

Contribution to the knowledge of Oriental Phasmatodea II: A taxonomic study of the genus *Paragonylopus* (Phasmatodea: Pachymorphinae: Gratiidiini)

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Abstract

This study provides a taxonomic review of *Paragonylopus* Chen & He, 1997 with descriptions of one new subgenus, four new species and one new subspecies. They are namely *Paragonylopus* (*Paragonylopus*) *cheni* sp. n., *P.* (*Paragonylopus*) *sinensis pingbianensis* subsp. n., *P.* (*Planoparagonylopus*) *lii* subgen. n. and sp. n., *P.* (*Planoparagonylopus*) *abramovi* sp. n., and *P.* (*Planoparagonylopus*) *nabanheensis* sp. n. The occurrence of *P.* (*Paragonylopus*) *plaumanni* Zompro, 2000 in China is reconfirmed. *Paragonylopus* is firstly recognized in Vietnam. Keys to the species of both subgenera and checklists of known species are also provided.

Key words

China, new taxa, stick insects, Thailand, Vietnam

Introduction

Paragonylopus Chen & He, 1997 is a genus with small body size and three recognized antennal segments that readily make it morphologically distinguishable from all other genera in the subfamily Pachymorphinae Brunner von Wattenwyl, 1893 (Brunner von Wattenwyl 1893, Chen and He 1997, Zompro 2000, Bragg 2001, Cliquennois 2004, Chen and He 2008, Ho 2014). *Paragonylopus* was considered as a Chinese endemic genus until it was reported by Zompro (2000) in Thailand with the description of a new species. Only two species, *Paragonylopus sinensis* Chen & He, 1997 and *P. plaumanni* Zompro, 2000, are described from Guangxi in southern China and Nakhon Ratchasima in central Thailand respectively. The former species is the type species of *Paragonylopus*, but only the female is known. After that, Ho (2014) provided the first description of its corresponding male and egg and also reported the occurrence of *P. plaumanni* in China. The author of this study conducted further collecting trips to various localities in China and examined

various Vietnamese collections that resulted in the discoveries of new localities and new taxa of *Paragonylopus*, including one new subgenus, four new species and one new subspecies described in this study. This study aims to provide a revision of *Paragonylopus* with the descriptions of six new taxa and a taxonomic key, and to enhance the knowledge of Chinese and Southeast Asian Phasmatodea biodiversity.

Material and methods

This study is based on the collection of specimens in various localities in China and examination of specimens in different collections. The specimens of *Paragonylopus* (*Paragonylopus*) *cheni* sp. n., *P.* (*Paragonylopus*) *sinensis pingbianensis* subsp. n., *P.* (*Planoparagonylopus*) *lii* subgen. n. and sp. n. and *P.* (*Paragonylopus*) *plaumanni* Zompro, 2000, were collected directly by hand by the present author at night due to their nocturnal behavior. A hand torch was used to spot them on the plants. The specimens were dried and pinned after collecting. No food plant fed upon by the collected species was observed.

Morphological terms follow Bragg (2001), Zompro (2004) and Bradler (2009). The eggs of *P.* (*Paragonylopus*) *cheni* sp. n. were extracted from the abdomen of the holotypic female. Ootaxonomic terminology refers to Clark (1976a, b, 1979, 1988, 1998), Clark-Sellick (1997) and Zompro (2004). The descriptions of coloration are based on dried specimens. Measurements are given in millimetres (mm) for all the taxa. The sequence of genera and species is in alphabetical order. The types and non-type material mentioned in this paper are deposited in the following localities: Hong Kong Entomological Society, Hong Kong, China (HKES), Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZCAS), Manchester Museum, The University of Manchester, U.K. (MMUE), Insect Collection of Shanghai Normal University, Shanghai, China (SNUC) and private collections of Oliver Zompro, Germany (OZ).

Taxonomy

Paragonylopus Chen & He, 1997

Subsequent literature.—Chen and He 1997: 297. Bragg 2001: 670. Cliquennois 2004: 314. Zompro 2004: 317. Otte and Brock 2005: 247. Chen and He 2008: 208. Hennemann et al. 2008: 19. Ho 2014: 12.

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

Distribution.—China (Guangxi and Yunnan), Thailand and Vietnam.

Notes.—A total of two subgenera, six species and two subspecies are recognized from this genus. Keys to the species of both subgenera with checklist of known species are provided.

Key to the subgenera of *Paragonylopus*

- 1 Body slender and elongate, longer than 30 mm, thorax and abdomen cylindrical.....*P. (Paragonylopus)* s. str.
- Body robust and stout, shorter than 30 mm, thorax and abdomen dorsoventrally flattened.....*P. (Planoparagonylopus)* subgen. n.

Paragonylopus (Paragonylopus) Chen & He, 1997 s. str.

Subsequent literature.—Chen and He 1997: 297. Bragg 2001: 670. Cliquennois 2004: 314. Zompro 2004: 317. Otte and Brock 2005: 247. Chen and He 2008: 208. Hennemann et al. 2008: 19. Ho 2014: 12.

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

Description.—Small size. Apterous. Body slender and cylindrical, robust in female, more slender in male. Head oval, with sparse and small granules. Vertex flat, unarmed or with paired supra-antennal armature. Occiput gently convex. Antennae formed by three segments, each with a different morphological structure from other segments: scapus oval in the dorsal view, more or less triangle-shaped in cross section; pedicellus minute, indistinct, and knob-shaped; third segment cylindrical, with a small medial elevation on its inner margin and a few minute, spine-like bristles on the first half of the inner margin. Thorax with sparse and small granules. Pronotum trapezoidal and expanded posteriorly. Female mesonotum parallel-sided or weakly expanded at second half. Abdomen cylindrical, sparsely granulated. Postero-medial area of seventh sternum lacking or with a small hump-like praeopercular organ in female. Female subgenital plate short, scoop-shaped and flattened, posterior margin rounded. Male poculum cup-shaped, posterior margin rounded. Cerci cylindrical and straight. Legs slender. Anterodorsal, posterodorsal, anteroventral and posteroventral carinae of femora and tibiae waved, serrated or unarmed. Egg capsule cylindrical with oblong micropylar plate.

