圓足螞屬二新種 (螞目: 笛螞科: 短角枝螞亞科)

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摘要: 本文記述中國仿圓足螞屬二新種: 短角仿圓足螞 *Paragonylopus* (*Paragonylopus*) *brevicornis* **sp. nov.** 及鈍齒仿圓足螞 *P.* (*Paragonylopus*) *obtusidentatus* **sp. nov.**。

關鍵字: 竹節蟲, 仿圓足螞屬, 新種, 中國

INTRODUCTION

Paragonylopus Chen & He, 1997, is a small Pachymorphinae genus in the Oriental region (Otte and Brock, 2005; Chen and He, 2008; Hennemann et al., 2008; Ho, 2014, 2017; Brock et al., 2019) consisting of two subgenera, six species and two subspecies. This genus is characterised by small body size, three antennal segments, and unarmed thorax and abdomen (Chen and He, 1997; Ho, 2014, 2017). Ho (2017) provided the first taxonomic study for the genus with the descriptions of one new subgenus, five new species and two new subspecies. The nominate subgenus *Paragonylopus* (*Paragonylopus*) Chen & He, 1997 is closely related to *P.* (*Planoparagonylopus*) Ho, 2017, but can be distinguished by the slender and elongate body, its larger size (longer than 30mm), and the cylindrical thorax and abdomen.

In this paper, two new species from the subgenus *Paragonylopus* (*Paragonylopus*), are described. They are *P.* (*P.*) *brevicornis* **sp. nov.** and *P.* (*P.*) *obtusidentatus* **sp. nov.**. A key to the species of the subgenus is provided.

MATERIALS & METHODS

Egg material of *Paragonylopus* (*Paragonylopus*) *brevicornis* **sp. nov.** was removed from the abdomen of the paratypic female. Measurements of specimens are

given in mm. Illustrations (Figs. 3-6, 9-10) are based on the type material that was dried and pinned and deposited in the Hong Kong Entomological Society, Hong Kong (HKES).

RESULTS

Paragonylopus (*Paragonylopus*) Chen & He, 1997

Type-species: *Paragonylopus sinensis* Chen & He, 1997: 297, by original designation.

Distributions: China (Guangxi and Yunnan), Thailand and Vietnam.

Notes: Currently five species and two subspecies are recognised from this subgenus. All five species share the characters of the subgenus including a slender and elongate body and cylindrical thorax and abdomen, but can be distinguished from each other by their unique traits.

A key to the species of this subgenus is only provided for the females because the males of *P.* (*P.*) *brevicornis* **sp. nov.** and *P.* (*P.*) *obtusidentatus* **sp. nov.** are unknown. The preliminary data might indicate that the males are very rare or that these species represent all-female obligate parthenogens. Further collecting of specimens in the type locality is necessary.

Key to females of *Paragonylopus* (*Paragonylopus*):

1. Anterodorsal and posterodorsal carinae of femora lacking noticeable armature. *P.* (*P.*) *plaumanni* Zompro, 2000
- Anterodorsal and posterodorsal carinae of femora distinctly or indistinctly armed with elevations, obtuse teeth, or serrations. **2**
2. Fourth abdominal tergum with a rounded laminate crest. *P.* (*P.*) *cheni* Ho, 2017
- Fourth abdominal tergum lacking laminate crest. **3**
3. Posteromedial area of seventh abdominal sternum with a U-shaped, carina-like praeopercular organ. **4**
- Posteromedial area of seventh abdominal sternum with a hump-like praeopercular organ. **5**
4. Metanotum square. *P.* (*P.*) *brevicornis* **sp. nov.**

- Metanotum rectangular.
 P. (P.) obtusidentatus **sp. nov.**

5. Vertex of head with erect, spine-like horns.
 P. (P.) sinensis pingbianensis Ho, 2017

- Vertex of head with flattened, triangle-shaped horns, apices pointing forwards.
 P. (P.) sinensis sinensis Chen & He, 1997

***Paragonylopus (Paragonylopus) brevicornis* sp. nov.** (Figs. 1-6)

Types: Holotype, ♀, 2000m, Xishan, Kunming, Yunnan, China, 31.V.2018, George Ho Wai-Chun (HKES); Paratypes, 1♀ & 5 eggs (extracted from abdomen of paratype ♀), 2000m, Xishan, Kunming, Yunnan, China, 22.VI.2019, George Ho Wai-Chun (HKES).

