

Review of some species of *Corrugia* (Hymenoptera: Tenthredinidae) with description of a new species and a revised key to world species

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Abstract: Some Chinese species of *Corrugia* Malaise are reviewed and some misidentifications of the species are discussed. *C. kuanding* Xiao, Niu & Wei **sp. nov.** is described as new to science. *C. horni* (Forsius, 1932) and *C. formosana* (Rohwer, 1916) are redescribed based on holotypes. *Nesoselandria melanopoda* Takeuchi, 1941 is treated as a new junior synonym of *C. horni* (Forsius, 1932). *C. nigroalata* (Haris, 2002) is a new combination transferred from *Nesoselandria*. A species list of *Corrugia* and a key to world species of this genus are provided.

Key words: Tenthredinomorpha; Selandriinae; sawfly; taxonomy; key

沟额叶蜂属部分中国种类评述暨一新种和分种检索表（膜翅目：茎蜂科）

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摘要: 评述了沟额叶蜂属部分中国种类, 讨论了一些种类的错误鉴定, 记述 1 新种: 宽顶沟额叶蜂 *C. kuanding* Xiao, Niu & Wei **sp. nov.**。基于模式标本, 重新描述了黑足沟额叶蜂 *C. horni* (Forsius, 1932) 和台湾沟额叶蜂 *C. formosana* (Rohwer, 1916)。建立了 1 个新组合: *C. nigroalata* (Haris, 2002), **comb. nov.**, 该种原放在 *Nesoselandria* 属内。提出了 1 个新异名: *Corrugia horni* (Forsius, 1932) = *Nesoselandria melanopoda* Takeuchi, 1941, **syn. nov.**, 前者原来放在 *Anapeptamena* 属内。编制了沟额叶蜂属世界种类目录和分种检索表。

关键词: 叶蜂亚目; 蕨叶蜂亚科; 叶蜂; 分类; 检索表

Introduction

Corrugia Malaise, 1944 belongs to Selandriinae in the family Tenthredinidae. This genus is one of the most common sawfly genera feeding on ferns in southeastern Asia. Species of this genus are very small and mostly black, so they are usually overlooked in the field. Larvae of these species feed on the leaves of ferns. Totally about 24 species have been described worldwide (Liu *et al.* 2012). Among them, 16 species occur in China (Wei 1997a, b; Wei & Nie 2002b, 2003; Wei *et al.* 2006; Liu *et al.* 2012).

Accepted 6 September 2021. Published online 9 November 2021. Published 25 December 2021.

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Malaise (1944) erected a subgenus *Corrugia* within *Nesoselandria* and included four species. He pointed out that *Corrugia* could be recognized from *Nesoselandria* s. str. by the frons with a transverse furrow and irregular carinae. Wei (1997a) first treated *Corrugia* as a valid genus, described a new species from China, and transferred *Nesoselandria formosana* Rohwer, 1916 and *Anapeptamena montana* Forsius, 1929 into *Corrugia*. Wei (1997b) revised the Chinese species of *Corrugia*, described five new species and proposed 3 new combinations: *Corrugia shirozui* (Okutani, 1965), *Corrugia melanopoda* (Takeuchi, 1941) and *C. annamitica* (Forsius, 1931). However, this last combination was not correct, and this species was in fact a member of *Nesoselandria* (Wei 2000). Liu *et al.* (2012) keyed out the 23 species of *Corrugia*. Among them *C. sulawesiensis* (Haris, 2006), *C. minuta* (Smith, 1982), *C. ryukyuensis* (Okutani, 1965) and *C. shirozui* (Okutani, 1965) were transferred from *Nesoselandria*. *C. rugafrons* (Benson, 1935) and *C. horni* (Forsius, 1932) were transferred from *Anapeptamena*.

Several years ago, we checked the types of *Anapeptamena horni* Forsius, 1932 and *Nesoselandria formosana* Rohwer, 1916. We confirmed that *Nesoselandria formosana* previously recorded from the mainland of China (Wei 1997a, 1997 b; Wei & Nie 2003; Liu *et al.* 2012) were misidentifications. That led to a further study of some species of *Nesoselandria* and *Corrugia*. Those results are reported here.