Distribution.—China (Guangxi and Yunnan) and Thailand.

Notes.—Currently three species and two subspecies are recognized from this subgenus.

Species included.—

1. *Paragonylopus (Paragonylopus) cheni* sp. n. [China (Yunnan)].
2. *Paragonylopus (Paragonylopus) plaumanni* Zompro, 2000: 50, figs 1–8. [China (Yunnan) and Thailand].
- 3.1. *Paragonylopus (Paragonylopus) sinensis pingbianensis* subsp. n. [China (Yunnan)].
- 3.2. *Paragonylopus (Paragonylopus) sinensis sinensis* Chen & He, 1997: 297, figs 1–3. s. str. [China (Guangxi)].

Key to females of *Paragonylopus (Paragonylopus)*

- 1 Anterodorsal and posterodorsal carinae of femora lacking noticeable armature.....*P. (Paragonylopus) plaumanni*
- Anterodorsal and posterodorsal carinae of femora distinctly armed with obtuse teeth or serrations 2
- 2 Fourth abdominal tergum with a rounded laminate crest
.....*P. (Paragonylopus) cheni* sp. n.
- Fourth abdominal tergum lacking laminate crest 3
- 3 Vertex of head with erect spine-like horns
.....*P. (Paragonylopus) sinensis pingbianensis* subsp. n.
- Vertex of head with flattened triangle-shaped horns, apices pointing forwards*P. (Paragonylopus) sinensis sinensis* s. str.

Key to males of *Paragonylopus (Paragonylopus)*

- 1 Anterodorsal and posterodorsal carinae of femora lacking noticeable armature.....*P. (Paragonylopus) plaumanni*
- Anterodorsal and posterodorsal carinae of femora distinctly armed with obtuse teeth.....*P. (Paragonylopus) sinensis sinensis* s. str.

Paragonylopus (Paragonylopus) cheni sp. n.

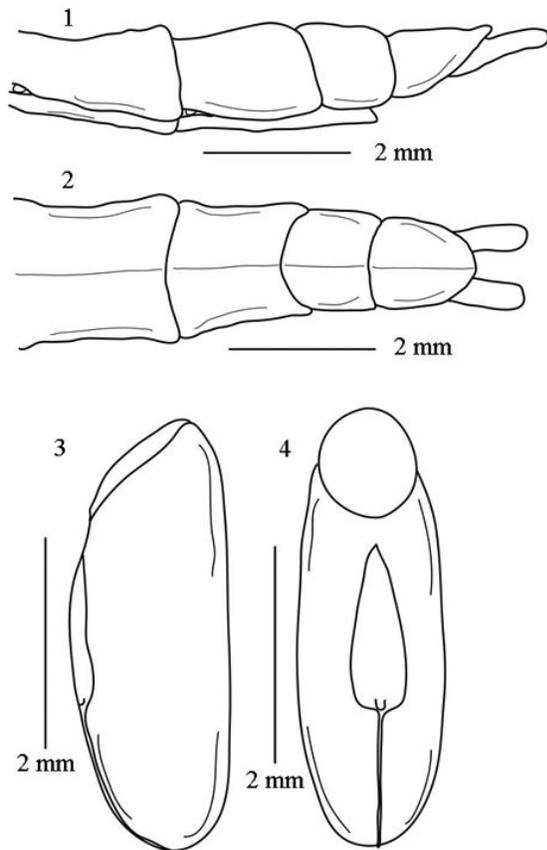
<http://zoobank.org/AE12B19E-94E0-4A2E-8176-899CDC220F1E>

Figs 1–4, 11–12, 17

Type material.—Holotype ♀, 1300–1400m, Huanglianshan, Luchun, Yunnan, China, 7.IX.2016, George Ho Wai-Chun (HKES); Paratypes 6 eggs (extracted from abdomen of holotype ♀), 1300–1400m, Huanglianshan, Luchun, Yunnan, China, 7.IX.2016, George Ho Wai-Chun (HKES).

Diagnosis.—*Paragonylopus (Paragonylopus) cheni* sp. n. is similar to *Paragonylopus (Paragonylopus) sinensis* Chen & He, 1997, but can be easily distinguished by rough thorax, distinctly carinate mesonotum and presence of a rounded lamellate crest on fourth abdominal tergum.

Description.—Female (Figs 1–2, 11–12, 17): Small size. Body cylindrical, slender and slim. General color of body and legs brown. Head oval, longer than wide, gently constricted after compound eyes. Vertex flat, with a pair of spine-like horns (erect in fresh specimen, curved in dried specimen) between compound eyes. Occiput convex, sparsely covered with small granules. Median and lateral longitudinal furrows indistinct. Compound eyes small and oval, its length about two-and-one-half times that of genae. Antennae short, with three distinct segments; scapus oval in dorsal view, more or less triangle-shaped in cross section, as large as compound eyes; pedicellus minute and indistinct, knob-like, smaller than compound eyes; third segment generally cylindrical, apices blunt, tapering basally, about four times longer than scapus, inner margin elevated medially, first half of inner margin with minute spine-like bristles. Thorax rough, sparsely covered



Figs 1–4. *Paragonylopus (Paragonylopus) cheni* sp. n. 1. ♀, apex of abdomen, lateral view; 2. ♀, apex of abdomen, dorsal view; 3. Egg, lateral view; 4. Egg, dorsal view.

with very few small granules. Pronotum trapezoidal, expanded posteriorly, shorter than head; anterior and posterior margins truncate, lateral margins thickened, transverse and longitudinal sulci indistinct. Mesonotum parallel-sided, as long as mesofemora, median and lateral longitudinal carinae distinct, posterolateral margins elevated. Metanotum longer than combined length of head and pronotum, median and lateral longitudinal carinae distinct, posterolateral margins elevated. Abdomen cylindrical, tapering posteriorly. Distinctly carinate mediolongitudinally. Sparsely covered with very few small granules. Median segment narrow, wider than long. Median segment to fifth tergites with a crest posteromedially, strongly enlarged as a rounded lamellate crest on fourth tergum, varied in sizes on other tergites. Second to fifth sternites with a granule-like hump on each side of posterolateral angles. Seventh sternum lacking noticeable praepopercular organ. Eighth tergum longer than anal segment. Anal segment longer than ninth tergum, shorter than eighth tergum, constricted posteriorly, posterior margin rounded. Supra-anal plate indistinct. Subgenital plate scoop-shaped, short, flattened, posterior margin rounded, almost reaching posterior margin of ninth tergum. Cerci cylindrical, straight, apices rounded and surpassing posterior margin of anal segment. Legs slender and long. Profemora incurved basally, as long as protibiae. Anterodorsal and posterodorsal carinae of femora and tibiae distinctly armed with three to six serrations of varied sizes. Anteroventral and posteroventral carinae of tibiae unarmed.

