Contribution to the knowledge of Chinese Phasmatodea VIII: Four new species of *Carausius* Stål, 1875 from China (Lonchodidae: Lonchodinae)

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ABSTRACT

This study provides descriptions of four new species from *Carausius* Stål, 1875 of China, as follows: *Carausius gracilicercus* **sp. nov.**, *Carausius gracilicornis* **sp. nov.**, *Carausius guizhouensis* **sp. nov.** and *Carausius rubrogranulatus* **sp. nov.**. A key to the species and a list of the species of *Carausius* are provided.

Key words: Stick insects, taxonomy, new species, China

中國螳目之新知VIII:中國竹異螳屬四新種(長角棒螳科:長角棒螳亞科)

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摘要:本文記述中國竹異螳屬 *Carausius* Stål, 1875四新種:細尾竹異螳 *Carausius gracilicercus* **sp. nov.**, 細角竹異螳 *Carausius gracilicornis* **sp. nov.**, 貴州竹異螳 *Carausius guizhouensis* **sp. nov.**及赤瘤竹異螳 *Carausius rubrogranulatus* **sp. nov.**; 以及制定竹異螳屬的分類檢索表及名錄。

關鍵字: 竹節蟲, 分類, 新種, 中國

INTRODUCTION

Carausius Stål, 1875, is one of the speciose genera in the subfamily Lonchodinae Brunner, 1893 in the Oriental and Palearctic regions (Otte and Brock, 2005; Brock et al., 2021). In China, Chen and He (2008) provided the first taxonomic study for the genus. Later Ho (2017) reviewed the genus, with the descriptions of six new species in China.

This study is a supplementary to Ho (2017) and four new Chinese *Carausius* species are described following collecting trips by the author.

MATERIALS & METHODS

The systematic treatment is according to Otte and Brock (2005), Bradler et al. (2014), Robertson et al. (2018), Simon et al. (2019) and Brock et al. (2021). Morphological terms follow Bragg (2001), Zompro (2004) and Bradler (2009). Measurements are given in millimeters (mm). The types are deposited in the Hong Kong Entomological Society, Hong Kong collection (HKES).

RESULTS

Lonchodidae Brunner, 1893

Lonchodinae Brunner, 1893

Carausius Stål, 1875

= *Dixippus* Stål, 1875: 9, 66. [Synonymised by Brunner, 1907: 265]

Type-species: *Carausius strumosus* Stål, 1875: 64, by subsequent designation of Rehn, 1904: 42.

Notes: Currently 14 species are recognised from China.

Species included from China:

1. *Carausius bicornis* Ho, 2017: 45, figs. 199-200, 221-225.
Distribution: China (Yunnan) and Vietnam

2. *Carausius emeiensis* Chen & He, 2008: 58, figs. 26a-b.
Distribution: China (Sichuan)

3. *Carausius femoralis* Chen & He, 2002: 2, figs. 3-4. [= *Carausius thoracius* Chen & He, in Chen et al., 2006: 97, figs. 7: 1-2; synonymised by Xu, 2008: 17]
Distribution: China (Guangxi, Guizhou, Sichuan and Yunnan)
Notes: Ho (2017: 45) followed Xu's suggestion (Xu, 2008: 17) and treated *Carausius thoracius* Chen & He, 2006 as the synonym of *C. femoralis* Chen & He, 2002.

4. *Carausius gracilicercus* **sp. nov.**
Distribution: China (Yunnan)

5. *Carausius gracilicornis* **sp. nov.**
Distribution: China (Yunnan)

6. *Carausius guizhouensis* **sp. nov.**
Distribution: China (Guizhou)

7. *Carausius huanglianshanensis* Ho, 2017: 47, figs. 201-202, 226-230.
Distribution: China (Yunnan)

8. *Carausius lijiangensis* Chen & He, 2002: 2, fig. 5.
Distribution: China (Yunnan)

9. *Carausius luchunensis* Ho, 2017: 48, figs. 203-206, 231-238, 290-291.
Distribution: China (Yunnan)

10. *Carausius novus* Ho, 2017: 49, figs. 207-210, 239-247.
Distribution: China (Yunnan)

11. *Carausius rubrogranulatus* **sp. nov.**
Distribution: China (Yunnan)

12. *Carausius undatus* Chen & He, 2002: 1, figs. 1-2.
Distribution: China (Sichuan)

13. *Carausius yingjiangensis* Ho, 2017: 51, figs. 211-212, 248-252.
Distribution: China (Yunnan)

14. *Carausius yunnanensis* Ho, 2017: 52, figs. 213-216, 253-260.
Distribution: China (Yunnan)

Key to the species of *Carausius* from China:

Female:

1. Vertex of head unarmed. . . **2**
- Vertex of head with various shapes of armature between compound eyes. . . **3**

2. Seventh abdominal sternum with noticeable praeopercular organ. . . *C. luchunensis*
- Seventh abdominal sternum lacking noticeable praeopercular organ. . . *C. yunnanensis*

3. Vertex of head elevated with a U-shaped crest between compound eyes. . . **4**
- Vertex of head with paired horns between compound eyes. . . . **6**

