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Cover photograph: *Parapachymorpha apicalis* sp. nov., photo by George Ho Wai-Chun.

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Two new species of the genus *Parapachymorpha* Brunner von Wattenwyl, 1893 (Phasmida: Phasmatidae: Clitumninae: Medaurini) from China

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ABSTRACT

Two new species, *Parapachymorpha apicalis* sp. nov. and *P. tridentata* sp. nov., from Yunnan, China, are described.

Key words: Stick insects, *Parapachymorpha*, new species, China, Yunnan

中國副厚蟪屬二新種 (蟪目: 蟪科: 短角枝蟪亞科: 莫蟪族)

何維俊

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摘要: 本文記述中國副厚蟪屬二新種: 尖尾副厚蟪 *Parapachymorpha apicalis* sp. nov. 及三齒副厚蟪 *P. tridentata* sp. nov.

關鍵字: 竹節蟲, 副厚蟪屬, 新種, 中國, 雲南

INTRODUCTION

Parapachymorpha Brunner von Wattenwyl, 1893, is a small Medaurini genus in the Oriental region consisting of ten species (Otte and Brock, 2005; Chen and He, 2008; Hennemann and Conle, 2008; Ho, 2014, 2017; Brock et al., 2020). In China, Chen and He (2001) first reported the genus in the region, with the description of a new species from Yunnan Province. Ho (2014) provided the first taxonomic study for the Chinese taxa, with the descriptions of two new species. Later, Ho (2017) reviewed the genus, with the descriptions of three new species and the first report of *Parapachymorpha spinigera* (Brunner von Wattenwyl, 1907) in China.

This paper is a supplementary for Ho (2017) and two new species from *Parapachymorpha* are described. They are *P. apicalis* sp. nov. and *P. tridentata* sp. nov..

MATERIALS & METHODS

Collecting of specimens and observation of mating behaviour were conducted at night due to their nocturnal behaviour. Measurements of specimens are given in millimeters (mm). Illustrations (Figs. 1-6, 11-14) are based on the type material that was pinned and dried and deposited in Hong Kong Entomological Society, Hong Kong (HKES) and Shanghai Entomological Museum, Chinese Academy of Sciences, Shanghai (SEM).

RESULTS

Parapachymorpha Brunner von Wattenwyl, 1893

Type-species: *Parapachymorpha nigra* Brunner von Wattenwyl, 1893: 96, by subsequent designation of Kirby, 1904: 342.

Distributions: China, Laos, Myanmar, Thailand and Vietnam.

Notes: Currently 12 species are recognized from this genus and eight species are known in China.

Parapachymorpha apicalis sp. nov. (Figs. 1-10)

Types: Holotype, ♀, 1000m, Yingjiang, Dehong, Yunnan, China, 3-5.VII.2019, George Ho Wai-Chun (HKES); Paratypes, 19♀, 12♂ & 110 eggs (naturally laid by paratype ♀), same data as holotype ♀, George Ho Wai-Chun (HKES); 1♂, Nabang, Yingjiang, Dehong, Yunnan, China, 19.VI.2017, Bi Wen-Xuan (SEM).

Differentiation: *Parapachymorpha apicalis* sp. nov. is similar to *P. spinigera* (Brunner von Wattenwyl, 1907), but can be easily distinguished by the horn-like praeopercular organ on the posteromedian area of seventh abdominal tergum in the female and the posteriorly elongated apex of semi anal abdominal segments in the male.

Etymology: The specific epithet of this new species is derived from the apically acute praeopercular organ on the seventh abdominal sternum in the female and the apically acute semi anal abdominal segments in the male.

Description of female (Figs. 1-2, 7, 9): Small size. Body slender, distinctly larger and more robust than male. General colouration of body and legs uniformly dark brown or dark brown, with light brown markings.