The main diagnosis of this genus is: the head with a distinct transverse furrow and irregular fine carinae above antennal toruli (Figs 5, 14); the male penis valve with a distinct caudal hook and a sharp dent above it (Figs 4, 8).

Material and methods

Specimens examined in this research including type material are deposited in the Asian Sawfly Museum, Nanchang, Jiangxi, China (ASMN); Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany (SDEI); Institute of Zoology, the Chinese Academy of Sciences, Beijing, P. R. China (IZAS); and Zhejiang University, Hangzhou, P. R. China (ZUH).

Images were obtained using a Nikon D2x digital camera and Motic BA400 microscope and further processed with Helicon Focus (©HeliconSoft) and Adobe Photoshop CS2 software.

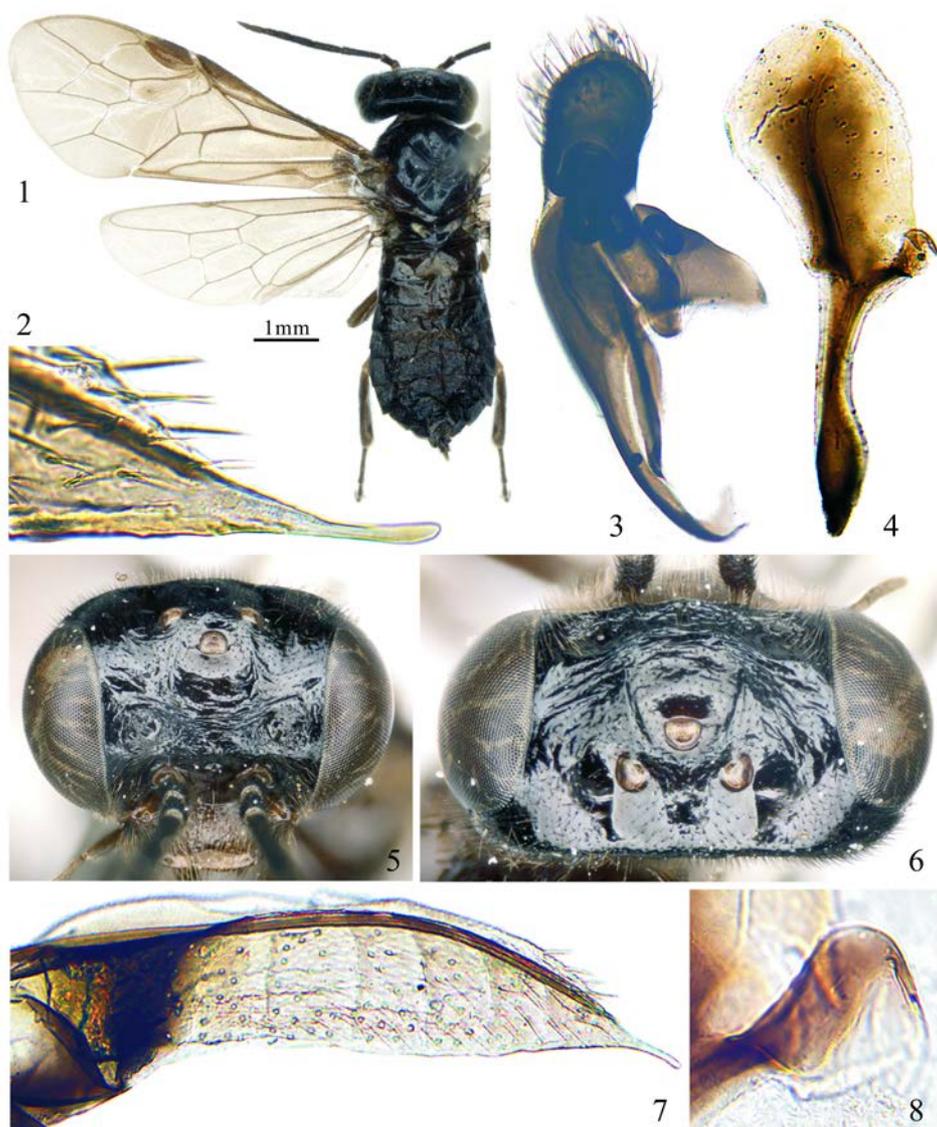
Abbreviations used are: OOL — distance between the eye and outer edge of lateral ocellus; POL — distance between the mesal edges of the lateral ocelli; OCL — distance between a lateral ocellus and the occipital carina or hind margin of the head.