4. Mesonotum with hump-like granulations. *C. novus*
- Mesonotum lacking hump-like granulations. **5**

5. Seventh abdominal tergum lacking posterolateral expansions. . . *C. gracilicercus* **sp. nov.**
- Seventh abdominal tergum with posterolateral expansions. . . *C. huanglianshanensis*

6. Vertex of head with paired long horns. *C. bicornis*
- Vertex of head with paired short horns. . **7**

7. Coxae of legs with a spine-like tubercle. . . . . *C. yingjiangensis*
- Coxae of legs unarmed. . . . **8**

8. Protibiae with waved lamellae. . . **9**
- Protibiae with rounded lamellae. . . **10**

9. Seventh abdominal sternum with horn-like praeopercular organ. . *C. gracilicercus* **sp. nov.**
- Seventh abdominal sternum with granule-like praeopercular organ. . . *C. undatus*

10. Seventh abdominal sternum with a carina-like praeopercular organ. . *C. guizhouensis* **sp. nov.**
- Seventh abdominal sternum with a horn-like praeopercular organ. . . . **11**

11. Mesonotum densely granulated. . *C. femoralis*
- Mesonotum sparsely granulated. . . . . *O. rubrogranulatus* **sp. nov.**

Male:

1. Vertex of head unarmed between compound eyes. **2**
- Vertex of head with various shapes of armature between compound eyes. . . **4**

2. Apices of anal abdominal semi-tergites pointed. . . . . *C. gracilicornis* **sp. nov.**
- Apices of anal abdominal semi-tergites obtuse. **3**

3. Apices of anal abdominal semi-tergites straight. . . . . *C. luchunensis*
- Apices of anal abdominal semi-tergites incurved. . . . . *C. yunnanensis*

4. Vertex of head elevated with a flattened U-shaped crest. . . . . *C. novus*
- Vertex of head with a pair of horns or spines. **5**

5. Vertex of head with a pair of spines. . **6**
- Vertex of head with a pair of horns. . **7**

6. Abdomen granulose. . . *C. lijiangensis*
- Abdomen lacking granules. . *C. emeiensis*

7. Dorsal carina of horns dentate. . . . . *C. gracilicornis* **sp. nov.**
- Dorsal carina of horns unarmed. . . **8**

8. Posterior margin of anal abdominal semi-tergites pointed. . . . . *C. femoralis*
- Posterior margin of anal abdominal semi-tergites rounded. . *C. rubrogranulatus* **sp. nov.**

***Oxyartes gracilicercus* sp. nov.** (Figs. 1-4, 15-18)

Types: Holotype, ♀, 1500m, Baoshan, Yunnan, China, 1 July 2019, George Ho Wai-Chun (HKES); Paratypes, 3♂, same data as holotype (HKES).

Differentiation: *Carausius gracilicercus* **sp. nov.** is similar to *C. huanglianshanensis* Ho, 2017, but can be separated by the laterally swollen sixth abdominal tergum, the absence of posterolateral expansions on seventh abdominal tergum and the horn-like praeopercular organ on the seventh abdominal sternum in the female. The male can be separated from all the Chinese taxa by the dorsally dentate horns on the vertex of head.

Description of female (Figs. 1-2, 15, 17): Medium-sized. Body elongate and slender, surface rough, sparsely granulose. General colouration of body and legs brown.

Head: Oval, weakly constricted after compound eyes. Rough, sparsely covered with small granules, also with a few enlarged granules. Vertex with a pair of short and thick ear-like horns between compound eyes, U-shaped from dorsal view. Occiput moderately convex, median and lateral longitudinal furrows indistinct, posterior margin with distinct swellings. Compound eyes small and rounded. Antennae filiform; scapus dorsoventrally flattened, indistinctly constricted basally, longer than third segment; pedicellus almost as long as third segment.

Thorax: Rough and wrinkled. Pronotum rectangular, longer than wide, anterior margin weakly incurved, posterior margin rounded, transverse and longitudinal sulci crossing at middle area. Mesonotum longer than combined length of metanotum and median segment, with median longitudinal carina. Metanotum longer than median segment. Mesopleurae, metapleurae and metasternum sparsely granulated with a few enlarged granules.

Abdomen: Cylindrical, rough and wrinkled, also with sparse granulations. Median segment rectangular, longer than wide. Second to fifth tergites parallel-sided. Sixth tergum moderately swollen laterally. Seventh sternum with a small horn-like praeopercular organ posteromedially. Eighth tergum as long as combined length of ninth tergum and anal segment. Anal segment as long as ninth tergum, posterior margin with a V-shaped emargination. Supra-anal plate distinct, tapering posteriorly, with median longitudinal carina, posterior margin rounded and projecting over posterolateral angles of anal segment. Operculum boat-shaped, median longitudinal carina indistinct, posterolateral areas raised, also with short tubercles situated at posterior half of longitudinal carina, posterior margin pointed. Cerci short, flattened, apices pointed and not projecting over end of anal segment.