Head: Oblong, longer than wide, sparsely covered with small granules and a few enlarged granules. Vertex flat, unarmed. Occiput gently convex, median and lateral longitudinal furrows distinct. Compound eyes small and rounded, its length about three times of genae. Antennae sparsely covered with long bristles, with 18 segments, reaching subapical area of profemora; scapus oval, constricted posteriorly and anteriorly, dorsoventrally flattened, longer than pedicellus; pedicellus cylindrical, shorter than third segment; and third segment shorter than scapus.

Thorax: Covered with sparse and small granules. Pronotum trapezoidal, gently expanded posteriorly, shorter than head; anterior margin curved inwards, posterior margin truncate, transverse and longitudinal sulci crossing just after middle point. Mesonotum moderately expanded posteriorly, median longitudinal carina faint, pre-median area with a pair of enlarged, more or less acute granules, post-median area with a pair of tubercle-like spines. Metanotum longer than median segment, median longitudinal carina indistinct.

Abdomen: Cylindrical, tapering posteriorly. Wrinkled and sparsely granulated. Median segment rectangular, two times wider than long. Seventh sternum with an apically pointed, horn-like praeopercular organ posteromedially. Eighth tergum longer than ninth tergum. Ninth tergum with a small posteromedian crest. Anal segment as long as ninth tergum, posterior margin rounded, mediolongitudinally carinate. Subgenital plate scoop-shaped, tapering posteriorly, apex pointed and reaching posterior margin of anal segment. Cerci short, flattened, apices rounded and not surpassing posterior margin of anal segment.

Legs: Sparsely covered with short bristles. Femora thicker than corresponding tibiae, anterodorsal, posterodorsal, anteroventral and posteroventral carinae waved with small dentations. Profemora distinctly curved basally. Tibiae unarmed, roughly as long as corresponding femora, medioventral carina raised basally.

Description of male (Figs. 3-4, 8, 10): Body slender, distinctly thinner and more slender than female. General colouration of body and legs brown.

Head: Sparsely granulated. Oval, posteriorly constricted behind compound eyes. Vertex flat and unarmed. Occiput gently convex, median and lateral longitudinal furrows distinct. Compound eyes small and rounded, its length about three times of genae. Antennae with 22 segments; scapus flattened, constricted basally, longer than third segment; and third segment longer than pedicellus.

Thorax: Sparsely covered with a few small granules. Pronotum rectangular, longer than wide, shorter than head, anterior margin curved inwards, posterior margin truncate, transverse and longitudinal sulci crossing just after middle point. Mesonotum slender and elongate, gently expanded posteriorly in second half, with paired pre-median and post-median spines. Metanotum longer than median segment, with a pair of pre-median spines.

Abdomen: Slender and cylindrical. Median segment rectangular, longer than wide. Second to seventh tergites parallel-sided. Eighth tergum expanded posteriorly, longer than ninth tergum. Anal segment longer than eighth tergum, split into two elongate semi-tergites, tapering posteriorly, apices pointed, inner surface with minute teeth. Semi-tergites laterally swollen post-medially in dorsal view, medially elevated

distinctly in lateral view. Poculum cup-shaped, with rounded posterior margin, reaching posterior margin of ninth tergum. Cerci cylindrical, short, gently curved inwards, apices obtuse.

Legs: Very slender and long, unarmed. Femora thicker than corresponding tibiae. Profemora curved basally. Medioventral carinae of tibiae weakly raised basally.

Measurements: See Table 1.

Description of egg (Figs. 5-6): Capsule light brown, reticulate-foveate, depressions more or less rounded, brown; oval, tapering posteriorly in dorsal view, posterior pole distinctly notched in lateral view. Micropylar plate oval, anteriorly pointed, posteriorly rounded. Micropylar cup placed at posterior margin of micropylar plate. Median line short, about one-sixth length of micropylar plate. Operculum centrally depressed, marginally elevated and wrinkled.

Measurements: Length, 1.7 mm; width, 1.4 mm; height 1.4 mm.

Distribution: Yunnan, China.