Terminology of sawfly genitalia follows Ross (1945). Terminology of wing venation follows Niu & Wei (2010).

Taxonomy

1. *Corrugia kuanding* Xiao, Niu & Wei sp. nov. (Figs 1–8)

Corrugia formosana Wei, 1997a: 1568; Wei, 1997b: 17; Liu *et al.*, 2012: 4; nec. Rohwer, 1916.



Figures 1–8. *Corrugia kuanding* Xiao, Niu & Wei **sp. nov.** 1. Holotype, female, dorsal view; 2. Apex of lancet; 3. Gonoforcep; 4. Penis valve; 5. Head, frontal view; 6. Head, dorsal view; 7. Lancet; 8. Caudal hook of penis valve.

Female (Holotype, Fig. 1). Body length 5.5 mm. Body and legs black; labrum, hind trochanter, tibial spurs of each leg, basal 2 tarsomeres of fore and middle tarsi pale brown, middle trochanter and fore femora dark brown; body hairs dark brown. Wings strongly and evenly infuscate, pterostigma and vein C black brown, other veins dark brown.

Clypeus minutely and sparsely punctured; anterior margin very shallowly emarginated; malar space linear, 0.1 times diameter of lateral ocellus; supraclypeal area weakly elevated, without middle carina, upper margin with a distinct trifurcated furrow; lateral fovea broad,

shallow, middle fovea very small, lateral foveae connected by a shallow transverse groove and irregular ridges, densely punctured (Fig. 5); frons flat, minutely and sparsely punctured, frontal wall fine, distinct (Figs 5, 6); postocellar area weakly elevated, 2.5 times as broad as long, smooth; lateral furrows distinct, weakly divergent backwards (Fig. 6); OOL : POL : OCL = 8 : 6 : 5; hind orbit minutely punctured. Antenna slender, pedicel 2 times as long as broad, third antennomere 1.4 times length of fourth antennomere. Anterior half of prescutum shallowly and sparsely punctured, other part of middle thorax impunctate, shiny; mesoscutellum flat, anterior margin triangularly protruding. First abdominal tergite polished, strongly shiny, other tergites coriaceous with many hair warts. Vein 2r curved, meeting cell 2Rs at apical 0.25; petiole of hind anal cell 0.3 times length of vein cu-a (Fig. 1). Claw with a distinct basal lobe, inner tooth about 0.85 times as long as apical tooth. Lancet with distinct annular sutures (Fig. 7), and a very long and terminally blunt apical process (Fig. 2).

Male. Body length 4 mm. Color and structure similar to female except for hind coxa dark brown; subgenital plate 1.2 times as long as broad, apical margin round; harpe as in Fig. 3; penis valve simple, slightly broadened toward apex, ventral middle lobe absent (Fig. 4), caudal lobe and dent distinct (Fig. 8).

Etymology. The specific epithet, “*kuanding*”, is a Chinese word meaning broad vertex, referring to the large postocellar area of the species.

Remarks. This species was misidentified as *C. formosana* (Rohwer, 1916) over the past 15 years (Wei 1997a, b, 2006; Wei *et al.* 2006; Wei & Nie 2002a, 2002b, 2003). The new species differs from *C. formosana* in the postocellar area about 2.5 times as broad as long; OOL : POL : OCL = 8 : 6 : 5, the fore and middle trochanters and hind tarsus black, body hairs dark brown, wings strongly infusate and the apex of the apical process of female lancet blunt. *C. kuanding* is also similar to *C. horni* (Forsius) but differs from the latter species by the postocellar area 2.5 times broader than long, the hind trochanter pale brown, the lateral furrows of postocellar area sharply defined and the apex of the apical process of female lancet blunt.