Legs: Slender and long. Procoxae and mesocoxae with a short tubercle. Femora almost as long as corresponding tibiae. Profemora basally curved, shorter than mesonotum, posterodorsal and posteroventral carina distinctly waved with small rounded elevations. Posteroventral carina of mesofemora and metafemora with one to two small teeth near apices. Posterodorsal and posteroventral carina of protibiae strongly raised. First segment of protarsi with a small semi-circular lamella dorsally.

Description of male (Figs. 3-4, 16, 18): Body rough, slender and elongate, distinctly slenderer than female. General colouration of body and legs brown.

Head: Oval, weakly constricted after compound eyes, as long as pronotum. Sparsely granulated. Vertex with a pair of ear-like horns between compound eyes, dorsal carina sparsely dentate. Occiput with distinct median and lateral longitudinal furrows, posterior margin with six small swellings. Compound eyes rounded and small. Antennae long and filiform; scapus dorsoventrally flattened, longer than combined length of pedicellus and third segment; pedicellus as long as third segment.

Thorax: Rough, sparsely covered with small granules, also interspersed with a few enlarged reddish granules. Pronotum rectangular, longer than wide, anterior margin weakly incurved, posterior rounded, transverse and longitudinal sulci crossing at middle area. Mesonotum slender and elongate, longer than combined length of metanotum and median segment, broadly emarginated medially, median longitudinal carina indistinct. Metanotum shorter than mesonotum, median longitudinal carina indistinct.

Abdomen: Slender and cylindrical, sparsely granulated. Median segment rectangular, longer than wide, shorter than metanotum. Seventh tergum as long as combined length of eighth and ninth tergites. Eighth tergum expanded posteriorly, as long as ninth tergum. Anal segment as long as seventh tergum, split into two semi-tergites, inner margin curved after middle area, apices with a few small dentations, posterior margin rounded. Poculum cup-like, medially elevated, posterior margin rounded and reaching posterior margin of ninth tergum. Cerci short, cylindrical, apices rounded and not surpassing apices of semi-tergites.

Legs: Slender and long, lacking noticeable armature. Procoxae and mesocoxae with a short tubercle. Femora shorter than corresponding tibiae. Profemora incurved basally, posteroventral carina with two small spines near apices. Posteroventral carina of mesofemora and metafemora with two small spines near apices. Hindlegs not extending beyond end of abdomen. First segment of protarsi with a small semi-circular lamella dorsally.

Measurements: See Table 1.

Distribution: China (Yunnan).

Etymology: The specific epithet of this new species is derived from the small cerci in the both sexes.

***Oxyartes gracilicornis* sp. nov.** (Figs. 5-8, 19-22)

Types: Holotype, ♀, 1500m, Baoshan, Yunnan, China, 1 July 2019, George Ho Wai-Chun (HKES); Paratypes, 1♂, 7 nymphs (4♀, 3♂), 1500-2000m, Baoshan, Yunnan, China, 30 June - 1 July 2019, George Ho Wai-Chun (HKES).

Differentiation: *Carausius gracilicornis* **sp. nov.** is related to *C. luchunensis* Ho, 2017, but can be easily separated by the smaller size in the both sexes, the horn-like praeopercular organ on the seventh abdominal sternum in the female and the pointed apices of the anal abdominal semi-tergites in the male.

Description of female (Figs. 5-6, 19, 21): Medium-sized. General colouration of body and legs brown. Body elongate and very slender.

Head: Oval, longer than wide, surface rough, sparsely covered with small granules. Vertex flattened, with a pair of small horns between compound eyes. Occiput flat, median and lateral longitudinal furrows indistinct, posterior margin with six small swellings. Compound eyes small and rounded. Antennae filiform, reaching apices of protibiae; scapus dorsoventrally flattened, constricted basally, medially carinate, three times longer than pedicellus, as long as third segment.

Thorax: Rough and wrinkled. Sparsely covered with small granules except for mesosternum. Pronotum rectangular, longer than wide, anterior margin nearly truncate, posterior margin rounded, transverse and longitudinal sulci crossing at middle area. Mesonotum elongate and slender, longer than combined length of metanotum and median segment; median longitudinal carina distinct, also interspersed with a few enlarged granules. Metanotum with distinct median longitudinal carina, also interspersed with a few enlarged granules.

Abdomen: Rough, wrinkled and sparsely covered with small granules. Median segment rectangular, longer than wide, shorter than metanotum. Seventh sternum with a horn-like praeopercular organ posteromedially, curved posteriorly, tapering apically, apex blunt. Eighth tergum as long as combined length of ninth tergum and anal segment. Anal segment shorter than ninth tergum, posterior margin with a deep U-shaped emargination, posterolateral angles rounded. Supra-anal plate small, mediolongitudinally carinate, posterior margin with a small elevation and projecting over posterolateral angles of anal segment. Operculum boat-shaped, with median and lateral longitudinal carinae, apex pointed and not exceeding posterolateral angles of anal segment. Cerci short and obtuse, not projecting over end of anal segment.