Measurements.—(mm) Holotype ♀, Body length: 32, head: 2.5, antennae: 2, pronotum: 2, mesonotum: 6, metanotum: 4.5, median segment: 1, profemora: 9, mesofemora: 6, metafemora: 7, protibiae: 10, mesotibiae: 7, metatibiae: 9.

Eggs.—(Figs 3–4): Capsule rufous brown, oblong, rough. Micropylar plate brown, oval, gently elongated anteriorly. Micropylar cup placed near posterior apex of micropylar plate. Median line long, placed behind micropylar plate, almost as long as length of micropylar plate. Operculum flattened and rough.

Measurements.—(mm) Length: 3.2 mm, width: 1.4 mm, height: 1.4 mm.

Habitats.—This species is found in the low level of evergreen mountainous broadleaf forests between 1300 and 1400 metres.

Distribution.—China (Yunnan).

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 holotypic female and probably in developing stage. No food plant eaten by the collected specimen was observed.

Etymology.—This new species is named in honor of Professor Chen Shu-Chun (Beijing, China) for his extensive works and contributions to the Chinese phasmid fauna.

***Paragonylopus (Paragonylopus) plaumanni* Zompro, 2000**

Figs 13–14

Paragonylopus plaumanni Zompro, 2000: 50, figs 1–8. Otte and Brock 2005: 247. Zompro 2009: 20. Ho 2014: 13.

Type material.—Holotype ♂, 101°19'E, 14°31'N, 900–1000m, S Khao Mai Pok, Nakhon Ratchasima, Thailand, 19–25.X.1997 (OZ); Paratypes 2♂ and 1♀, 101°19'E, 14°31'N, 900–1000m, S Khao Mai Pok, Nakhon Ratchasima, Thailand, 19–25.X.1997 (OZ); 1♂ and 1♀, 1200m, Viewpoint Khao Kheo, Khao Yai, Nakhon Ratchasima, Thailand, 15.X.1997 (OZ).

Further material.—1♀, 500–600 m, Menglun, Xishuangbanna, Yunnan, China, 4.IX.2015, George Ho Wai-Chun (HKES).

Distribution.—China (Yunnan) and Thailand.

Notes.—No food plant eaten by the collected specimen was observed.

***Paragonylopus (Paragonylopus) sinensis pingbianensis* subsp. n.**

<http://zoobank.org/2CC6BD20-49EA-4307-AF2B-C6BFDE480861>

Figs 15–16, 18

Type material.—Holotype ♀, Yuping, Pingbian, Yunnan, China, 8.IX.2016, George Ho Wai-Chun (HKES).

Diagnosis.—*Paragonylopus (Paragonylopus) sinensis pingbianensis* subsp. n. is similar to the nominate *Paragonylopus (Paragonylopus) sinensis* Chen & He, 1997 s. str., but can be distinguished by erect spine-like horns on vertex of head and comparatively enlarged armature on legs.

Description.—Female (Figs 15–16, 18): As in nominate race, body cylindrical, slender and elongate, covered with short dense bristles. General color of body and legs brown. Head as in nominate race, but vertex with a pair of erect spine-like horns between compound eyes. Antennae and compound eyes as in nominate race. Thorax as in nominate race. Abdomen as in nominate race, but median segment to seventh tergites with more distinct paired lamella-like elevations on posterior margin, strongly enlarged as a pair of humps on fifth tergum, varied in size on other tergites. Posteromedial area seventh sternum with a small hump-like praeopercular organ as in nominate race. Legs slender and long. Anterodorsal and posterodorsal carinae of femora and tibiae distinctly armed with four to eight serrations of varied sizes. Anteroventral and posteroventral carinae of protibiae and mesotibiae unarmed. Anteroventral and posteroventral carinae of metatibiae waved.

Measurements.—(mm) Holotype ♀, Body length: 43, head: 3, antennae: 2.5, pronotum: 2.5, mesonotum: 8, metanotum: 6, median segment: 1, profemora: 13, mesofemora: 8, metafemora: 10, protibiae: 13, mesotibiae: 8, metatibiae: 10.

Habitats.—This species inhabits the low level of evergreen mountainous broadleaf forests.

Distribution.—China (Yunnan).

Notes.—The male is unknown. No food plant eaten by the collected specimen was observed.

Etymology.—This new species is named after the type locality, Pingbian (Yunnan, China).

***Paragonylopus (Paragonylopus) sinensis sinensis*
Chen & He, 1997 s. str.**

Paragonylopus sinensis Chen & He, 1997: 297, figs 1–3.

Chen 1999: 48. Otte and Brock 2005: 247. Chen and He 2008: 208, figs 173a–b. Hennemann et al. 2008: 19. Zompro 2009: 21. Ho 2014: 12, figs 1–7.

Type material.—Holotype ♂, Damingshan, Wuming, Guangxi, China, 23.V.1963, Yang Chi-Kun (IZCAS).

Further material.—6♂, 2♀ and 4 eggs, Damingshan, Wuming, Guangxi, China, 28–31.VII.2012, George Ho Wai-Chun (HKES).

Distribution.—China (Guangxi).

Notes.—Ho (2014) provided the first description of male and eggs for this species.