2. *Corrugia horni* (Forsius, 1932) (Figs 9–15)

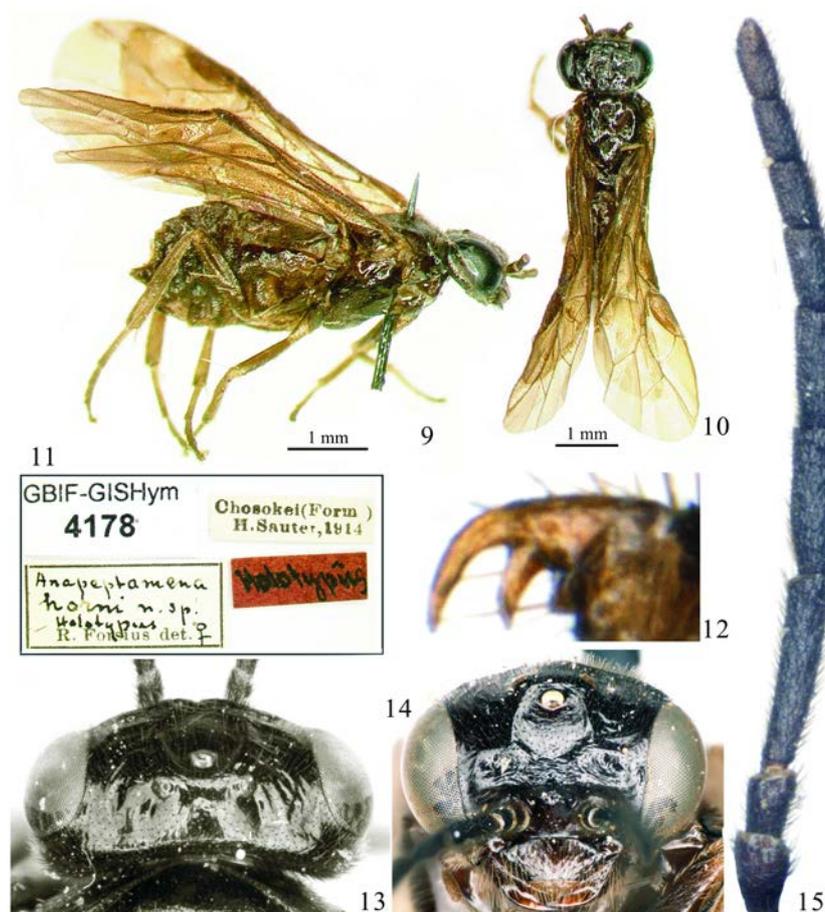
Anapeptamena horni Forsius, 1932: 51.

Nesoselandria melanopoda Takeuchi, 1941: 267. **Syn. nov.**

Redescription (Based on holotype female except for antenna and male). Body length 5 mm. Body and legs black; tibial spurs of each leg pale brown, fore and middle tibiae and tarsi brown; body hairs dark brown. Wings evenly and distinctly infusate, pterostigma and veins dark brown (Figs 9–10).

Clypeus densely punctured; anterior margin shallowly and roundly emarginated; malar space linear, 0.1 times diameter of lateral ocellus; supraclypeal area weakly elevated, without middle carina, upper margin with a distinct trifurcated furrow; lateral fovea broad, distinct, about as large as lateral ocellus, shiny; middle fovea small and shallow, shiny; lateral foveae connected by irregular ridges, finely punctured; frons flat, minutely and sparsely punctured, frontal wall fine, distinct (Fig. 14); postocellar area weakly elevated, 2 times as broad as long, largely smooth; lateral furrows vestigial, hardly recognizable, weakly divergent backwards; POL : OOL : OCL = 5 : 4 : 3 (Fig. 13); hind orbit densely and minutely punctured. Pedicel 2 times longer than broad, flagellum slender, antennomere 3 1.4 times as long as antennomere 4

(Fig. 15). Anterior half of prescutum shallowly and sparsely punctured, other part of middle thorax impunctate, shiny; mesoscutellum very flat, anterior margin triangularly protruding. First abdominal tergite polished, strongly shiny, other tergites coriaceous with many hair warts. Vein 2r roundly curved, meeting cell 2Rs at apical 0.33; petiole of hind anal cell 0.5 times length of vein cu-a. Claw with a distinct basal lobe, inner tooth about 0.85 times as long as apical tooth (Fig. 12). Lancet without a long and slender apical spine, apex of lancet triangular.



