



Neogergithoides, a new genus with a new species from China (Hemiptera: Issidae)

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Abstract

Neogergithoides **gen. nov.** is described from China with *N. tubercularis* **sp. nov.** as the type species. Morphological structures, male and female genitalia and female internal reproductive organs of the new species are described and illustrated. A key to genera of Hemisphaeriini is provided. The genus is compared to other superficially similar genera.

Key words: Taxonomy, Fulgoromorpha, *Gergithoides*, *Macrodaruma*, female internal reproductive organs

Introduction

Hemisphaeriini, originally a subfamily in the family Issidae, was established by Melichar (1906) and can be recognized easily by the following combination of characteristics: body hemispherical; head (including eyes) slightly narrower than pronotum, more or less produced; tegmen generally convex and thick, no claval suture and veins indistinct; hind wing developed or not, shorter than tegmen.

There are 11 genera of the Hemisphaeriinae recorded in Metcalf's catalogue (1958). Subsequently, the genus *Mithymna* Stål was transferred to the family Nogodinidae (Fennah, 1967). Hori (1969) designated *Gergithus iguchii* Matsumura as the type species of *Ishiharanus* Hori by body nitid in color, pronotum very short, and frons levigate. Che *et al.* (2007) suggested treating *Ishiharanus* Hori, 1969 as a junior synonym of *Gergithus*. Based on tapering vertex, frons tricarinate, pronotum with median and foliaceous lateral carinae, the genus *Macrodaruma* was established based on a single specimen from Vietnam by Fennah (1978). Chan & Yang (1994) split two genera, *Epyhemisphaerius* and *Euhemisphaerius*, from *Hemisphaerius*. Gnezdilov (2003) transferred *Pseudohemisphaerius* Melichar to the tribe. Zhang *et al.* (2006) established the genus *Choutagus* based on the special characters of the vertex, tegmen and male genitalia. The genus *Darumara* Matsumura, 1916 was considered as a synonym of *Gergithoides* Schumacher, 1915 by Gnezdilov (2009).

Currently, Hemisphaeriini is considered to comprise 12 genera, distributed in the Oriental and Palaearctic regions. In the present paper, a new genus and species, *Neogergithoides tubercularis* gen. & sp. nov. from China is described and illustrated within Hemisphaeriini. The 12 genera in Hemisphaeriini can be distinguished from one to another by the following key. The key is partly revised from Chan & Yang (1994), and illustrations of some species is provided.

Key to genera of Hemisphaeriini

1. Wing longer than half length of tegmen 2
- Wing shorter than half length of tegmen 7
2. Frons with median carina absent 3
- Frons with complete median carina 4
3. Frons smooth, without tubercles (Fig. 54) *Gergithus* Stål
- Frons finely rugose, with a row of tubercles along lateral margin (Fig. 48). *Mongoliana* Distant
4. Frons with complete median carina and lateral margin not elevated, with a row of tubercles along lateral margin (Fig. 45) ...
..... *Gergithoides* Schumacher

-.	Frons with median carina and lateral margin elevated without any tuberculus	5
5.	Vertex more or less triangular, tapering, with median and lateral carinae (Fig. 40)	<i>Choutagus</i> Zhang, Wang and Che
-.	Vertex nearly hexagonal, with median and lateral carinae or not	6
6.	Pronotum with median carina, anterior margin not elevated; spinal formula of hind leg 6–8–2 (Fig. 3)	<i>Neogergithoides</i> , gen. nov.
-.	Pronotum without median carina, anterior margin foliately elevated (Fig. 37); spinal formula of hind leg 6–10–2	<i>Macrodaruma</i> Fennah
7.	Frons with lateral margin almost right-angled at middle (Melichar, 1906, Fig. 15)	<i>Hysteropterissus</i> Melichar
-.	Frons with lateral margin not right-angled at middle (Fig. 51)	8
8.	Clypeus with median carina (Melichar, 1906, Fig. 16)	<i>Hysterosphaerius</i> Melichar
-.	Clypeus without median carina	9
9.	Fore and mid femora dilated (Melichar, 1906, Fig. 14; Metcalf, 1952)	<i>Hemiphile</i> Metcalf
-.	Fore and mid femora not dilated	10
10.	Clypeus at right angle to frons (Distant, 1906, Fig. 188)	<i>Hemisphaeroides</i> Melichar
-.	Clypeus at same plane as frons	11
11.	Aedeagus with 2 processes, suspensorium indistinct	12
-.	Aedeagus without process, suspensorium distinct	<i>Hemisphaerius</i> Schaum
12.	Pygofer in profile with hind margin distinctly angulated; phallobase asymmetrical at apex (Chan & Yang, 1994, Figs. 27–30)	<i>Euhemisphaerius</i> Chan et Yang
-.	Pygofer not distinctly angulated; phallobase symmetrical (Chan & Yang, 1994, Fig. 26)	<i>Epyhemisphaerius</i> Chan et Yang

Materials and Methods

Terminology mainly follows Bourgoin (1993) and Gnezdilov (2002). The genital segments of the examined specimens were macerated in 10% KOH and observed in glycerin jelly using a Leica MZ125 stereomicroscope. Photographs of the specimens were made using a Nikon SMZ1500 stereomicroscope with a Q-image CCD. Images were produced using the software Synoptics Automontage. All the specimens studied are deposited in the Entomological Museum of Northwest Agriculture and Forestry University (NWAUFU), Yangling, China.