Legs: Lacking noticeable armature. Femora almost as long as corresponding tibiae. Profemora basally curved, shorter than mesonotum, anterodorsal carina distinctly waved with small rounded elevations. Posterodorsal carina of protibiae waved. First segment of protarsi with a small semi-circular lamella dorsally. Posteroventral carina of mesofemora and metafemora with two small teeth near apex.

Description of male (Figs. 7-8, 20, 22): Distinctly slenderer and smaller than female. General colouration of body and legs brown.

Head: Oval, as long as pronotum. Vertex flattened, with two elevations between compound eyes. Occiput flattened, median and lateral longitudinal furrows indistinct, posterior margin with six small distinct swellings. Compound eyes rounded. Antennae filiform and long, surpassing apices of protibiae; scapus dorsoventrally flattened, medially carinate, longer than third segment; pedicellus shorter than third segment.

Thorax: Sparsely covered with a few small granules except for mesosternum. Pronotum rectangular, longer than wide, anterior margin nearly truncate, posterior margin rounded, transverse and longitudinal sulci crossing at middle area. Mesonotum slender and elongate, broadly emarginated medially, median longitudinal carina distinct. Metanotum shorter than mesonotum.

Abdomen: Slender and cylindrical. Dorsal surface rough, covered with a few small granules, ventral surface lacking granulation. Median segment rectangular, two times longer than wide, shorter than metanotum. Eighth tergum expanded posteriorly, as long as ninth tergum. Ninth tergum constricted posteriorly. Anal segment longer than ninth tergum, split into two laterally flattened semi-tergites, tapering apically, apices obtuse, interior surfaces with a few small dentations. Poculum cup-like, posterior margin truncate, reaching anterior margin of anal segment. Cerci short, cylindrical, tapering apically, apices pointed and not exceeding apices of semi-tergites.

Legs: Slender and long, lacking noticeable armature. Femora almost as long as corresponding tibiae. Profemora incurved basally, posterodorsal carina with inconspicuous elevations. Protibiae as long as mesonotum. Mesofemora longer than metanotum. Anteroventral and posteroventral carinae of mesofemora and metafemora with two small teeth near apex.

Measurements: See Table 2.

Distribution: China (Yunnan).

Notes: The descriptions of the female and male are based on adult specimens. Measurements are only given for the adults. The general appearance and colouration of the nymphs resemble the adults.

Etymology: The specific epithet of this new species is derived from the small horns on the vertex of head in the female.

***Oxyartes guizhouensis* sp. nov.** (Figs. 9-10, 23)

Types: Holotype, ♀, 900-1000m, Xishui, Zunyi, Guizhou, China, 2 July 2015, George Ho Wai-Chun (HKES); Paratypes, 3♀, same data as holotype (HKES).

Differentiation: *Carausius guizhouensis* **sp. nov.** is similar to *C. femoralis* Chen & He, 2002, but can be separated by the robust body, the presence of sparse and short bristles on body, the short tubercle-like granules on the lower margin of mesopleurae and metapleurae and the carina-like praeopercular organ on the seventh abdominal sternum in the female.

Description of female (Figs. 9-10, 23): Medium-sized. Body elongate and slender, surface rough, granulated

and weakly wrinkled, also sparsely covered with short bristles. General colouration of body and legs brown.

Head: Oval, weakly constricted after compound eyes. Rough, sparsely covered with small granules. Vertex with a pair of flattened horns between compound eyes, apex pointed and pointing forwards. Occiput weakly convex, median and lateral longitudinal furrows distinct, posterior margin with six distinct small swellings. Compound eyes small and rounded. Antennae filiform, apices not surpassing protarsi; scapus dorsoventrally flattened, distinctly constricted basally, as long as combined length of pedicellus and third segment; pedicellus shorter than third segment.

Thorax: Rough. Pronotum rectangular, longer than wide, as long as head, anterior margin weakly curved inwards, posterior margin rounded, transverse and longitudinal sulci crossing at middle area. Mesonotum longer than combined length of metanotum and median segment, moderately expanded posteriorly, median longitudinal carina indistinct, densely granulated, also interspersed with a few enlarged granules. Metanotum longer than median segment, densely granulated. Mesopleurae and metapleurae with a few tubercle-like granules along lower margin.

Abdomen: Cylindrical, rough, with granulations and short wrinkles. Median segment rectangular, longer than wide. Sixth tergum with or without a pair of humps posteromedially. Seventh sternum with a carina-like praeopercular organ posteromedially, V-shaped from ventral view, weakly elevated. Eighth tergum almost as long as combined length of ninth tergum and anal segment, with a small crest-like elevation posteromedially. Ninth tergum with a small crest-like elevation posteromedially. Anal segment as long as ninth tergum, posterior margin with a small and broad U-shaped emargination, posterolateral angles pointed. Supra-anal plate distinct, small, with median longitudinal carina, posterior margin pointed and projecting over posterolateral angles of anal segment. Operculum boat-shaped, median longitudinal carina distinct, posterior area distinctly raised, posterior margin pointed and reaching posterior margin of supra-anal plate. Cerci short, flattened, apices rounded and not projecting over end of anal segment.