Figures 9–15. *Corrugia horni* (Forsius, 1932). Female. 9. Holotype, lateral view; 10. Holotype, dorsal view; 11. Labels of holotype; 12. Claw; 13. Head, dorsal view; 14. Head, frontal view; 15. Antenna.

Male. Body length 4–5 mm. Color and structure similar to female (After Takeuchi, 1941).

Specimen examined. ♀, “Chosokei (Form.), H. Sauter, 1914”; “Holotypus” [red]; “*Anapeptamena horni* n. sp., R. Forsius det., ♀”; “GBIF–GISHym 4178” (SDEI).

Distribution. China (Taiwan).

Remarks. This species could be easily recognized from other species of *Corrugia* by the combination of following characters: legs black; postocellar area about 2 times broader than

long; lateral furrows vestigial, hardly recognizable; wings strongly infusate.

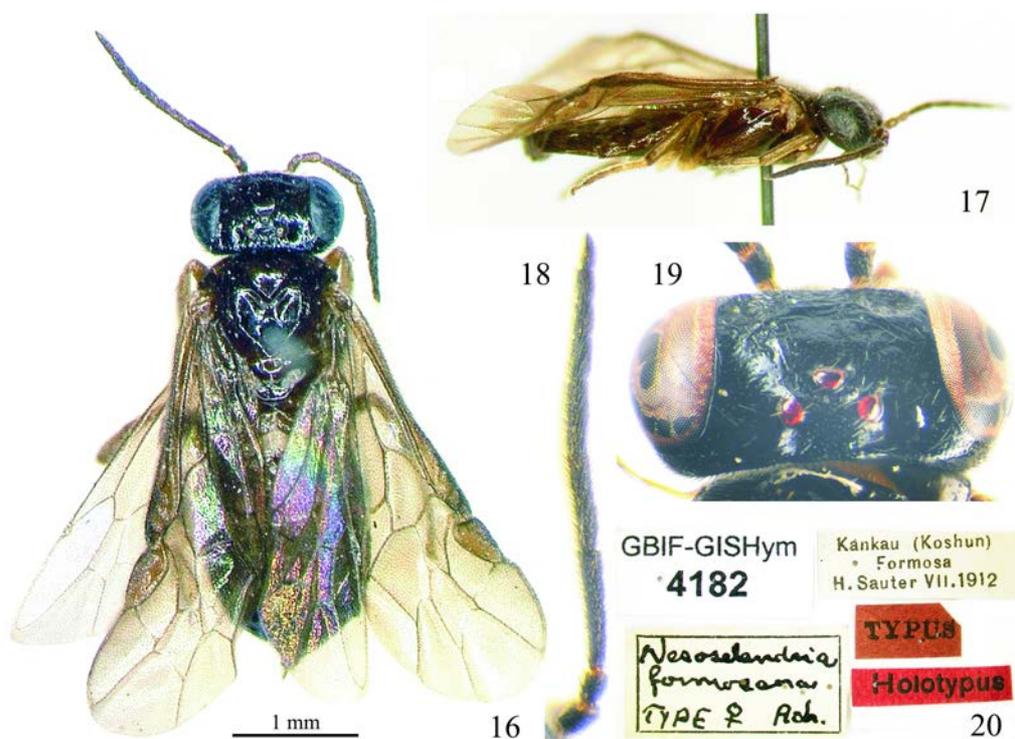
Malaise (1944) stated that *Anapeptamena horni* Forsius, 1932 was probably a *Nesoselandria* species. This viewpoint was followed by Wei *et al.* (2006). The examination of the types showed that it was really a species of *Corrugia*. Liu *et al.* (2012) transferred the species into *Corrugia*.

The type of the *Nesoselandria melanopoda* Takeuchi, 1941 cannot be found in the Osaka Prefecture University collection (Toshiya Hirowatari, personal comm.). But the detailed original description and the distribution data given by Takeuchi (1941) can be relied on to treat it as a new synonym of *Corrugia horni* (Forsius, 1932).