Neogergithoides Sun, Meng & Wang, gen. nov.

Type species: *Neogergithoides tubercularis* sp. nov. by monotypy

Description. Body hemispherical. Head with eyes distinctly narrower than pronotum. Vertex more or less hexagonal, tricarinate, 1.7 times longer than broad, anterior margin weakly convex at middle, posterior margin shallowly emarginate, disc depressed. Frons smooth, 1.8 times longer than broad, anteriorly truncate and moderately produced above eyes, slightly convex and narrowed towards clypeus, disk elevated with median carina; lateral margin clearly carinated. Clypeus elongate and triangulate, strongly elevated at disc, median carina present. Rostrum long, reaching post-trochanters. Eyes oval, ocelli present. Pronotum short, about half of vertex in mid-line, anterior margin convex onwards between eyes, with two central pits at disc, median carina present or obsolete, posterior margin elevated. Mesonotum more or less triangular with median and lateral carinae, with two pits along each lateral margin. Tegula small. Tegmen longer than broad, semicoriaceous and without claval suture, approximately 2.0 times longer in midline than wide at widest part, veins distinct and reticulate. Wing translucent, veins distinct and netlike, longer than half length of tegmen. Legs moderately long, not dilated; lateral margin of hind tibia with two teeth. Spinal formula of hind leg 6–9–2.

Male genitalia. Anal segment in dorsal view mushroom-shaped. Pygofer in profile with dorsolateral angles strongly produced. Aedeagus slightly curved downward medially, with dorsal, lateral and ventral lobes, two short sword-like processes near middle. Genital styles in lateral view subtriangular, caudo-ventral angle rounded. Capitulum of style, in dorsal view, with two obtuse apical processes, and large lateral tooth.

Female genitalia. Sternite VII with apical margin distinctly convex at middle. Anal segment in dorsal view oval-like. Anterior connective laminae of gonapophysis VIII nearly quadrilateral, with three nearly parallel teeth at apical margin; lateral margin with three small teeth with carinae at apex. Posterior connective laminae of gonapophyses IX nearly square in lateral view, lateral fields flat, median field wide and single. Gonoplac nearly quadrilateral, in dorsal view, fused at base and forked at apical half along dorsal margin.

Remarks. The new genus is placed into the tribe Hemisphaeriini by the following combination of characteristics: body hemispherical; head with eyes narrower than pronotum; tegmen coriaceous and relatively thick, without claval suture; wing developed, and shorter than tegmen; lateral margin of hind tibia with two teeth.

This new genus resembles *Gergithoides* Schumacher but differs from the latter by the following characters: 1) ocelli present, absent in *Gergithoides*; 2) vertex with tricarinate, about 1.7 times longer than wide, in *Gergithoides*, vertex with median carina or not, almost as long at base as wide in middle line; 3) frons without any tubercle and elevated at disc, posterior margin of pronotum with indistinct tubercles, in *Gergithoides*, frons with numerous tubercles along lateral margin and flat at disc, anterior and posterior margin of pronotum with distinct tubercles; 4) tegmen with a brown stripe along black anterior and apical margins, and anterior margin moderately convex at one third of base, *Gergithoides* without such stripe and anterior margin arc; 5) aedeagus with two short sword-like processes in basal half, *Gergithoides* with two processes at apical half.

This new genus is also similar to *Macrodaruma* Fennah, but can be separated from the latter by the following characters: 1) vertex more or less hexagonal, slightly produced, in *Macrodaruma*, vertex almost trapezoidal and strongly produced, tapering; 2) pronotum with indistinct median carina, absent in *Macrodaruma*; 3) frons with lateral margin elevated, in *Macrodaruma*, lateral margin flat; 4) aedeagus with two short sword-like processes apex directed dorsally near middle, the *Macrodaruma* with two short processes apex directed basally at base.

The similarity of some characters of the new genus, particularly the presence of the median carina on the frons, indicates that it is probably closer to *Gergithoides*, *Macrodaruma*, *Mongoliana* and *Choutagus* than other genera in the subfamily Hemisphaeriini, but it needs to be verified based on further phylogenetic research by using molecular and morphologic data as well.