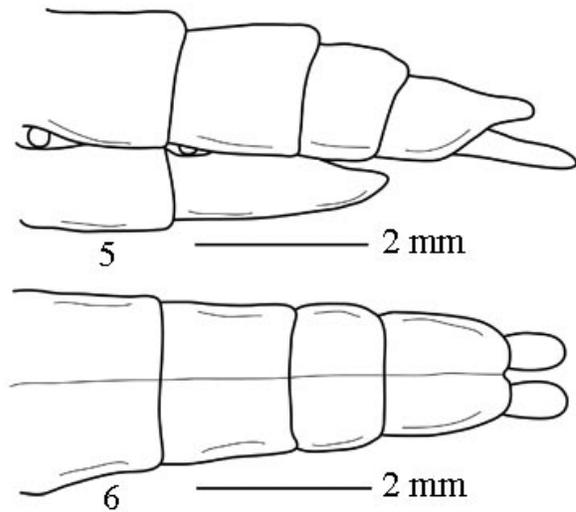
Subgenus *Paragonylopus (Planoparagonylopus)* subgen. n.

<http://zoobank.org/156FAE34-E635-49CC-9904-BACBD36B480D>

Figs 5–10, 19–25

Type species.—*Paragonylopus (Planoparagonylopus) lii* sp. n., by present designation.

Diagnosis.—*Paragonylopus (Planoparagonylopus)* subgen. n. is similar to *Paragonylopus (Paragonylopus)* s. str., but can be



Figs 5–6. *Paragonylopus (Planoparagonylopus) abramovi* subgen. n. and sp. n. 5. ♀, apex of abdomen, lateral view; 6. ♀, apex of abdomen, dorsal view.

distinguished by smaller size and dorsoventrally flattened thorax and abdomen.

Description.—Small size. Apterous. Body dorsoventrally flattened, robust and stout. Head rounded or oval in dorsal view, dorsoventrally flattened. Vertex flat, unarmed. Occiput flattened. Antennae formed by three segments, structures as in *Paragonylopus (Paragonylopus)* s. str. Thorax dorsoventrally flattened. Pronotum trapezoidal or square. Mesonotum wider than pronotum. Abdomen dorsoventrally flattened, with small pits. Seventh sternum lacking noticeable praeopercular organ. Anal segment gently constricted posteriorly, longer than ninth tergum. Subgenital plate short, scoop-shaped and flattened, posterior apex not reaching middle area of anal segment. Cerci cylindrical and straight. Legs slender and long. Anterodorsal, posterodorsal, anteroventral and posteroventral carinae of femora and tibiae waved with indistinct elevations or lacking noticeable elevations.

Distribution.—China (Yunnan) and Vietnam.

Notes.—Currently three species are recognized from this newly established subgenus. Male and egg are unknown.

Species included.—

1. *Paragonylopus (Planoparagonylopus) abramovi* sp. n. [Vietnam (Lao Cai)].
2. *Paragonylopus (Planoparagonylopus) lii* sp. n. [China (Yunnan)].
3. *Paragonylopus (Planoparagonylopus) nabanheensis* sp. n. [China (Yunnan)].

Key to females of *Paragonylopus (Planoparagonylopus)* subgen. n.

- | | | |
|---|---------------------------------------|--|
| 1 | Metanotum wider than mesonotum | <i>P. (Planoparagonylopus) lii</i> sp. n. |
| – | Metanotum parallel to mesonotum | 2 |
| 2 | Mesonotum rectangular..... | <i>P. (Planoparagonylopus) nabanheensis</i> sp. n. |
| – | Mesonotum square..... | <i>P. (Planoparagonylopus) abramovi</i> sp. n. |

Paragonylopus (Planoparagonylopus) abramovi sp. n.<http://zoobank.org/F5E7D9D7-E8F3-4AA0-BCDF-6D48B546FBBF>

Figs 5–6, 19–21

Type material.—Holotype ♀, c. 1930–2000m a.s.l., 22° 21'N, 103° 46'E, Nr. Tram Ton station of Hoang Lien National Park, north slope of Phansipan Mt. Area, 6km W of Sa Pa, Lao Cai, Vietnam, V.2010, A.V. Abramov, F3376.3 (MMUE).

Diagnosis.—*Paragonylopus (Planoparagonylopus) abramovi* sp. n. is similar to *Paragonylopus (Planoparagonylopus) nabanheensis* sp. n., but can be distinguished by square mesonotum and distinct elevations on legs.

Description.—Female (Figs 5–6, 19–21): Small size. Body flattened and stout. General color of body and legs grayish brown. Head oval in dorsal view, dorsoventrally flattened, with minute pits. Vertex flat and unarmed. Occiput flat. Median longitudinal furrow indistinct. Compound eyes small and oval, its length about three times that of genae. Antennae short, with three distinct segments; scapus oval in dorsal view, more or less triangle-shaped in cross section, larger than compound eyes, about four times longer than pedicellus; pedicellus minute and indistinct, knob-like, smaller than compound eyes; third segment generally cylindrical, apices blunt, tapering basally, about three times longer than scapus, inner margin elevated medially, first half of inner margin with minute spine-like bristles. Thorax with minute pits. Pronotum trapezoidal, expanded posteriorly, wider than head; anterior margin weakly incurved, posterior margin truncate, anterolateral angles weakly tuberculate; transverse sulcus short, placed after middle area, longitudinal sulcus indistinct. Mesonotum square, as long as mesofemora; median longitudinal carina distinct. Metanotum rectangular, wider than pronotum, wider than long, parallel to mesonotum, median longitudinal carina distinct. Abdomen flattened, tapering posteriorly. Distinctly carinate mediolongitudinally. Wrinkled and pitted, also with a very few small granules. Median segment narrow, wider than long. Second and third tergites parallel to mesonotum and metanotum, fourth tergum to anal segment not wider than second tergum. Seventh sternum lacking noticeable praeopercular organ. Eighth tergum longer than ninth tergum. Anal segment longer than ninth tergum, shorter than eighth tergum, medially constricted posteriorly, posterior margin with a small emargination. Supra-anal plate indistinct. Subgenital plate scoop-shaped, short, flattened, posterior margin pointed, reaching anterior margin of anal segment. Cerci flattened, straight, apices rounded and surpassing posterior margin of anal segment. Legs slender and long. Sparsely covered with minute bristles. Femora as long as corresponding tibiae. Profemora incurved basally. Anterodorsal, posterodorsal, anteroventral and posteroventral carinae of femora and tibiae waved with indistinct elevations.