3. *Corrugia formosana* (Rohwer, 1916) (Figs 16–20)

Nesoselandria formosana Rohwer, 1916: 102.

Corrugia formosana: Wei, 1997a: 1568.



Figures 16–20. *Corrugia formosana* (Rohwer, 1916), holotype. 16. Female, dorsal view; 17. Female, lateral view; 18. Antenna; 19. Head, dorsal view; 20. Labels of holotype.

Redescription (Holotype female). Body length 4 mm. Body and legs black; labrum and anterior trochanter dark brown, apex of hind coxa, middle and hind trochanters, extreme base of hind femur, tibial spurs of each leg, basal half of hind basitarsomere yellow brown; body hairs pale brown. Wings evenly and weakly infusate, pterostigma and veins dark brown (Figs 16, 17).

Clypeus minutely and sparsely punctured with some microsculptures, anterior margin shallowly and roundly emarginated; malar space linear, 0.1 times diameter of lateral ocellus;

supraclypeal area weakly elevated, without middle carina, upper margin with a curved furrow; lateral fovea broad, roundish; middle fovea indistinct, lateral foveae connected by a distinct transverse groove and irregular ridges, densely and minutely punctured; frons flat, minutely and very sparsely punctured, frontal wall obscure; postocellar area weakly elevated, 4 times as broad as long, smooth; OOL : POL : OCL = 9 : 7 : 3; lateral furrows distinct, as long as diameter of lateral ocellus, strongly divergent backwards (Fig. 19); hind orbit densely and minutely punctured. Antenna slender, pedicel 2 times as long as broad, antennomere 3 1.3 times as long as antennomere 4, antennomere 7 about 1.8 times as long as broad (Fig. 18). Middle thorax impunctate, shiny; mesoscutellum very flat, anterior margin triangularly protruding. First abdominal tergite polished, strongly shiny, other tergites coriaceous with hair warts. Vein 2r hardly curved, meeting cell 2Rs at apical 0.25; petiole of hind anal cell 0.5 times length of vein cu-a. Claw with a distinct basal lobe, inner tooth about 0.8 times as long as apical tooth. Lancet with a very long and slender apical process.

Male. Body length 3.5 mm. Color and structure similar to female; subgenital plate subtruncate at apex.

Distribution. China (Fujian, Guangdong, Hunan, Taiwan); Japan (Yakushima).

Specimens examined. ♀, “Kankau (Koshun), Formosa, H. Sauter, VII-1912”; “*Nesoselandria formosana* Roh., Type ♀”; “Holotypus”[red]; “*Corrugia formosana* (Rohwer), det. M. Wei, 2010” (SDEI). 1♂, allotype, Kankau, Formosa, H. Sauter, VII-1912 (SDEI). 1♀, Hunan, Zhuzhou, 18-VIII-1999, leg. Meicai WEI; 1♀, Guangdong, Shixing, Chebaling, 24°43.382'N, 114°15.383'E, alt. 400 m, 20-VI-2007, leg. Fangjun LIAO (ASMN).

Remarks. *C. formosana* (Rohwer) can be recognized by the combination of following characters: body and legs black, middle and hind trochanters, basal half of hind basitarsus yellow brown; postocellar area 4 times as broad as long; transverse furrow in anterior margin of frons complete; body hairs pale brown. See the remarks under *C. kuanding* for the differences between *C. formosana* and *C. kuanding*.