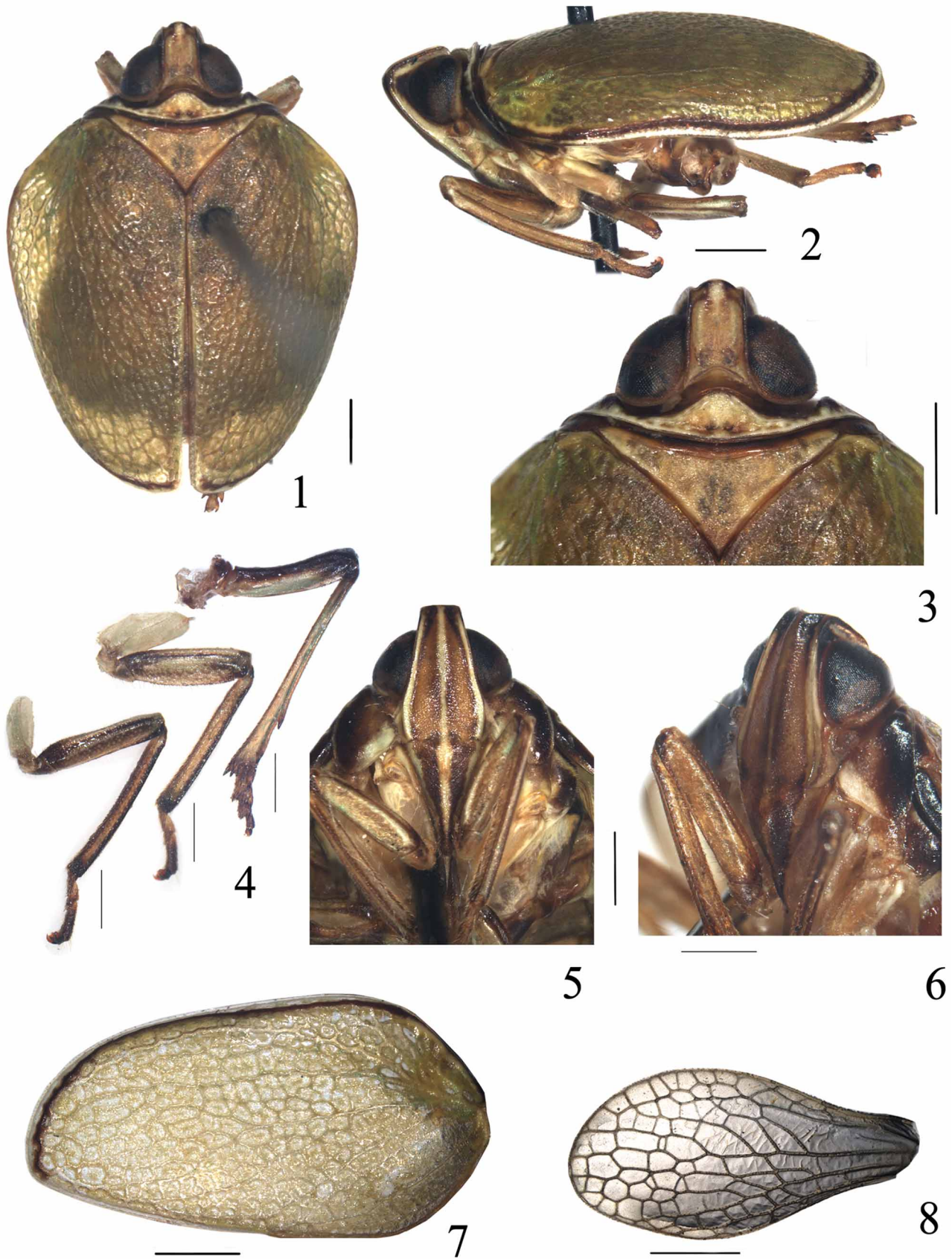
Etymology. The generic name “*Neogergithoides*” refers to the strong resemblance to *Gergithoides*. The genus is feminine in gender.

Neogergithoides tubercularis, sp. nov.

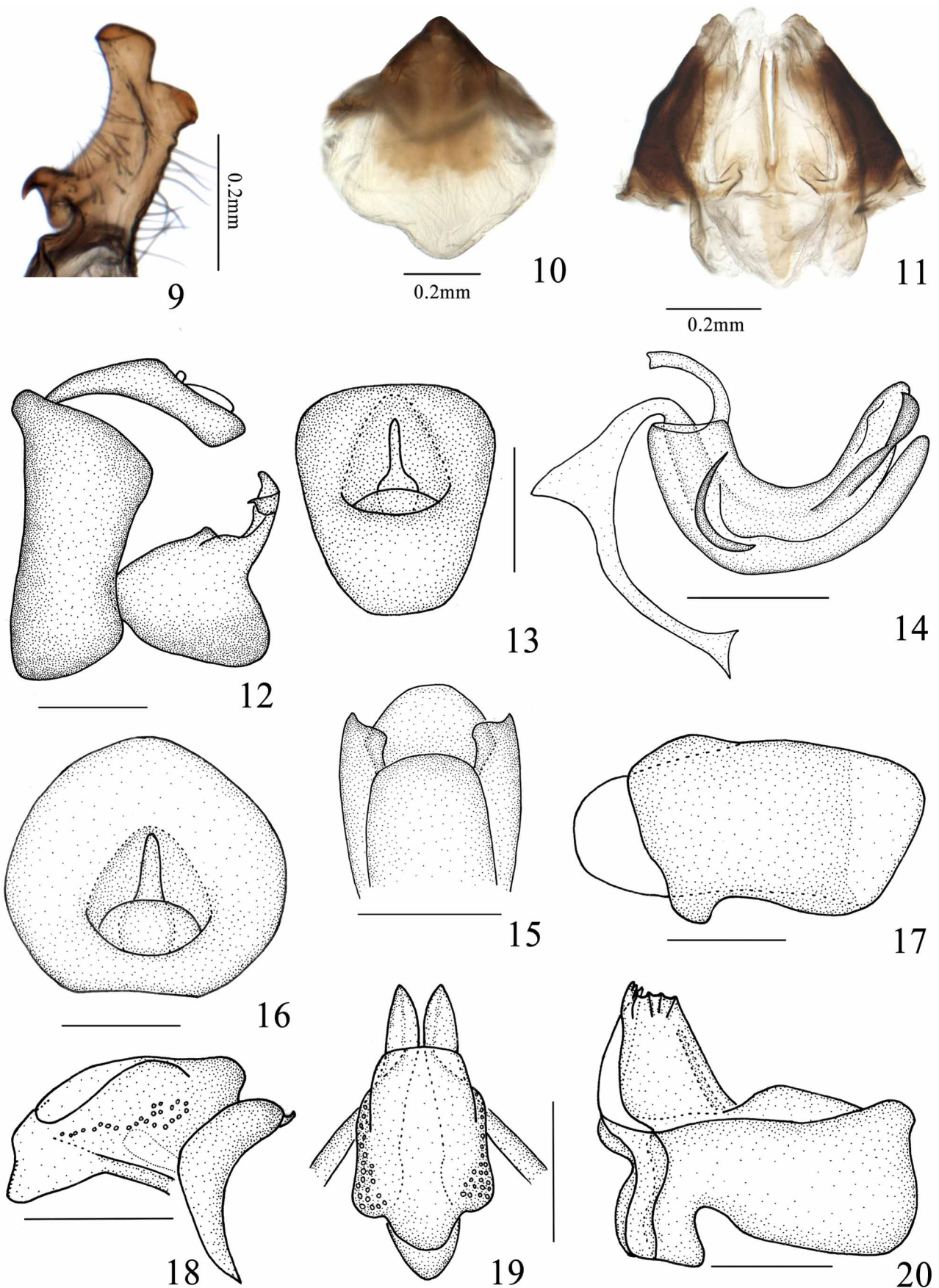
Description. Length, male (including tegmen): 7.6–8.0 mm, length of tegmen: 5.7–6.2 mm; female (including tegmen): 8.5–9.1 mm, length of tegmen: 6.3–7.0 mm.