Measurements.—(mm) Holotype ♀, Body length: 25, head: 2.5, antennae: 2, pronotum: 2, mesonotum: 4, metanotum: 2, median segment: 1, profemora: 5, mesofemora: 4, metafemora: 5, protibiae: 5, mesotibiae: 4, metatibiae: 5.

Distribution.—Vietnam (Lao Cai).

Notes.—The male is unknown.

Etymology.—It is named in honor of Alexei V. Abramov (Russia) for his discovery of this new species.

Paragonylopus (Planoparagonylopus) lii sp. n.<http://zoobank.org/D9B82775-B9A2-4AFE-903B-B999075F67E3>

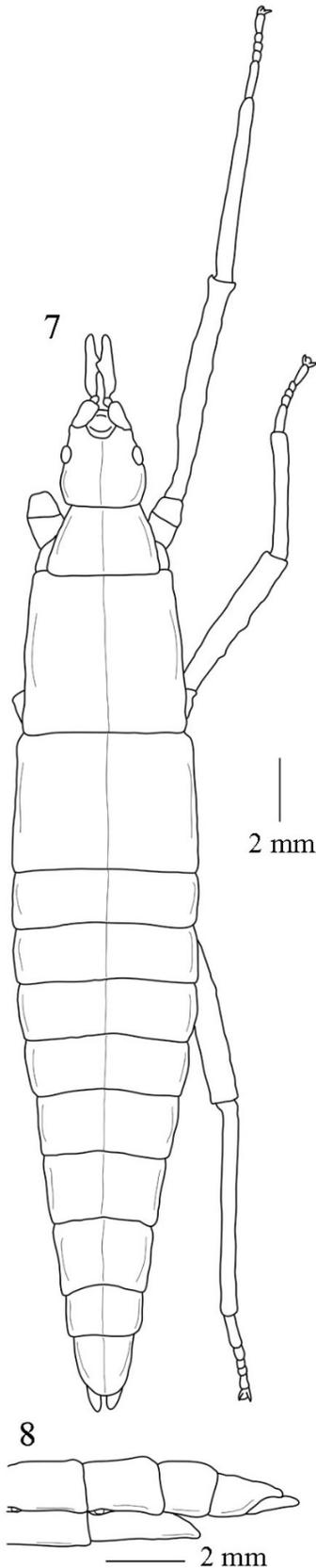
Figs 7–8, 22–23

Type material.—Holotype ♀, 1300–1400m, Fenshuiling, Jinping, Yunnan, China, 4.IX.2016, George Ho Wai-Chun (HKES); Paratype 1♀, 1300–1400m, Fenshuiling, Jinping, Yunnan, China, 4.IX.2016, George Ho Wai-Chun (HKES).

Diagnosis.—*Paragonylopus (Planoparagonylopus) lii* sp. n. is similar to *Paragonylopus (Planoparagonylopus) nabanheensis* sp. n., but can be easily distinguished by granulated body, nearly square mesonotum, rectangular metanotum and indistinct elevations on legs.

Description.—Female (Figs 7–8, 22–23): Small size. Body flattened and stout. General color of body and legs brown. Head rounded in dorsal view, dorsoventrally flattened. Vertex flat and unarmed. Occiput flat. Median longitudinal furrow distinct. Compound eyes small and oval, its length about two times that of genae. Antennae short, with three distinct segments; scapus oval in dorsal view, more or less triangle-shaped in cross section, larger than compound eyes, about three times longer than pedicellus; pedicellus minute and indistinct, knob-like, smaller than compound eyes; third segment generally cylindrical, apices blunt, tapering basally, about three times longer than scapus, inner margin elevated medially, first half of inner margin with minute spine-like bristles. Thorax with inconspicuous granulations. Pronotum trapezoidal, expanded posteriorly, wider than head; anterior margin weakly incurved, posterior margin truncate, lateral margins thickened; transverse sulcus indistinct, longitudinal sulcus distinct. Mesonotum nearly square, slightly expanded posteriorly, anterior margin almost as long as posterior margin, shorter than mesofemora; median longitudinal carina distinct, with minute pits along lateral margins. Metanotum rectangular, wider than pronotum, wider than long, median longitudinal carina distinct, with minute pits along lateral margins. Abdomen flattened, tapering posteriorly. Distinctly carinate mediolongitudinally. Wrinkled, with minute pits along lateral margins, also with sparse granulations. Median segment narrow, wider than long. Second and third tergites wider than mesonotum, as wide as metanotum, fourth tergum to anal segment not wider than second tergum. Seventh sternum lacking noticeable praeopercular organ. Eighth tergum longer than ninth tergum. Anal segment as long as eighth tergum, constricted posteriorly, posterior margin rounded. Supra-anal plate indistinct. Subgenital plate scoop-shaped, short, flattened, posterior margin pointed, reaching anterior margin of anal segment. Cerci cylindrical, straight, apices rounded and surpassing posterior margin of anal segment. Legs slender and long. Densely covered with minute bristles. Femora roughly as long as corresponding tibiae. Profemora incurved basally. Anterodorsal, posterodorsal, anteroventral and posteroventral carinae of femora and tibiae waved with indistinct elevations.

Measurements.—(mm) Holotype ♀, Body length: 29, head: 3, antennae: 2.5, pronotum: 2, mesonotum: 4.5, metanotum: 3, median segment: 1, profemora: 7, mesofemora: 4.5, metafemora: 6, protibiae: 7, mesotibiae: 4.5, metatibiae: 6. Paratype ♀, Body length: 27, head: 3, antennae: 2.5, pronotum: 2, mesonotum: 4.5, metanotum: 3, median segment: 1, profemora: 6.5, mesofemora: 4.5, metafemora: 6, protibiae: 6.5, mesotibiae: 4.5, metatibiae: 6.