4. List of species groups and species of *Corrugia* Malaise

C. sulawesiensis group

C. nigroalata (Haris, 2002), **comb. nov.** Malaysia.

C. sulawesiensis (Haris, 2006). Indonesia.

C. annulata group

C. annulata Malaise, 1944. Indonesia.

C. hainanica Wei, 2002. China: Hainan.

C. montana (Forsius, 1929). China: Hubei, Zhejiang, Fujian, Sichuan, Guangxi; Indonesia.

C. femorata group

C. abrupta Wei, 1997. China: Fujian, Guangxi, Guizhou.

C. albotegularis Wei, 1997. China: Hunan.

C. curvatispina Wei & Xiao, 2012. China: Guangxi.

C. femorata Wei, 1997. China: Zhejiang, Fujian, Hunan, Guangdong, Guangxi, Sichuan, Chongqing, Guizhou.

C. jacobsoni (Enslin, 1912). Indonesia.

C. liaoeae Wei & Liu, 2012. China: Guangxi.

C. libona Wei, 1997. China: Hunan, Guangxi, Guizhou.

C. sinica Wei, 1997. China: Fujian, Zhejiang, Guangdong.

C. rufocincta group

C. rufocincta Wei, 1997. China: Yunnan.

C. formosana group

C. anthracina Malaise, 1944. Sri Lanka.

C. minuta (Smith, 1982). Sri Lanka.

C. rugafrons (Benson, 1935). Indonesia.

C. ryukyuensis (Okutani, 1965). Japan: Ryukyus.

C. sulciceps Malaise, 1944. China: Fujian; Myanmar, Himalayas.

C. thwaitesi (Kirby, 1883). China: Fujian; Sri Lanka.

= *Nesoselandria ceylonensis* Rohwer, 1912.

C. formosana (Rohwer, 1916). China: Taiwan, Fujian, Guangdong; Japan (Yakushima).

C. horni group

C. pendleburyi (Forsius, 1933). Malaysia.

C. horni (Forsius, 1932). China: Taiwan.

= *Nesoselandria melanopoda* Takeuchi, 1941, **syn. nov.**

C. shirozui (Okutani, 1965). China: Taiwan; Ryukyus.

C. kuanding Xiao, Niu & Wei, **sp. nov.** China: Beijing, Hubei, Hunan, Chongqing, Zhejiang, Fujian, Taiwan, Guangdong, Guangxi, Guizhou, Hainan.

Key to world species of *Corrugia* Malaise

1. Clypeus yellowish white. *C. sulawesiensis* group..... 2
- . Clypeus black..... 3
2. Hind femur white, dorsum brown; hind tibia and tarsus entirely white; malar space linear.....
..... *C. sulawesiensis* (Haris)
- . Hind leg brown, tibia and tarsus white except apex; malar space 0.4 times diameter of lateral ocellus.....
..... *C. nigroalata* (Haris)
3. Hind femora yellowish brown or white, dorsal side sometimes darkened. 4
- . Hind femora largely or entirely black..... 14
4. Postocellar area 2–3 times broader than long. *C. annulata* group..... 5
- . Postocellar area 4–5 times broader than long. *C. femorata* group..... 7
5. Anterior furrow of frons complete, not interrupted at middle..... 6
- . Anterior furrow of frons not complete, interrupted at middle by a distinct elevation; apical 1/3 of hind tibia black..... *C. hainanica* Wei
6. Malar space distinct, about half diameter of median ocellus, slightly shorter in male.....
..... *C. annulata* Malaise
- . Malar space linear, almost absent *C. montana* (Forsius)
7. Supraclypeal area with a distinct middle carina; middle fovea absent *C. jacobsoni* (Enslin)
- . Supraclypeal area without a middle carina; middle fovea distinct..... 8
8. Hind femur entirely yellow white; hind tibia white, at most apex dark brown to blackish 9
- . Dorsum of hind femur black, hind tibia largely black brown *C. femorata* Wei
9. Anterior furrow of frons not complete, interrupted at middle by a distinct elevation 10
- . Anterior furrow of frons complete, not interrupted at middle 12