Body flavovirens (Fig. 1). Vertex alutaceous, with opalescent big quadrate blotch at middle of apical margin and two small irregular fuscous spots near posterior margin, lateral carinae pale greenish (Figs. 1, 3). Genae and outer sides of head pallide-flavens; small fusco-piceous subtriangular blotch on each side of head before eyes (Fig. 2). Frons fuscous with base black, median carina and lateral margin pale flavovirens. Clypeus fusco-piceous with a broad stramineous median carina; lateral margin pale flavovirens or sometimes viridescent. Rostrum fuscous (Fig. 5). Antennae fusco-testaceous with a small black spot on preapical surface of second segment. Ocelli testaceous (Fig. 6). Eyes pitchy (Figs. 2, 3). Pronotum yellowish green with two piceous maculae at mid of posterior margin; anterior margin fusco-rufous, posterior margin canescent with some small fuscous spots. Mesonotum testaceous with some black maculae or spots (Fig. 3). Tegmen pale flavovirens, costal margin ivory, with one narrow pitchy stripe from costal margin to outer margin (Fig. 7). Wing fumatus, veins blackish brown (Fig. 8). Leg flavotestaceous with suffusion greenish, hind femora dark fuscous, fore- and mesofemora with black stripes, fore-, meso- and hind tibiae with black stripes (Fig. 4). Abdomen pale brown, and apex of each segment pale flavovirens.

Vertex with disc depressed, about 0.6 time wider at apex than long in midline, minute transverse wrinkles scattered at disc, median carina complete, lateral margin distinctly carinated (Fig. 3). Frons elevated at disc with median carina, glossy, 2.0 times wider at widest part near apex than at base, 1.8 times longer at midline than broad at widest part. Clypeus distinctly elevated, median carina distinct. Rostrum long, reaching post-trochanters, last segment slightly shorter than penultimate (Fig. 5). Antennae comparatively short, scape annular, pedicel subglobose with numerous tuberculiform sensory pores. Pronotum with numerous pustules or small tubercles along posterior margin. Mesonotum broad, 2.5 times wider at widest part than long at midline, median carina only distinct on anterior half, with some small depressed tubercles (Fig. 3). Tegmen nearly elliptical, 2.2 times longer than broad at widest part, costal margin moderately convex at one third of base; longitudinal veins prominent, with much supernumerary forkings and numerous irregular transverse veinlets (Fig. 7). Wing relatively elongate, about 0.9 time length of tegmen. Spinal formula of posterior leg 6–9–2.



FIGURES 1–8 *Neogergithoides tubercularis* sp. nov. Male 1. holotype, dorsal view; 2. same, lateral view; 3. head and thorax, dorsal view; 4. fore-, meso-, hind legs; 5. frons and clypeus, ventral view; 6. frons and clypeus, lateral view; 7. tegmen; 8. wing. Scale bars= 1 mm.