Differentiation: *P. (Paragonylopus) brevicornis* **sp. nov.** is morphologically similar to *P. (Paragonylopus) sinensis* Chen & He, 1997 **sen. str.**, the former can be easily diagnosed from the latter by its smaller size (body length 24-26mm), different shape of the praeopercular organ on the posteromedial area of seventh abdominal sternum, and the inconspicuous small elevations on the anterodorsal, posterodorsal, anteroventral, and posteroventral carinae of femora.

Etymology: The name of this new species is derived from a pair of short horns on the vertex of the head.

Description of female (Figs. 1-4): Body slender and cylindrical. General colouration of body brown.

Head: Oval, longer than pronotum and sparsely covered with small granules. Vertex flat, with a pair of short and small horns between the compound eyes. Occiput flat, with indistinct median and lateral longitudinal furrows. Posterior margin of occiput with indistinct swellings. Compound eyes elliptical and small, their lengths about three times that of genae. Antennae short, with three distinct segments, with sparse and short bristles, apices of terminal segment obtuse. Scapus oval in dorsal view, more or less triangle-shaped in cross section; pedicellus small, indistinct and knob-shaped, shorter than scapus; and third segment longest, cylindrical, apically tapering after middle area.

Thorax: Wrinkled and sparsely covered with small granules. Pronotum trapezoidal, posteriorly expanded, anterior margin gently incurved, posterior margin truncate, lateral margins thickened, transverse and longitudinal sulci crossing just after middle point. Mesonotum gently expanded posteriorly, longer than combined length of metanotum and median segment, with distinct mediolongitudinal and lateral carinae, lateral margins with minute pits. Metanotum square, with distinct mediolongitudinal and lateral carinae, lateral margins with minute pits.

Abdomen: Cylindrical, tapering posteriorly, sparsely granulated and punctuated, mediolongitudinally and

laterally carinate. Seventh sternum with an indistinct, U-shaped, carina-like praeopercular organ on posteromedial area, medially with a minute granule. Anal segment as long as eighth tergum, longer than ninth tergum, medially constricted posteriorly, posterior margin rounded. Supra-anal plate indistinct. Subgenital plate scoop-shaped, flat, posterior margin rounded and reaching posterior area of ninth tergum. Cerci cylindrical and straight, apices rounded and surpassing posterior margin of anal segment.

Legs: Sparsely covered with short bristle, slender and long. Profemora curved basally. Anterodorsal, posterodorsal, anteroventral and posteroventral carinae of femora and tibiae with indistinct elevations.

Measurements: See Table 1.

Description of egg (Figs. 5-6): Capsule brown, cylindrical, tapering posteriorly, ventral surface smooth. Micropylar plate light brown, oblong, anterior end pointed and elongated, posterior end rounded. Micropylar cup small, placed near posterior end of micropylar plate. Median line long, almost as long as length of micropylar plate. Operculum oval, gently convex.

Distribution: Yunnan, China.

Notes: The male is unknown. The description, illustrations and measurements of eggs are based on the extracted eggs which were removed from the abdomen of the paratypic female and probably in an immature stage.

***Paragonylopus (Paragonylopus) obtusidentatus* sp. nov.** (Figs. 7-10)

Types: Holotype, ♀, 1400-1800m, Wutaishan, Jinping, Yunnan, China, 29.VIII.2019, George Ho Wai-Chun (HKES); Paratypes, 4♀, 1400-1800m, Wutaishan, Jinping, Yunnan, China, 29-30.VIII.2019, George Ho Wai-Chun (HKES).

Differentiation: *P. (Paragonylopus) obtusidentatus* **sp. nov.** is similar to *P. (Paragonylopus) brevicornis* **sp. nov.**, but can be separated by its larger size (body length 32mm), the rectangular mesonotum, the flattened granulations on mesonotum and metanotum, and the distinct armature on the carinae of the legs.