Figs 7–8. *Paragonylopus (Planoparagonylopus) lii* subgen. n. and sp. n. ♀, body and legs, dorsal view; 8. ♀, apex of abdomen, lateral view.

Habitats.—This species is found in the low level of evergreen broadleaf forests between 1300 and 1400 metres.

Distribution.—China (Yunnan).

Notes.—The male is unknown. No food plant eaten by the collected specimens was observed. No egg was collected and further material is necessary for understanding the relationship with other species.

Etymology.—This new species is named in honor of Professor Li Li-Zhen (Shanghai, China) for his contributions to Chinese entomology.

Paragonylopus (Planoparagonylopus) nabanheensis sp. n.

<http://zoobank.org/086D438B-1269-4754-990E-CD9295DB75E7>

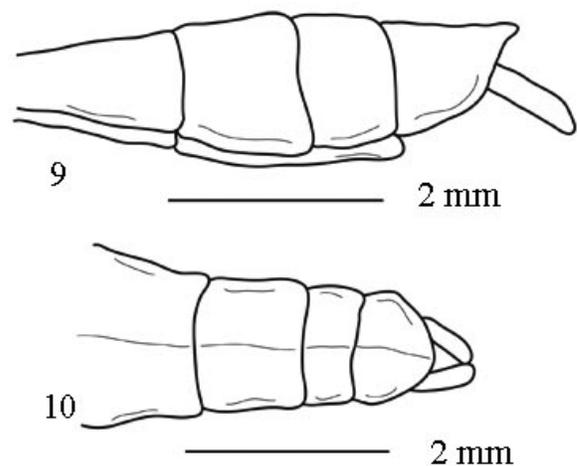
Figs 9–10, 24–25

Paragonylopus plaumanni Ho, 2014: 13. [misidentification]

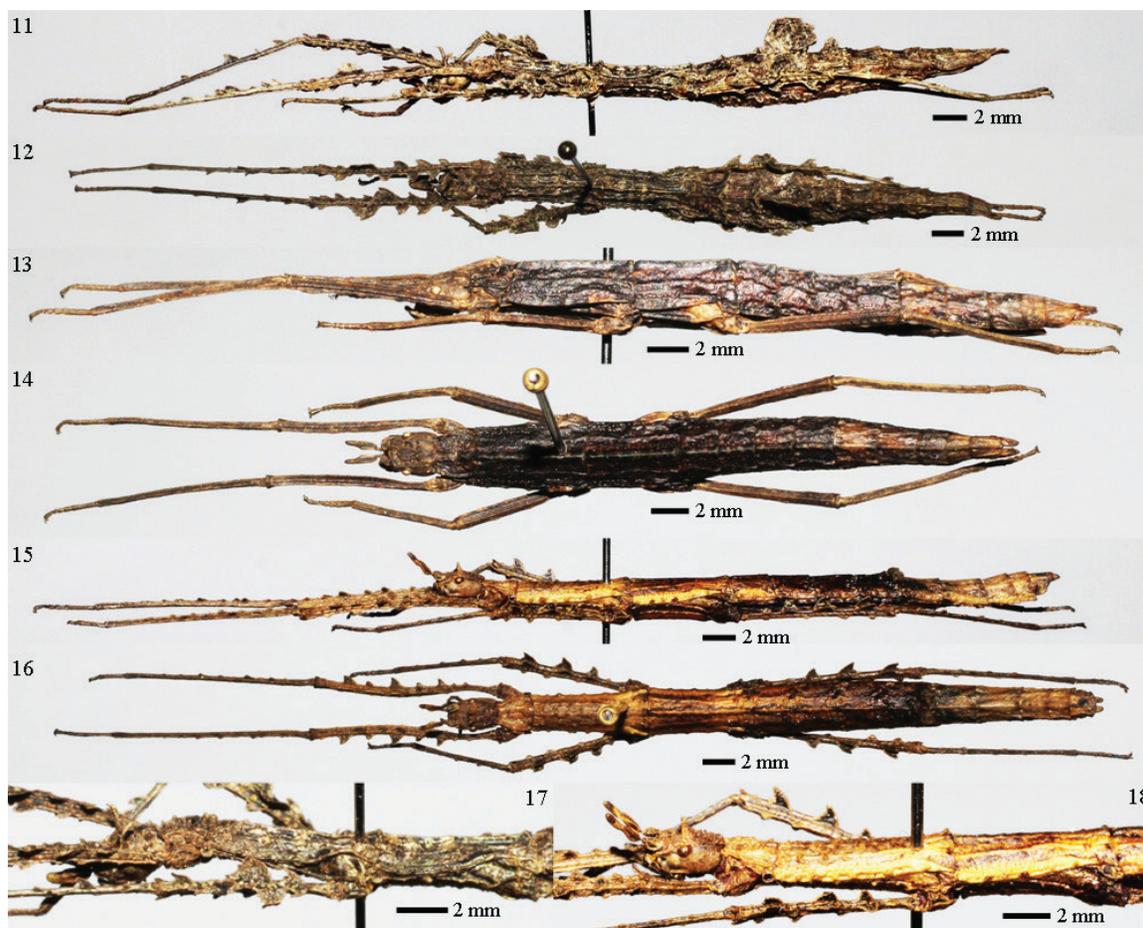
Type material.—Holotype ♀, Nabanhe, Xishuangbanna, Yunnan, China, 10.VII.2003, Hu Jia-Yao and Tang Liang (SNUC).

Diagnosis.—*Paragonylopus (Planoparagonylopus) nabanheensis* sp. n. is similar to *Paragonylopus (Planoparagonylopus) lii* sp. n., but can be easily distinguished by non-granulated body, rectangular mesonotum, square metanotum and lacking noticeable elevation on legs.