10. Fore femur entirely and fore coxa largely yellow white; postocellar area about 4 times as broad as long 11
 -. Fore coxa and femur largely black; postocellar area 5 times as broad as long
 *C. abrupta* Wei
11. Frons without fine lateral carina; basal 2 antennomeres black, antennomere 3 shorter than apical 3 antennomeres together; distance between antennal toruli 1.8 times as broad as inner orbit; lancet without sclerotized annular sutures, apical process straight with acute apex
 *C. liaoe* Wei & Liu
- . Frons with distinct fine lateral carina; basal 2 antennomeres brown, antennomere 3 longer than apical 3 antennomeres together; distance between antennal toruli 1.2 times as broad as inner orbit; lancet with sclerotized annular sutures, apical process distinctly curved with blunt apex
 *C. curvatispina* Wei & Xiao
12. All femora white; apical process of lancet very short *C. sinica* Wei
- . At least fore femur black or dark brown; lancet with a long apical process 13
13. Tegula and middle femur white *C. albotegularis* Wei
- . Tegula and middle femur black or black brown *C. libona* Wei
14. Middle abdominal segments yellow white; postocellar area 3 times as broad as long. *C. rufocincta* group
 *C. rufocincta* Wei
- . Abdomen black, without pale segment 15
15. Postocellar area not very short, 2–3 times as broad as long; OCL 1.5–2 times as long as diameter of lateral ocellus. *C. horni* group 16
- . Postocellar area very short, much more than 3 times as broad as long, OCL about as long as diameter of lateral ocellus. *C. formosana* group 19
16. Postocellar area 2–2.5 times broader than long, lateral furrows subparallel or slightly divergent; malar space about 0.1 times diameter of lateral ocellus in female 17
- . Postocellar area about 2.7–3.0 times broader than long; lateral furrows distinctly divergent backwards; malar space 0.3 times diameter of lateral ocellus in female; fine frontal carina distinct
 *C. shirozui* (Okutani)
17. Hind tibia largely white, basitarsus white; lateral furrows of postocellar area distinct
 *C. pendleburyi* (Forsius)
- . Hind tibia and hind basitarsus black 18
18. Lateral furrows of postocellar area vestigial; postocellar area 2 times broader than long; hind trochanter blackish brown *C. horni* (Forsius)
- . Lateral furrows of postocellar area distinct; postocellar area 2.5 times broader than long; hind trochanter pale brown *C. kuanding* Xiao, Niu & Wei **sp. nov.**
19. Posterior margin of temple sharply angulated without marginal ridge; body and legs entirely black; penis valve very large, anterior margin truncate, caudal lobe very large; lancet with a long apical process, annular suture weak but recognizable *C. anthracina* Malaise
- . Posterior margin of temple not angulated and with a distinct marginal ridge; at least base of hind tibia or of metabasitarsus whitish 20
20. Hind tibia largely black, metabasitarsus entirely white; trochanters black 21
- . Hind tibia white with black apex; all trochanters yellow white; penis valve of known species without ventral middle lobe 22
21. Distance between hind ocelli nearly 3 times diameter of an ocellus; penis valve with a distinct middle ventral lobe, ventral apical corner produced; female lancet without annular suture
 *C. thwaitesi* (Kirby)

- . Distance between hind ocelli less than 2 times diameter of an ocellus; penis valve without middle ventral lobe, ventral apical corner round. Female unknown *C. minuta* (Smith)
22. Tegula black 23
- . Tegula white; metabasitarsus yellow brown in basal half and dark brown in apical half
..... *C. ryukyuensis* (Okutani)
23. Metabasitarsus entirely yellow brown; basal half of fore wing not darker than apical half 24
- . Metabasitarsus blackish in apical half; basal half of fore wing slightly darker than apical half
..... *C. formosana* (Rohwer)
24. Clypeus truncate at apex; hind femur black with narrow apical ring white; basal half of fore wing paler than apical half *C. sulciceps* Malaise
- . Clypeus distinctly emarginated; apical half of hind femur white; fore wing evenly infuscate
..... *C. rugafrons* (Benson)

Acknowledgements

Our cordial thanks are due to Dr. Andreas TAEGER of Senckenberg Deutsches Entomologisches Institut (DEI), Müncheberg, Germany for lending us the holotypes of *Anaepptamena horni* Forsius and *Nesoselandria formosana* Rohwer. We also much appreciate Dr. Toshiya HIROWATARI of Osaka Prefecture University, Japan and Dr. Akihiko SHINOHARA of National Museum of Nature and Science, Japan for searching for the type of *Nesoselandria melanopoda* Takeuchi. This work is supported by the National Natural Science Foundation of China (31970447) and GDAS Special Project of Science and Technology Development (2020GDASYL-20200102021, 2020GDASYL-20200301003).

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