Etymology: The name of this new species is derived from the obtuse dentations on the carinae of the legs.

Description of female (Figs. 7-10): Body slender and cylindrical; rough with granulations, sparsely covered with minute bristles. General colouration of body brown.

Head: Oval, longer than pronotum and sparsely covered with small granules. Vertex flat, with a pair of short and small horns between the compound eyes. Occiput flat, with indistinct median and lateral longitudinal furrows. Posterior margin of occiput with indistinct swellings.

Compound eyes elliptical and small, their lengths about three times that of genae. Antennae short, with three distinct segments, with sparse and short bristles, apices of terminal segment obtuse. Scapus oval in dorsal view, more or less triangle-shaped in cross section; pedicellus small and indistinct and knob-shaped, shorter than scapus; and third segment longest, cylindrical, apically tapering after middle area, inner margin distinctly elevated medially.

Thorax: Pronotum trapezoidal, posteriorly expanded, sparsely granulated, posteromedial area elevated with a small, obscure, granulated hump; anterior margin incurved, anterolateral angles pointed, posterior margin truncate, lateral margins thickened; transverse and longitudinal sulci crossing just after middle point. Mesonotum longer than wide, longer than combined length of metanotum and median segment, gently expanded posteriorly; sparsely covered with flattened granulations, mediolongitudinal and lateral carinae indistinct, lateral margins with very few minute pits. Metanotum rectangular, longer than wide, sparsely covered with flattened granulations, with indistinct mediolongitudinal and lateral carinae, lateral margins with very few minute pits. Mesosternum and metasternum lacking granulation.

Abdomen: Cylindrical, tapering posteriorly, sparsely granulated, mediolongitudinal carina indistinct. Median segment rectangular, broader than long. Second to ninth tergites with a small posteromedial hump. Seventh sternum distinctly elevated with a carina-like praeopercular organ on posteromedial area, U-shaped, medially with a minute tubercle. Anal segment as long as eighth tergum, longer than ninth tergum, post-medially constricted posteriorly, posterior margin rounded. Supra-anal plate indistinct. Subgenital plate scoop-shaped, flat, mediolongitudinal carina medially bifurcated, posterior margin rounded and reaching posterior area of ninth tergum. Cerci cylindrical, long and straight, almost as long as ninth tergum, apices rounded and exceeding posterior margin of anal segment.

Legs: Sparsely covered with short bristles, slender and long. Femora as long as corresponding tibiae. Profemora distinctly curved basally. Anterodorsal, posterodorsal, anteroventral, and posteroventral carinae of femora and tibiae waved with small and obtuse dentations, dentations indistinct on anteroventral carina of tibiae.

Measurements: See Table 2.

Distribution: Yunnan, China.

Notes: The male is unknown. The description and illustration of egg are insufficiently provided because no egg was removed from the abdomen of the females.

DISCUSSION

A total of two subgenera, eight species and two subspecies are currently recognised in the genus

Paragonylopus Chen & He, 1997 **sen. str.**. The two newly described taxa, *P. (Paragonylopus) brevicornis* **sp. nov.** and *P. (Paragonylopus) obtusidentatus* **sp. nov.**, from Yunnan, China, are taxonomically placed in the subgenus *P. (Paragonylopus)* Chen & He, 1997 based on the morphological characters. The discovery of *P. (Paragonylopus) brevicornis* **sp. nov.** (type locality: Xishan, Kunming) further extends the known range of the genus in Yunnan from the southern to the central mountainous region and represents the most northern distribution of the genus.