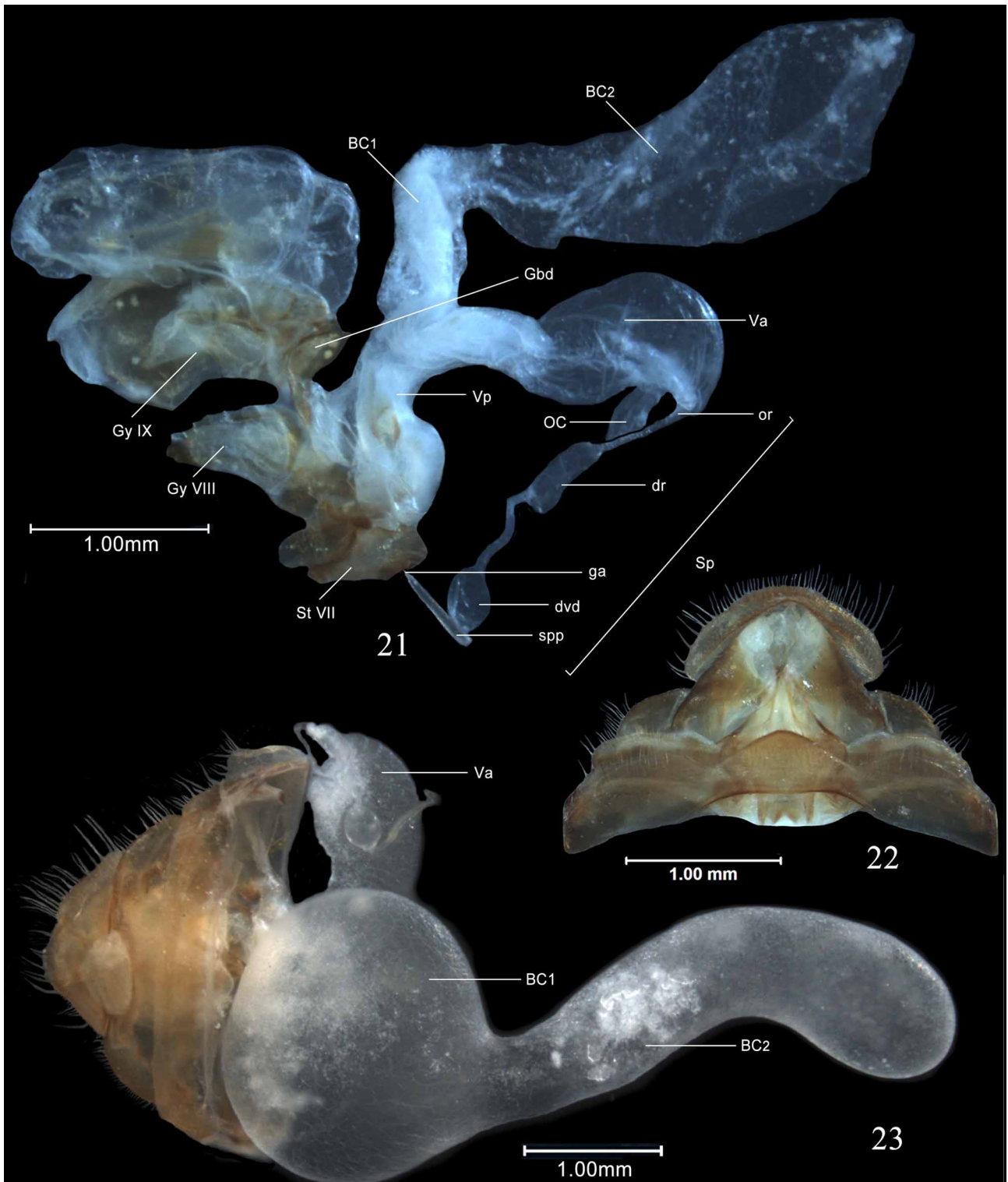
FIGURES 9–20 *Neogergithoides tubercularis* sp. nov. 9. capitulum, dorsal view; 10. gonaspiculum bridge, dorsal view; 11. gonoplace, dorsal view; 12. male genitalia, left side; 13. male anal segment, dorsal view; 14. aedeagus, left side; 15. apex of aedeagus, ventral view; 16. female anal segment, dorsal view; 17. gonoplace, right side; 18. gonapophyses IX, right side; 19. gonapophyses IX, dorsal view; 20. gonapophysis VIII, right side. Scale bars = 0.5 mm.

Male genitalia. Anal segment in dorsal view mushroom-shaped, widest near apex, with apical margin slightly convex at middle and lateral margin strongly convex near apex; anal foramen near middle (Fig. 13). Pygofer in lateral view with dorsal margin oblique, ventral margin relatively straight, dorsolateral angles strongly roundly produced caudad, posterior margin moderately concave in basal half and anterior margin slightly concave in dorsal half (Fig. 12). Aedeagus slightly curved downward medially, with a pair of short sword-like processes near middle, dorsal lobe with apical margin strongly convex at middle, two angles rounded; lateral lobes sword-like with apex tapering; ventral lobe lamellate with apical margin nearly straight (Figs. 14, 15). Genital styles (Fig. 12) in profile nearly triangular, apical margin concave, caudo-ventral angle rounded, with one longitudinal carina between dorsal and apical margins, dorsal margin with one large tubercular process at middle. Capitulum of style, in dorsal view, longer than wide, with two obtuse apical processes, and large lateral tooth (Fig. 9).