Description.—Female (Figs 9–10, 24–25): Small size. Body flattened and slender. General color of body and legs rufous brown. Head rounded in dorsal view, dorsoventrally flattened. Vertex flat and unarmed. Occiput flat. Median longitudinal furrow distinct. Compound eyes small and oval, its length about two times that of genae. Antennae short, with three distinct segments; scapus larger than compound eyes, more or less triangle-shaped in cross section, larger than compound eyes, about four times longer than pedicellus; pedicellus minute and indistinct, knob-like, smaller than compound eyes; third segment generally cylindrical, apices blunt, tapering basally, about four times longer than scapus, inner margin elevated medially, first half of inner margin with minute spine-



Figs 9–10. *Paragonylopus (Planoparagonylopus) nabanheensis* subgen. n. and sp. n. ♀, apex of abdomen, lateral view; 10. ♀, apex of abdomen, dorsal view.



Figs 11–18. *Paragonylopus* (*Paragonylopus*) s. str. spp. 11. *P. (Paragonylopus) cheni* sp. n.: ♀, habitus, lateral view; 12. *P. (Paragonylopus) cheni* sp. n.: ♀, habitus, dorsal view; 13. *P. (Paragonylopus) plaumanni* Zompro, 2000: ♀, habitus, lateral view; 14. *P. (Paragonylopus) plaumanni* Zompro, 2000: ♀, habitus, dorsal view; 15. *P. (Paragonylopus) sinensis pingbianensis* subsp. n.: ♀, habitus, lateral view; 16. *P. (Paragonylopus) sinensis pingbianensis* subsp. n.: ♀, habitus, dorsal view; 17. *P. (Paragonylopus) cheni* sp. n.: ♀, head and thorax, dorso-lateral view; 18. *P. (Paragonylopus) sinensis pingbianensis* subsp. n.: ♀, head and thorax, dorsolateral view.

like bristles. Thorax lacking granulation. Pronotum square, as long as and parallel to head, sparsely pitted; anterior margin weakly incurved, posterior margin truncate, lateral margins thickened; transverse and longitudinal sulci crossing at middle area. Mesonotum rectangular, longer than wide, as long as mesofemora, sparsely pitted, median longitudinal carina distinct. Metanotum square, wider than pronotum, parallel to mesonotum, sparsely pitted, median longitudinal carina distinct. Abdomen flattened, tapering posteriorly. Distinctly carinate mediolongitudinally. With minute pits along lateral margins. Median segment narrow, wider than long. Second to sixth tergites parallel to mesonotum and metanotum, seventh tergum to anal segment tapering posteriorly. Seventh sternum lacking noticeable praeopercular organ. Eighth tergum longer than ninth tergum. Anal segment as long as ninth tergum, constricted posteriorly, posterior margin rounded. Supra-anal plate indistinct. Subgenital plate scoop-shaped, short, flattened, posterior margin rounded, reaching anterior margin of anal segment. Cerci cylindrical, straight, apices rounded and surpassing posterior margin of anal segment. Legs slender and long. Sparsely covered with minute bristles. Femora roughly as long as corresponding tibiae. Profemora incurved basally. Anterodorsal, posterodorsal, anteroventral and posteroventral carinae of femora and tibiae lacking elevation.

Measurements.—(mm) Holotype ♀, Body length: 20, head: 2, antennae: 2, pronotum: 1.5, mesonotum: 5, metanotum: 3, median segment: 1, profemora: 7, mesofemora: 4.5, metafemora: 6, protibiae: 7, mesotibiae: 5, metatibiae: 6.

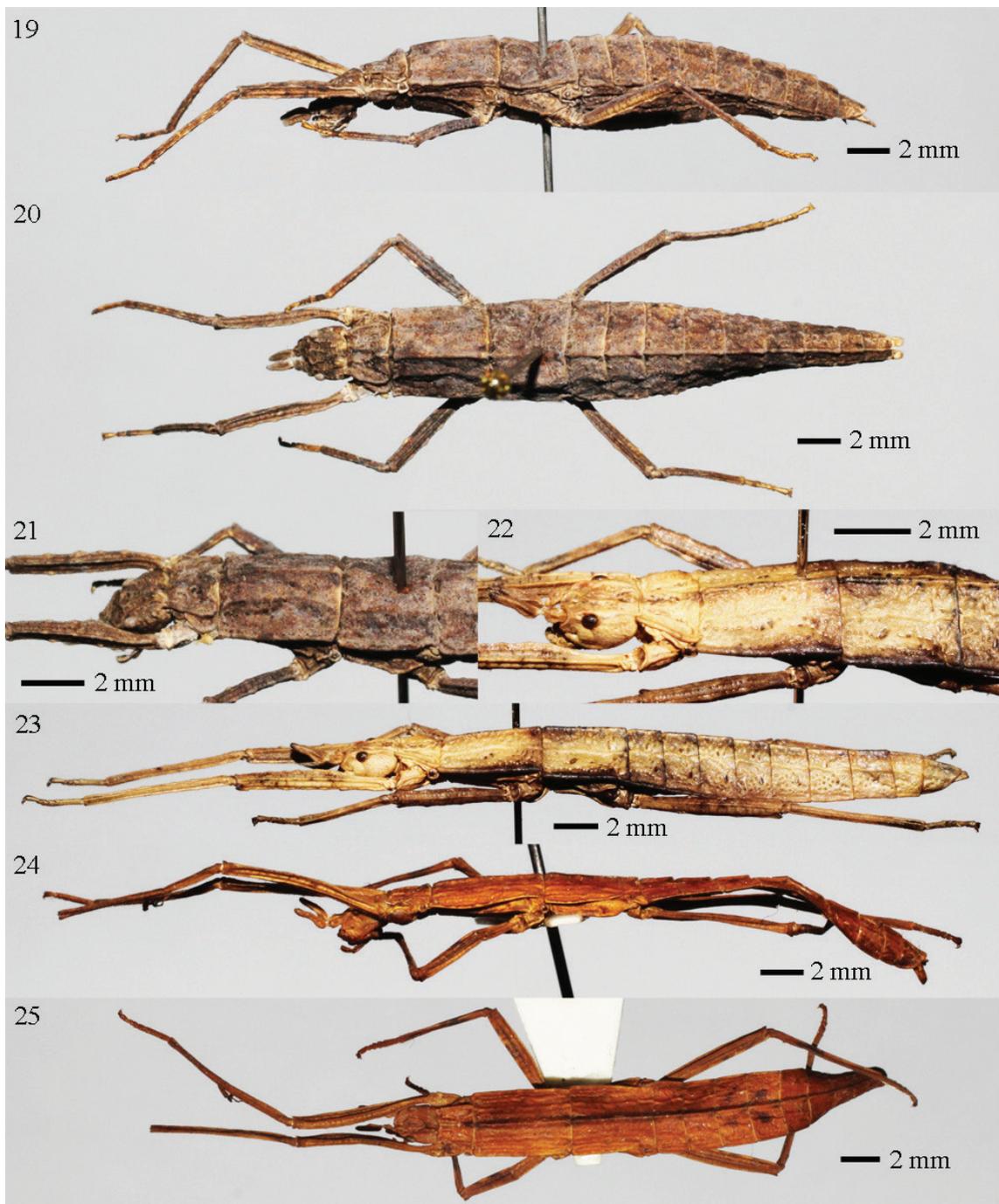
Distribution.—China (Yunnan).