Legs: Slender and long. Procoxae and mesocoxae with a short tubercle. Femora almost as long as corresponding tibiae. Profemora distinctly basally curved, shorter than mesonotum, anterodorsal carina distinctly waved with small rounded elevations, posteroventral carina elevated. Posteroventral carina of mesofemora and metafemora with two small teeth near apices. Anterodorsal carina of protibiae elevated, also with small rounded elevations, posteroventral carina elevated. First segment of protarsi with a small semi-circular lamella dorsally.

Measurements: See Table 3.

Distribution: China (Guizhou).

Notes: The male is unknown.

Etymology: The specific epithet of this new species is derived from the type locality, Guizhou (China).

***Oxyartes rubrogranulatus* sp. nov.** (Figs. 11-14, 24-27)

Types: Holotype, ♀, 2000m, Nanjian, Dali, Yunnan, China, 2 June 2018, George Ho Wai-Chun (HKES); Paratypes, 2♀, 2♂, same data as holotype (HKES).

Differentiation: *Carausius rubrogranulatus* **sp. nov.** is similar to *C. femoralis* Chen & He, 2002, but can be separated by the sparsely granulated mesonotum and metanotum, the sparsely granulated abdomen and the apically pointed horn-like praeopercular organ on the seventh abdominal sternum in the female and the reddish granules on the thorax and the rounded posterior apices of the anal abdominal semi-tergites in the male.

Description of female (Figs. 11-12, 24, 26): Medium-sized. Body elongate and slender, surface rough, sparsely granulated. General colouration of body and legs brown.

Head: Oval, weakly constricted after compound eyes. Rough, sparsely covered with small granules. Vertex with a pair of short and thick ear-like horns between compound eyes. Occiput flattened, median and lateral longitudinal furrows indistinct, posterior margin with indistinct swellings. Compound eyes small and rounded. Antennae filiform; scapus dorsoventrally flattened, indistinctly constricted basally, longer than combined length of pedicellus and third segment; pedicellus as long as third segment.

Thorax: Rough and sparsely granulated. Pronotum rectangular, longer than wide, as long as head, anterior margin weakly incurved, posterior margin rounded, transverse and longitudinal sulci crossing at middle area. Mesonotum longer than combined length of metanotum and median segment, median longitudinal carina indistinct, also interspersed with a few small reddish granules. Metanotum longer than median segment, also interspersed with a few reddish granules.

Abdomen: Cylindrical, rough, with sparse granulations. Median segment rectangular, longer than wide. Second to sixth tergites parallel-sided. Sixth tergum with or without a hump posteromedially. Seventh tergum with a small rounded lobe posterolaterally. Seventh sternum with a small crest-like praeopercular organ posteromedially, also with a short tubercle laterally. Eighth tergum almost as long as combined length of ninth tergum and anal segment. Anal segment as long as ninth tergum, posterior margin with a small and broad U-shaped emargination, posterolateral angles obtuse. Supra-anal plate distinct, small, with median

longitudinal carina, posterior margin rounded and not projecting over posterolateral angles of anal segment. Operculum boat-shaped, median longitudinal carina indistinct, posterolateral areas raised, posterior margin pointed. Cerci short, flattened, apices rounded and not projecting over end of anal segment.

Legs: Slender and long. Profemora longer than protibiae, basally curved, shorter than mesonotum, posterodorsal carina distinctly waved with small rounded elevations. Mesofemora and metafemora as long as corresponding tibiae, posteroventral carina with two small teeth near apices. Posterodorsal and posteroventral carina of protibiae waved with small rounded elevations. First segment of protarsi with a small semi-circular lamella dorsally.

Description of male (Figs. 13-14, 25, 27): Body slender and elongate, distinctly slenderer than female. General colouration of body and legs brown.

Head: Oval, weakly constricted posteriorly after compound eyes, as long as pronotum. Sparsely granulose. Vertex with a pair of small horns between compound eyes. Occiput flattened, with distinct median and lateral longitudinal furrows, posterior margin with six small swellings. Compound eyes rounded and small. Antennae long and filiform; scapus dorsoventrally flattened, weakly constricted basally, almost as long as third segment; pedicellus shorter than third segment.

Thorax: Sparsely covered with small granules. Pronotum rectangular, longer than wide, anterior margin truncate, posterior rounded, transverse and longitudinal sulci crossing at middle area. Mesonotum slender and elongate, longer than combined length of metanotum and median segment, broadly emarginated medially, median longitudinal carina indistinct, also with a few small reddish granules. Metanotum shorter than mesonotum, broadly emarginated medially, median longitudinal carina indistinct, also with a few small reddish granules.

Abdomen: Slender and cylindrical, with very few small and inconspicuous granules. Median segment rectangular, longer than wide, shorter than metanotum. Seventh tergum shorter than combined length of eighth and ninth tergites. Eighth tergum expanded posteriorly, longer than ninth tergum. Anal segment as long as seventh tergum, split into two semi-tergites, inner margin weakly curved after middle area, apices with a few small dentations, posterior margin rounded. Poculum cup-like, basally elevated, posterior margin rounded and reaching posterior margin of ninth tergum. Cerci short, flattened, apices rounded and not exceeding apices of semi-tergites.