Female genitalia. Sternite VII with apical margin distinctly convex at middle (Fig. 22). Anal segment in dorsal view oval, with apical margin distinctly produced and lateral margin rounded; anal foramen in basal half (Fig. 16). Gonocoxa VIII nearly quadrilateral (Fig. 20); anterior connective laminae of gonapophysis VIII nearly quadrate, apical margin with 3 nearly parallel teeth, lateral margin with 3 small teeth (Fig. 20); endogonocoxal lobe strongly sclerotized, crescentic in ventral view; endogonocoxal process foliate and membranous. Proximal part of posterior connective lamina of gonapophyses IX slightly convex in lateral view, distal parts of posterior connective laminae of gonapophyses IX arched, lateral fields flat, median field membranous with wide single lobe (Figs. 18, 19); gonospiculum bridge situated at base of gonapophyses IX, apex angled in lateral view (Fig. 18), in dorsal view basal margin angled, apical margin convex and transparent (Fig. 10). Gonoplacs strongly elevated and sclerotized at middle, in dorsal view transparent and membranous at base, fused at base and forked at apical half along dorsal margin (Fig. 11); in profile nearly rectangle, anterior margin membranous and oblique, posterior margin concave at ventral half, dorsal and ventral margins almost straight (Fig. 17).

Bursa copulatrix (BC) membranous with two connected pouches (BC1 & BC2) (bursa copulatrix constricted medially forming two pouches), opening directly into posterior vagina (Vp), first pouch (BC1) orbiculate, wall with visible cells, second one (BC2) saccular and long, without any ornamentation on wall. Vagina much thicker and elongate with posterior and anterior vagina, posterior vagina relatively short. Oviductus communis (OC) slender at base, slightly swollen at apex. Spermatheca (Sp) well-developed with five parts: orificium receptaculi (or), ductus receptaculi (dr), diverticulum ductus (dvd), spermathecal pump (spp) and glandula apicalis (ga). Orificium receptaculi correspondingly robust and short. Ductus receptaculi thin and elongate, strongly intumescent and sacculated at middle, with long and smooth ductus at basal and apical part. Diverticulum ductus orbiculate and extending off from tip of ductus receptaculi, followed by spermathecal pump slender and tubular; two glandula apicalis slender at apex of spermathecal pump (Figs. 21, 23).

Material examined. Holotype: male, China, **Hainan Province**, Diaoluoshan Mountain, 1 June 2007, coll. Yinglun Wang & Qing Zhai. Paratypes: 1 male, China, **Hainan Province**, Wuzhishan Mountain, 15 May 1963, coll. Io Chou; 1 female, China, **Guangxi Zhuang Autonomous Region**, Huaping, 7 June 1963, collector unknown. 1 male, 28 March 1964, coll. Sikong Liu; 2 males, 1 May 1965, coll. Sikong Liu; 1 female, 9 May 1984, coll. Youdong Lin; 1 male, 2 females, 29 May 2007, 29 May 2007, coll. Yinglun Wang & Qing Zhai; 2 males, 3 females, 1 June 2007, coll. Yinglun Wang & Qing Zhai; 1 male, 26 May 2008, coll. Qiulei Men; 3 males, 1 female, N18°43.664', E109°52.704', 948m, 6 August 2010, coll. Guo Zheng, China, **Hainan Province**, Diaoluoshan Mountain. 1 male, 1 female, 10 April 1980, coll. Jiang Xiong; 1 female, 23 May 1981, coll. Zhiqing Chen; 1 female, 24 March 1982, coll. same; 1 male, 20 April 1982, coll. same; 1 male, 1 female, 17 May 1984, coll. same; 1 female, 2 December 1981, coll. Maobin Gu; 2 males, 21 April 1983, coll. same; 1 male, 1 female, 15 July 1981, coll. Yuanfu Liu; 1 female, 6 July 1982, coll. Lizhong Hua; 1 male, 28 July 1983, coll. same; 1 male, 15 May 1984, coll. Youdong Lin; 1 male, 3 females, 6 June 2007, coll. Yinglun Wang & Qing Zhai; 41 males, 41 females, N18°44.026', E108°52.460', 975m, 15 August 2010, coll. Guo Zheng; 19 males, 14 females, N18°44.727', E108°59.632', 235m, 17 August 2010, coll. Guo Zheng; 32 males, 42 females, N18°44.658', E108°50.435', 1017m, 18 August 2010, coll. Guo Zheng, China, **Hainan Province**, Jianfengling Mountain. 1 male, China, **Hainan Province**, Bawangling Mountain, 28 May 2007, coll. Yinglun Wang & Qing Zhai; 4 females, same, 10 June 2007, coll. same; 1 female, China, **Hainan Province**, Limuling Mountain, 19 April 2008, coll. Qiulei Men; 48 males, 32 females, China, **Hainan Province**, Yinggeling Mountain (Yinggezui), N19°02.884', E109°33.529', 797m, 20 August 2010, coll. Guo Zheng.



FIGURES 21–23 *Neogergithoides tubercularis* sp. nov. 21. female internal reproductive organs, right side; 22. female genitalia, ventral view; 23. female internal reproductive organs, dorsal view.