***Parapachymorpha tridentata* sp. nov.** (Figs. 11-20)

Types: Holotype, ♀, 500-600m, Bubang, Mengla, Xishuangbanna, Yunnan, China, 8.IX.2015, George Ho Wai-Chun (HKES); Paratypes, 4♀, 5♂ & 25 eggs (naturally laid by paratype ♀), same data as holotype ♀ (HKES).

Differentiation: *Parapachymorpha tridentata* sp. nov. is similar to *P. spinigera* (Brunner von Wattenwyl, 1907), but can be distinguished by its small size and more slender body in both sexes, the small dentations on the anterodorsal, posterodorsal, anteroventral and posteroventral carinae of femora in the female and the paired spine-like tubercles on the anterior margin of pronotum and the absence of tubercle-like elongation on the lower margin of semi anal abdominal segments in the male.

Etymology: The specific epithet of this new species is derived from the three small dentations on the anterodorsal, posterodorsal, anteroventral and posteroventral carinae of femora in the female.

Description of female (Figs. 11-12, 17, 19): Small size. Body slender, more robust than male. General colouration of body uniformly dark brown or dark brown with a light brown mediolongitudinal band. Legs brown, with light brown markings.

Head: Oblong, longer than wide, sparsely covered with small granules and a few enlarged granules. Vertex flat, unarmed. Occiput gently convex, median and lateral longitudinal furrows distinct. Compound eyes small and rounded, its length about four times of genae. Antennae sparsely covered with long bristles, with 18 segments,

reaching middle area of profemora; scapus oval, constricted posteriorly and anteriorly, dorsoventrally flattened, longer than pedicellus; pedicellus cylindrical, shorter than third segment; and third segment shorter than scapus.

Thorax: Densely covered with minute granules and a few enlarged granules. Pronotum trapezoidal, gently expanded posteriorly, shorter than head; anterior margin curved inwards, posterior margin rounded, transverse and longitudinal sulci crossing just after middle point, with a pair of tubercle-like granules on posterior margin. Mesonotum moderately expanded posteriorly, median longitudinal carina indistinct, with paired post-median spines. Metanotum longer than median segment, median longitudinal carina indistinct, with paired median spines. Mesopleurae and metapleurae with a tubercle-like supra-coxal granule.

Abdomen: Cylindrical, tapering posteriorly. Densely covered with small granules and a few enlarged granules. Median segment square. Seventh sternum with a dorsoventrally flattened and apically emarginated praeopercular organ posteromedially. Eighth tergum longer than ninth tergum. Ninth tergum with a small posteromedian crest. Anal segment shorter than ninth tergum, posterior margin with a minute notch, mediolongitudinally carinate. Subgenital plate scoop-shaped, tapering posteriorly, apex pointed and reaching posterior area of anal segment. Cerci short, flattened, apices rounded and not surpassing posterior margin of anal segment.

Legs: Sparsely covered with short bristles. Femora thicker than corresponding tibiae, anterodorsal, posterodorsal, anteroventral and posteroventral carinae with three small dentations. Profemora distinctly curved basally. Tibiae roughly as long as corresponding femora, anterodorsal and posterodorsal carinae with a few indistinct dentations, anteroventral and posteroventral carinae unarmed, medioventral carina raised basally.

Description of male (Figs. 13-14, 18, 20): Body slender, distinctly more slender than female. General colouration of body and legs brown.

Head: Oval, with a few small granules, posteriorly constricted behind compound eyes. Vertex flat. Occiput gently convex, median and lateral longitudinal furrows indistinct. Compound eyes small and rounded, its length about three times of genae. Antennae with 21 segments; scapus flattened, constricted basally, roughly as long as third segment, longer than pedicellus.

Thorax: Pronotum rectangular, longer than wide, shorter than head, anterior margin curved inwards, posterior margin truncate, transverse and longitudinal sulci crossing just after middle point, with a pair of spine-like tubercles on anterior margin. Mesonotum slender and elongate, gently expanded posteriorly in second half, with paired pre-median and post-median spines. Metanotum longer than median segment, with paired

pre-median and median spines, median spines larger than pre-median spines.