Legs: Slender and long, lacking noticeable armature. Profemora as long as protibiae, incurved basally, posteroventral carina with two small teeth near apices. Mesofemora and metafemora slightly shorter than corresponding tibiae, posteroventral carina with two small teeth near apices. Hindlegs not extending beyond end of abdomen.

Measurements: See Table 4.

Distribution: China (Yunnan).

Etymology: The specific epithet of this new species is derived from the reddish granulations on the mesonotum and metanotum in the both sexes.

CONCLUSION

The diversity of Lonchodinae in China is apparently high and more than 100 species are expected to be recorded in the subfamily (Chen and He, 2008; Hennemann et al., 2008; Ho, 2016, unpubl. data). *Carausius* Stål, 1875 is one of the most speciose genera in the subfamily and a total of 14 species are currently recognised. The known range of the genus is widely distributed from eastern to southwestern China and broadly covers the tropical, subtropical and temperate regions. The discovery of the four newly described taxa, *C. gracilicercus* **sp. nov.**, *C. gracilicornis* **sp. nov.**, *C. guizhouensis* **sp. nov.** and *C. rubrogranulatus* **sp. nov.**, from Yunnan, China, further reflects the high species diversity of the genus in China. New taxa can possibly be discovered in any localities of China. Molecular study on the Chinese taxa can help advance the understanding of their phylogenic relationship.

ACKNOWLEDGMENTS

My special thanks go to Paul Brock (Natural History Museum, London, U.K.) for providing valuable comments and suggestions to improve the manuscript.

REFERENCES

Bradler, S., 2009. Die Phylogenie der Stab- und Gespenstschrecken (Insecta: Phasmatodea). *Species, Phylogeny and Evolution* 2: 3-139.

Bradler, S., Robertson, J.A. and Whiting, M.F., 2014, A molecular phylogeny of Phasmatodea with emphasis on Necrosciinae, the most species-rich subfamily of stick insects. *Systematic Entomology* 39(2): 1-18.

Bragg, P.E., 2001. *Phasmids of Borneo*. Natural History Publications (Borneo), Kota Kinabalu. 772pp.

Brock, P.D., Büscher, T. and Baker, E., 2021. *Phasmida Species File Online*. *Version 5.0/5.0*. Available from http://phasmida.speciesfile.org/HomePage/Phasmida/HomePage.aspx, accessed on 14 March 2021.

Brunner von Wattenwyl, K., 1893. Révision du Système des Orthoptères et description des espèces rapportées par M. Leonardo Fea de Birmanie. *Annali del Museo Civico di storia naturale Giacomo Doria, Genova* (2)13(33): 1-230.

Brunner von Wattenwyl, K., 1907. *Die Insektenfamilie*

der Phasmiden. II. Phasmidae Anareolatae (Clitumnini, Lonchodini, Bacunculini). Wilhelm Engelmann, Leipzig. 157pp.

Chen, S.C. and He, Y.H., 2002. Three new species of *Carausius* from Sichuan and Yunnan provinces, China (Phasmatodea: Heteronemiidae). *Acta Entomologica Sinica* 45(Suppl.): 1-3.

Chen, S.C. and He, Y.H., 2008. *Phasmatodea of China*. China Forestry Publishing House, Beijing. 476pp.

Chen, S.C., He, Y.H. and Xu, F.L., 2006. Phasmatodea: Heteronemiidae and Phasmatidae. In: *Insects from Mt. Fanjingshan Landscape* (Li, Z.Z. and Jin, D.C., eds.). Guizhou Science and Technology Publishing House, Guiyang: 52-57.

Hennemann, F.H., Conle, O.V. and Zhang, W.W., 2008. Catalogue of the Stick and Leaf-insects (Phasmatodea) of China, with a faunistic analysis, review of recent ecological and biological studies and bibliography (Insecta: Orthoptera: Phasmatodea). *Zootaxa* 1735: 1-76.

Ho, G.W.C., 2016. Contribution to the knowledge of Chinese Phasmatodea III: Catalogue of the phasmids of Hainan Island, China, with descriptions of one new genus, one new species and two new subspecies and proposals of three new combinations. *Zootaxa* 4150(3): 314-340.

Ho, G.W.C., 2017. Contribution to the knowledge of Chinese Phasmatodea V: New taxa and new nomenclatures of the subfamilies Necrosciinae (Diapheromeridae) and Lonchodinae (Phasmatidae) from the Phasmatodea of China. *Zootaxa* 4368(1): 1-72.

Otte, D. and Brock, P.D., 2005. *Phasmida Species File - Catalog of Stick and Leaf Insects of the World*. The Insect Diversity Association and the Academy of Natural Sciences, Philadelphia. 414pp.

Rehn, J.A.G., 1904. Studies in the orthopterous family Phasmidae. *Proceedings of the Academy of Natural Sciences of Philadelphia* 56: 38-107.