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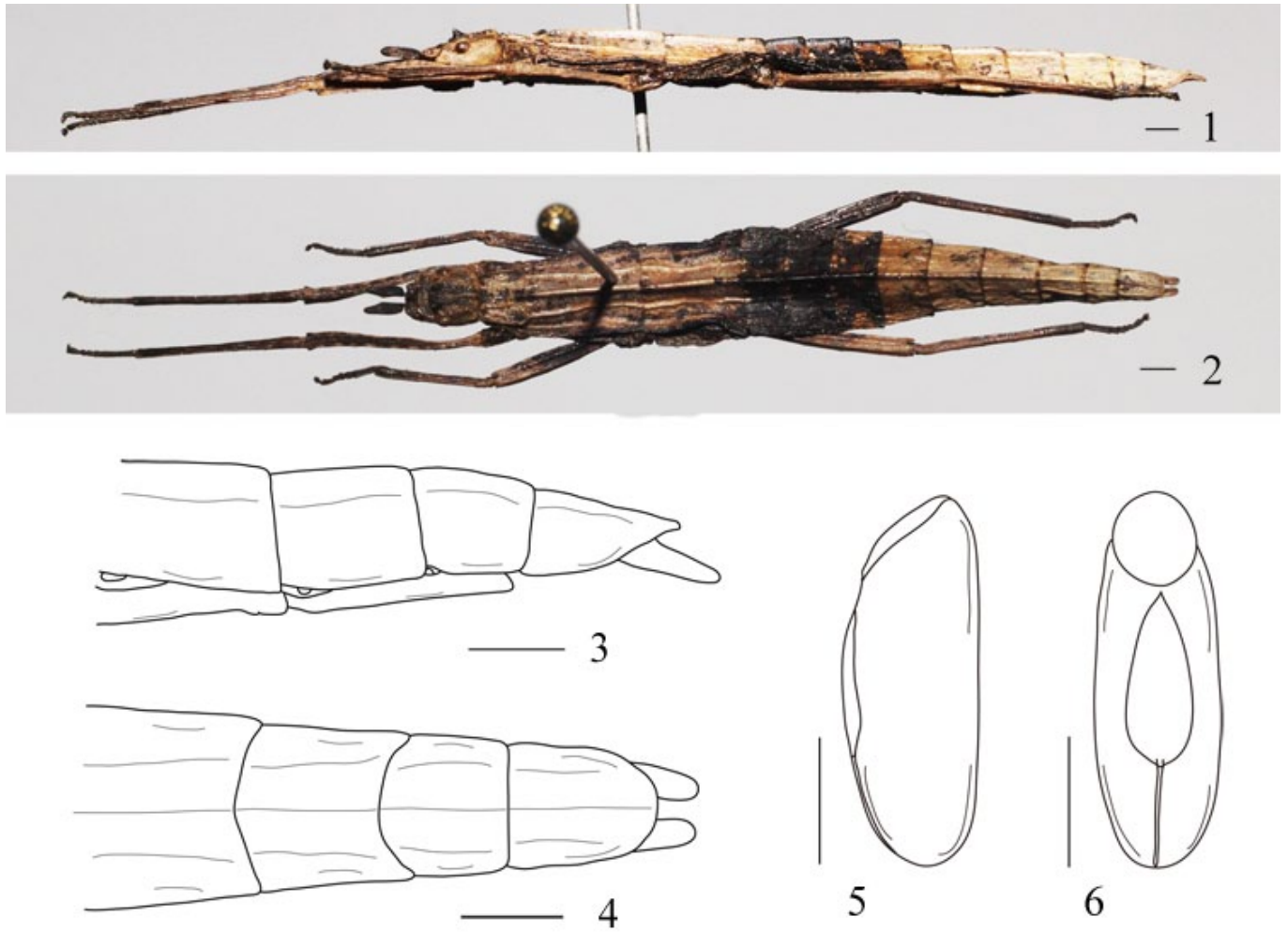
TABLE & FIGURES

	Holotype Female	Paratype Female
Body	24.0	26.0
Head	2.0	2.0
Antennae	1.5	1.5
Pronotum	1.5	1.5
Mesonotum	4.0	4.0
Metanotum	2.5	2.5
Median segment	1.0	1.0
Profemora	5.5	6.0
Mesofemora	4.0	4.5
Metafemora	5.0	5.5
Protibiae	5.5	5.5
Mesotibiae	4.0	4.0
Metatibiae	5.0	5.5