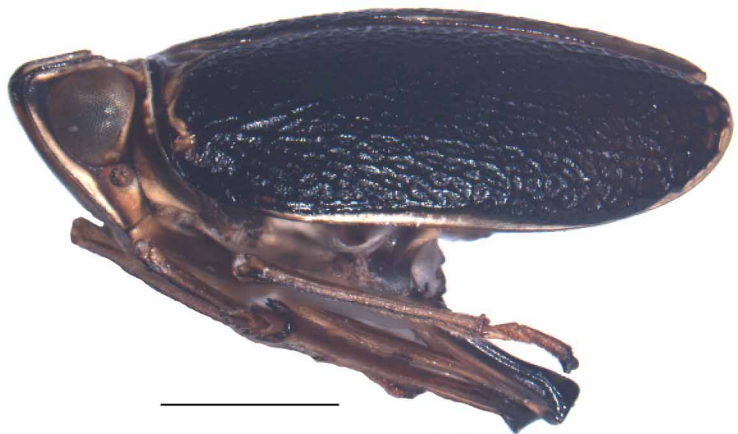
BC1, BC2: two pouches of bursa copulatrix; dr: ductus receptaculi; dvd: diverticulum ductus; ga: glandula apicalis; Gbd: gonospiculum bridge; Gy VIII: gonapophysis VIII; Gy IX: gonapophyses IX; OC: oviductus communis; or: orificium receptaculi; Sp: spermatheca; spp: spermathecal pump; St VII: sternite VII; Va: anterior vagina; Vp: posterior vagina.

Additional material. 3 females, China, **Hainan Province**, Yinggeling Mountain (Yinggezui), N19°03.047', E109°33.782', 678m, 21 August 2010, coll. Guo Zheng.

Distribution. China (Hainan, Guangxi).



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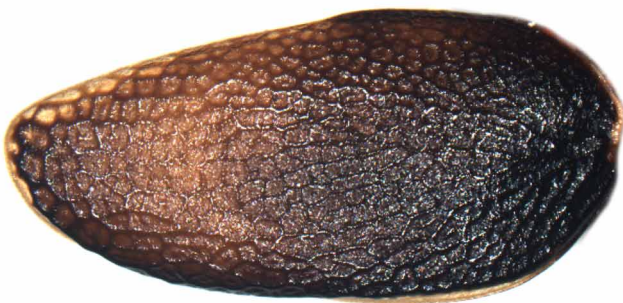
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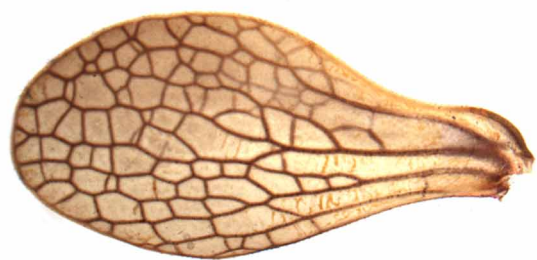
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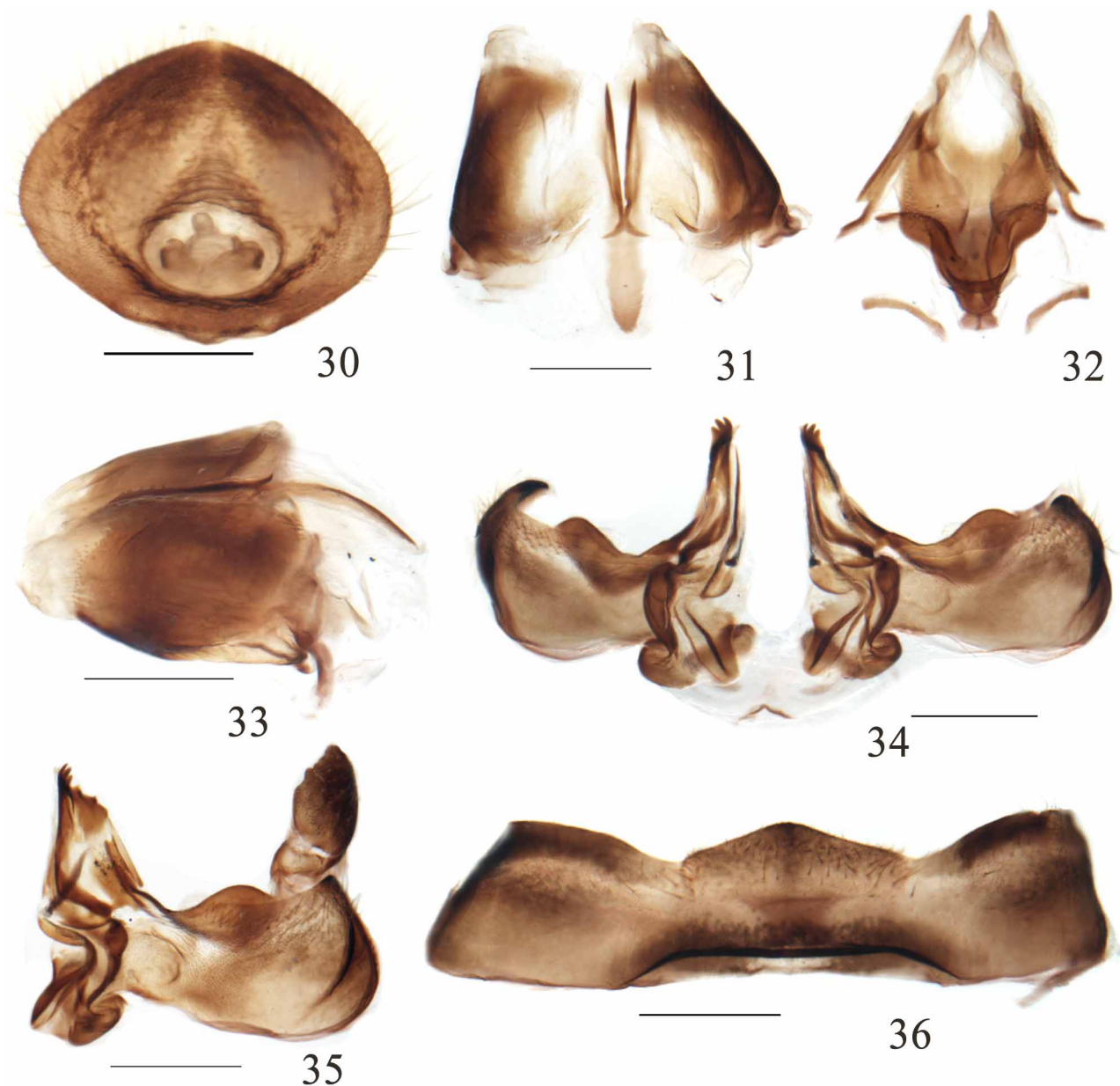