Abdomen: Slender and cylindrical. Median segment rectangular, longer than wide. Second to seventh tergites parallel-sided. Eighth tergum expanded posteriorly, longer than ninth tergum. Anal segment as long as eighth tergum, split into two semi-tergites, tapering posteriorly, inner surface with minute teeth. Semi-tergites gently elongated posteromedially in lateral view, apices obtuse, upper margin elevated medially in lateral view. Poculum cup-shaped, with rounded posterior margin, reaching anterior area of anal segment. Cerci cylindrical, short, gently curved inwards, apices blunt and not surpassing posterior apices of anal segment.

Legs: Very slender and long, sparsely covered with short bristles. Unarmed. Femora thicker than corresponding tibiae. Profemora curved basally. Medioventral carinae of tibiae weakly raised basally.

Measurements: See Table 2.

Description of egg (Figs. 15-16): Capsule light brown, reticulate-foveate, depressions more or less rounded, dark brown; oval, tapering posteriorly in dorsal view, posterior pole weakly notched in lateral view. Micropylar plate oval, anteriorly pointed, posteriorly rounded. Micropylar cup placed at posterior margin of micropylar plate. Median line long, about one-half length of micropylar plate. Operculum centrally depressed, marginally elevated and wrinkled.

Measurements: Length, 1.5 mm; width, 1.2 mm; height 1.4 mm.

Distribution: Yunnan, China.

Notes: This new species was identified as *Parapachymorpha spinigera* (Brunner von Wattenwyl, 1907) in Ho (2017: 532). Further examination of the Chinese material reflected that it is a distinct species described and illustrated in this study.

CONCLUSION

A total of 12 species are currently recognized in the genus *Parapachymorpha* Brunner von Wattenwyl, 1893. The discovery of the two newly described taxa, *P. apicalis* sp. nov. and *P. tridentata* sp. nov., from Yunnan, China, further reflects the high species diversity of the genus in China. The known range of the genus in China is primarily from the southern to the southwestern Yunnan. Further collecting of specimens in various places in the eastern part of Yunnan and the southwestern part of Guangxi may discover new populations of the genus in new locations of these regions.

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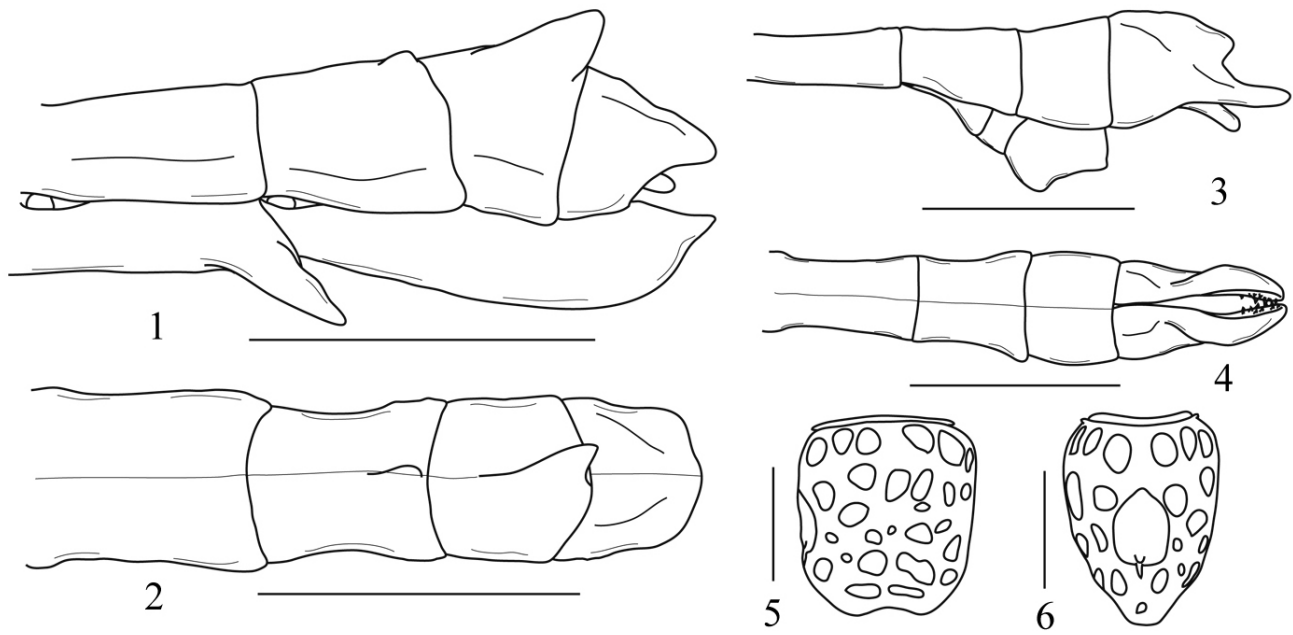
TABLES & FIGURES