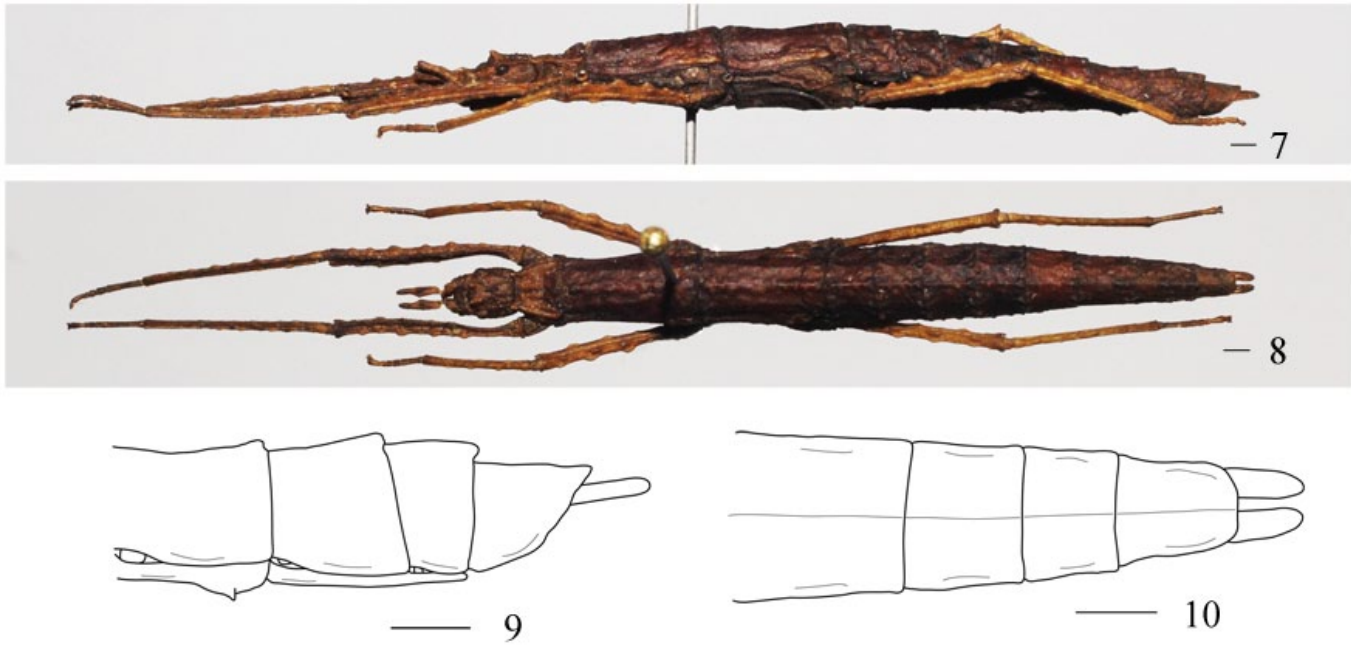
Table 1. Measurements of *Paragonylopus (Paragonylopus) brevicornis* sp. nov. (mm)

	Holotype Female	Paratype Females
Body	32.0	32.0
Head	3.0	3.0
Antennae	3.0	3.0
Pronotum	2.0	2.0
Mesonotum	6.0	5.5
Metanotum	4.0	4.0
Median segment	1.0	1.0
Profemora	8.0	8.0
Mesofemora	5.0	5.5-6.0
Metafemora	7.0	7.0
Protibiae	8.0	8.0
Mesotibiae	5.0	5.5
Metatibiae	7.0	7.0

Table 2. Measurements of *Paragonylopus (Paragonylopus) obtusidentatus* sp. nov. (mm)



Figures 1-6. *Paragonylopus (Paragonylopus) brevicornis* sp. nov. [scale bar 1 mm] (Drawings by author). 1. Female, habitus, lateral view. 2. Female, habitus, dorsal view. 3. Female, end of abdomen, lateral view. 4. Female, end of abdomen, dorsal view. 5. Egg, lateral view. 6. Egg, dorsal view.



Figures 7-10. *Paragonylopus (Paragonylopus) obtusidentatus* sp. nov. [scale bar 1 mm] (Drawings by author). 7. Female, habitus, lateral view. 8. Female, habitus, dorsal view. 9. Female, end of abdomen, lateral view. 10. Female, end of abdomen, dorsal view.