Robertson, J.A., Bradler, S. and Whiting, M.F., 2018. Evolution of oviposition techniques in stick and leaf insects (Phasmatodea). *Frontiers in Ecology and Evolution* 6(216): 1-15.

Simon, S, Letsch, H., Bank, S., Buckley, T.R., Donath, A., Liu, S., Machida, R., Meusemann, K., Misof, B., Podsiadlowski, L., Zhou, X., Wipfler, B. and Bradler, S., 2019. Old world and new world Phasmatodea: Phylogenomics resolve the evolutionary history of stick and leaf insects. *Frontiers in Ecology and Evolution* 7(345): 1-14.

Stål, C., 1875. Recensio orthopterorum. 3. Revue critique des Orthoptères décrits par Linné, DeGeer et Thunberg. *Öfversigt af Kongliga Vetenskaps-Akademiens Förhandlingar* 32: 1-105.

Xu, F.L., 2008. *A taxonomic study on Phasmatodea in Guizhou*. Guizhou University, Guizhou. 70pp.

Zompro, O., 2004. Revision of the genera of the Areolatae, including the status of *Timema* and *Agathemera* (Insecta, Phasmatodea). *Abhandlungen des Naturwissenschaftlichen Vereins Hamburg (NF)* 37: 1-327.

TABLES & FIGURES

	Holotype Female	Paratype males
Body	118.0	84.0-87.0
Head	5.0	3.0
Antennae	37.0	41.0-44.0
Pronotum	4.5	3.0
Mesonotum	24.5	19.0-20.0
Metanotum	15.0	12.0
Median segment	6.0	3.5-4.0
Profemora	21.0	18.0-19.0
Mesofemora	16.0	13.0-14.0
Metafemora	17.0	15.0-17.0
Protibiae	19.0	20.0-21.0
Mesotibiae	15.0	15.0
Metatibiae	16.0	19.0-21.0

Table 1. Measurements of *Carausius gracilicercus* **sp. nov.**

	Holotype Female	Paratype male
Body	105.0	80.0
Head	4.0	3.0
Antennae	39.0	45.0
Pronotum	4.0	3.0
Mesonotum	24.0	19.0
Metanotum	14.0	12.0
Median segment	4.0	3.0
Profemora	18.0	19.0
Mesofemora	14.0	14.0
Metafemora	17.0	16.0
Protibiae	18.0	20.0
Mesotibiae	15.0	15.0
Metatibiae	18.0	19.0

Table 2. Measurements of *Carausius gracilicornis* **sp. nov.**

	Holotype Female	Paratype females
Body	122.0	105.0-112.0
Head	5.5	5.0
Antennae	42.0	36.0-40.0
Pronotum	5.5	5.0
Mesonotum	29.0	24.0-25.0
Metanotum	15.0	12.5-13.0
Median segment	6.0	4.0-5.0
Profemora	22.0	20.0-21.0
Mesofemora	17.0	15.0-16.0
Metafemora	20.0	18.0-20.0
Protibiae	22.0	19.0-20.0
Mesotibiae	17.0	15.0-17.0
Metatibiae	22.0	19.0-21.0

Table 3. Measurements of *Carausius guizhouensis* **sp. nov.**

	Holotype Female	Paratype Females	Paratype Males
Body	145.0	123.0-137.0	97.0
Head	5.0	4.5-5.0	3.0
Antennae	48.0	48-49.0	50.0
Pronotum	5.5	5.0	3.0
Mesonotum	33.0	26.0-31.0	22.0
Metanotum	18.0	15.0-18.0	13.5-14.0
Median segment	6.0	5.0-5.5	3.5
Profemora	25.0	23.0-25.0	20.0-21.0
Mesofemora	19.0	17.0	14.0-16.0
Metafemora	22.0	20.0-22.0	17.0-18.0
Protibiae	24.0	20.0-22.0	21.0
Mesotibiae	19.0	17.0	16.0-17.0
Metatibiae	22.0	20.0-22.0	20.0-21.0