	Holotype Female	Paratype Females	Paratype Males
Body	56.0	47.0-62.0	45.0-50.0
Head	4.5	4.0-5.0	2.5-3.0
Antennae	9.0	8.0-10.0	10.0-13.0
Pronotum	3.0	2.5-3.0	2.0-2.5
Mesonotum	10.5	10.0-13.0	10.5-11.5
Metanotum	6.0	5.5-7.0	6.0-7.0
Median segment	2.0	2.0-2.5	1.0-1.5
Profemora	19.0	18.0-22.0	20.0-24.0
Mesofemora	11.0	10.0-12.0	12.0-15.0
Metafemora	15.0	14.0-17.0	16.0-19.0
Protibiae	20.0	18.0-23.0	22.0-27.0
Mesotibiae	11.0	10.0-13.0	12.0-15.5
Metatibiae	16.0	15.0-19.0	18.0-22.0

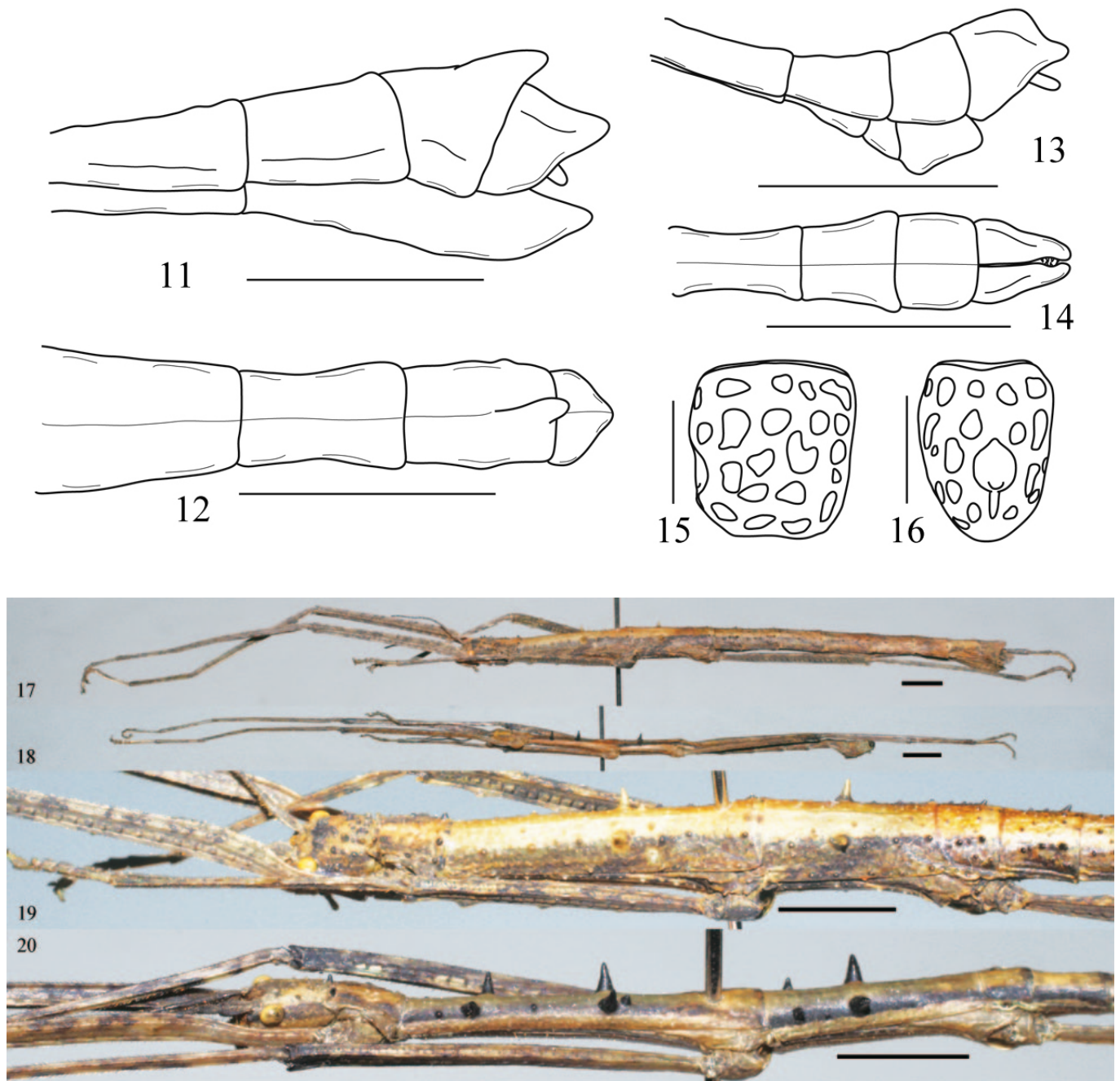
Table 1. Measurements of *Parapachymorpha apicalis* sp. nov.