Notes.—The male is unknown. This species is the smallest phasmid in China.

Etymology.—This new species is named after the type locality, Nabanhe (Yunnan, China).

Discussion

The genus *Paragonylopus* Chen & He, 1997 has been placed in Pachymorphinae Brunner von Wattenwyl, 1893 based on the ootaxonomic characters of the oblong egg capsule and smooth ventral surface of the capsule, which show a close relationship with *Macellina* Uvarov, 1940 (Ho 2014). *Paragonylopus* is characterized by small body size and uniquely structured, three-segmented antennae that readily make it morphologically distinguishable from all other genera in the Phasmatodea (Zompro 2000, Chen and He



Figs 19–25. *Paragonylopus* (*Planoparagonylopus*) subgen. n. spp. 19. *P. (Planoparagonylopus) abramovi* sp. n.: ♀, habitus, lateral view; 20. *P. (Planoparagonylopus) abramovi* sp. n.: ♀, habitus, dorsal view; 21. *P. (Planoparagonylopus) abramovi* sp. n.: ♀, head and thorax, dorsolateral view; 22. *P. (Planoparagonylopus) lii* sp. n.: ♀, head and thorax, dorsolateral view; 23. *P. (Planoparagonylopus) lii* sp. n.: ♀, habitus, lateral view; 24. *P. (Planoparagonylopus) nabanheensis* sp. n.: ♀, habitus, lateral view; 25. *P. (Planoparagonylopus) nabanheensis* sp. n.: ♀, habitus, dorsal view.

2008, Ho 2014). The uniquely structured, synapomorphic antennae may have unknown functions. Further study, especially on the ultrastructural characterization of the antennal sensillae, is needed to understand the function of *Paragonylopus*'s sense organ.

Paragonylopus currently contains two subgenera, six species and two subspecies (Table 1). They are *P. (Paragonylopus) cheni* sp. n., *P. (Paragonylopus) plaumanni* Zompro, 2000, *P. (Paragonylopus) sinensis pingbianensis* subsp. n., *P. (Paragonylopus) sinensis*

sinensis Chen & He, 1997 s. str., *P. (Planoparagonylopus) lii* subgen. n. and sp. n., *P. (Planoparagonylopus) abramovi* sp. n., and *P. (Planoparagonylopus) nabanheensis* sp. n. Ho (2014: 13) reported the occurrence of *P. (Paragonylopus) plaumanni* in China based on a female specimen which was collected from Nabanhe in Xishuangbanna, Yunnan, China. However, the female is characterised by flattened thorax and abdomen and is a distinct species, *P. (Planoparagonylopus) nabanheensis* sp. n., described in this study. Anoth-

Table 1. Distribution of *Paragonylopus* (*Paragonylopus*) Chen & He, 1997 s. str. and *P.* (*Planoparagonylopus*) subgen. n.

Species	China		Thailand	Vietnam
	Guangxi	Yunnan	Nakhon Ratchasima	Lao Cai
<i>P.</i> (<i>Paragonylopus</i>) <i>cheni</i> sp. n.		✓		
<i>P.</i> (<i>Paragonylopus</i>) <i>plaumanni</i> Zompro, 2000		✓	✓	
<i>P.</i> (<i>Paragonylopus</i>) <i>sinensis pingbianensis</i> subsp. n.		✓		
<i>P.</i> (<i>Paragonylopus</i>) <i>sinensis sinensis</i> Chen & He, 1997 s. str.	✓			
<i>P.</i> (<i>Planoparagonylopus</i>) <i>abramovi</i> sp. n.				✓
<i>P.</i> (<i>Planoparagonylopus</i>) <i>lii</i> sp. n.		✓		
<i>P.</i> (<i>Planoparagonylopus</i>) <i>nabanheensis</i> sp. n.		✓		

er female specimen, which was collected from Menglun in Xishuangbanna, Yunnan, shows cylindrical body and unarmed legs that perfectly match with *P.* (*Paragonylopus*) *plaumanni*. Therefore, the occurrence of *P.* (*Paragonylopus*) *plaumanni* is reconfirmed in China. In addition, the males of *P.* (*Paragonylopus*) *sinensis pingbianensis* subsp. n. and three newly described taxa of *P.* (*Planoparagonylopus*) subgen. n. are unknown. Further material, especially corresponding male and eggs produced by female, are needed to evaluate their taxonomic relationship with other taxa.

Based on the current knowledge, all six species are geographically restricted to southwestern China, northern Vietnam and northern Thailand. The discovery of *P.* (*Planoparagonylopus*) *abramovi* sp. n. represents the first record of *Paragonylopus* from Vietnam. Further collecting trips to various localities in China, Thailand and Vietnam and even adjacent countries in the Indochinese area such as Cambodia, Myanmar and Laos may discover more taxa for this special phasmid genus in the Oriental region.

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