Table 4. Measurements of *Carausius rubrogranulatus* **sp. nov.**

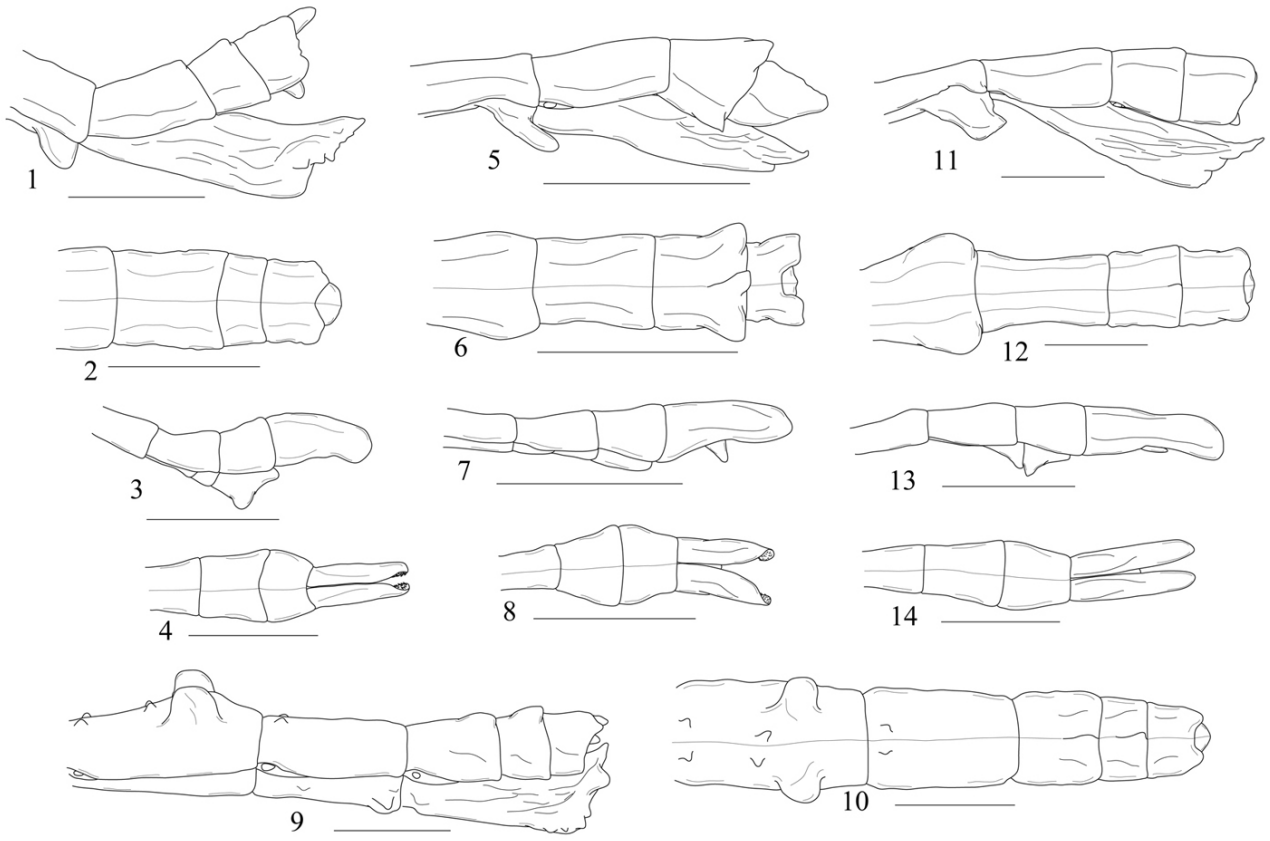

Figure 1-14. *Carausius* spp. 1. *Carausius gracilicercus* **sp. nov.**, female, apex of abdomen, lateral view. 2. *Carausius gracilicercus* **sp. nov.**, female, apex of abdomen, dorsal view. 3. *Carausius gracilicercus* **sp. nov.**, male, apex of abdomen, lateral view. 4. *Carausius gracilicercus* **sp. nov.**, male, apex of abdomen, dorsal view. 5. *Carausius gracilicornis* **sp. nov.**, female, apex of abdomen, lateral view. 6. *Carausius gracilicornis* **sp. nov.**, female, apex of abdomen, dorsal view. 7. *Carausius gracilicornis* **sp. nov.**, male, apex of abdomen, lateral view. 8. *Carausius gracilicornis* **sp. nov.**, male, apex of abdomen, dorsal view. 9. *Carausius guizhouensis* **sp. nov.**, female, apex of abdomen, lateral view. 10. *Carausius guizhouensis* **sp. nov.**, female, apex of abdomen, dorsal view. 11. *Carausius rubrogranulatus* **sp. nov.**, female, apex of abdomen, lateral view. 12. *Carausius rubrogranulatus* **sp. nov.**, female, apex of abdomen, dorsal view. 13. *Carausius rubrogranulatus* **sp. nov.**, male, apex of abdomen, lateral view. 14. *Carausius rubrogranulatus* **sp. nov.**, male, apex of abdomen, dorsal view. [Scale bars = 5 mm; drawings by author]

Figures 15-18. *Carausius gracilicercus* **sp. nov.** 15. Female, habitus. 16. Male, habitus. 17. Female, head and thorax, dorsolateral view. 18. Male, head and thorax, dorsolateral view. [Scale bars = 5 mm; photos by author]

Figure 19-23. *Carausius* spp. 19. *Carausius gracilicornis* **sp. nov.**, female, habitus. 20. *Carausius gracilicornis* **sp. nov.**, male, habitus. 21. *Carausius gracilicornis* **sp. nov.**, female, head and thorax, dorsolateral view. 22. *Carausius gracilicornis* **sp. nov.**, male, head and thorax, dorsolateral view. 23. *Carausius guizhouensis* **sp. nov.**, female, habitus. [Scale bars = 5 mm; photos by author]

Figures 24-27. *Carausius rubrogranulatus* **sp. nov.** 24. Female, habitus. 25. Male, habitus. 26. Female, head and thorax, dorsolateral view. 27. Male, head and thorax, dorsolateral view. [Scale bars = 5 mm; photos by author]