	Holotype Female	Paratype Females	Paratype Males
Body	62.0	60.0	48.0-52.0
Head	4.0	4.0	2.5-3.0
Antennae	9.0	9.0-9.5	10.5-12.5
Pronotum	3.0	3.0	2.0-2.5
Mesonotum	12.5	12.0-12.5	11.0-12.0
Metanotum	6.5	7.0	6.5-7.0
Median segment	2.5	2.5	1.5
Profemora	20.0	19.0-20.5	21.0-23.0
Mesofemora	12.0	11.0-12.0	12.5-13.5
Metafemora	16.5	16.0-16.5	16.0-18.0
Protibiae	23.0	20.0-23.0	23.0-25.0
Mesotibiae	13.0	11.0-13.0	13.0-14.0
Metatibiae	18.0	16.0-18.0	18.0-20.0

Table 2. Measurements of *Parapachymorpha tridentata* sp. nov.



Figures 1-10. *Parapachymorpha apicalis* sp. nov. [scale bar: end of abdomen, head, thorax and habitus = 5 mm; egg = 1 mm] (Drawings by author). 1. Female, end of abdomen, lateral view. 2. Female, end of abdomen, dorsal view. 3. Male, end of abdomen, lateral view. 4. Male, end of abdomen, dorsal view. 5. Egg, lateral view. 6. Egg, dorsal view. 7. Female, habitus. 8. Male, habitus. 9. Female, head and thorax, dorsolateral view. 10. Male, head and thorax, dorsolateral view.



Figures 11-20. *Parapachymorpha tridentata* sp. nov. [scale bar: end of abdomen, head, thorax and habitus = 5 mm; egg = 1 mm] (Drawings by author). 11. Female, end of abdomen, lateral view. 12. Female, end of abdomen, dorsal view. 13. Male, end of abdomen, lateral view. 14. Male, end of abdomen, dorsal view. 15. Egg, lateral view. 16. Egg, dorsal view. 17. Female, habitus. 18. Male, habitus. 19. Female, head and thorax, dorsolateral view. 20. Male, head and thorax, dorsolateral view.