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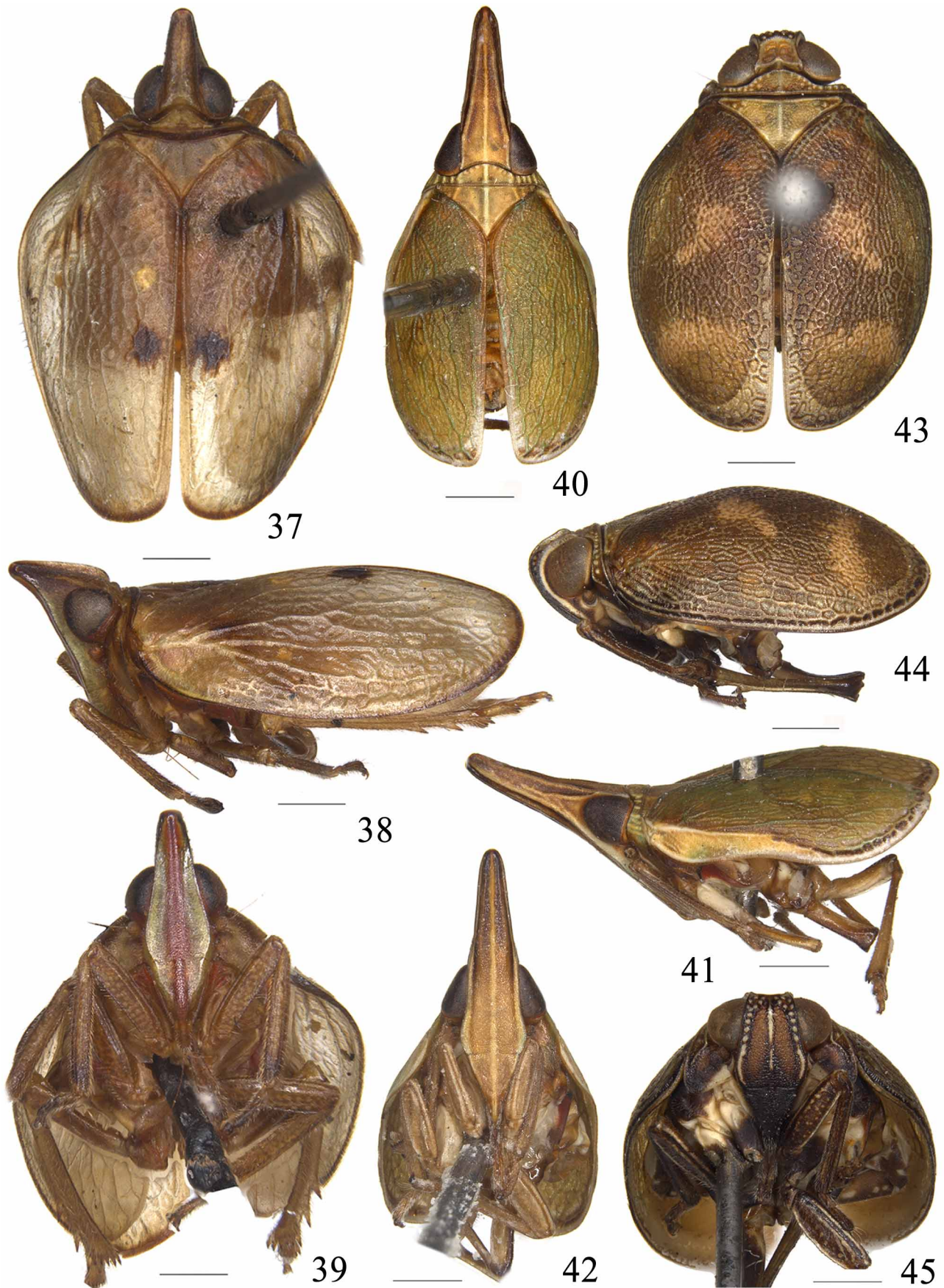
FIGURES 24–29 additional material with variation Female 24. dorsal view; 25. lateral view; 26. head and thorax, dorsal view; 27. frons and clypeus, ventral view; 28. tegmen; 29. wing. Scale bars = 2 mm



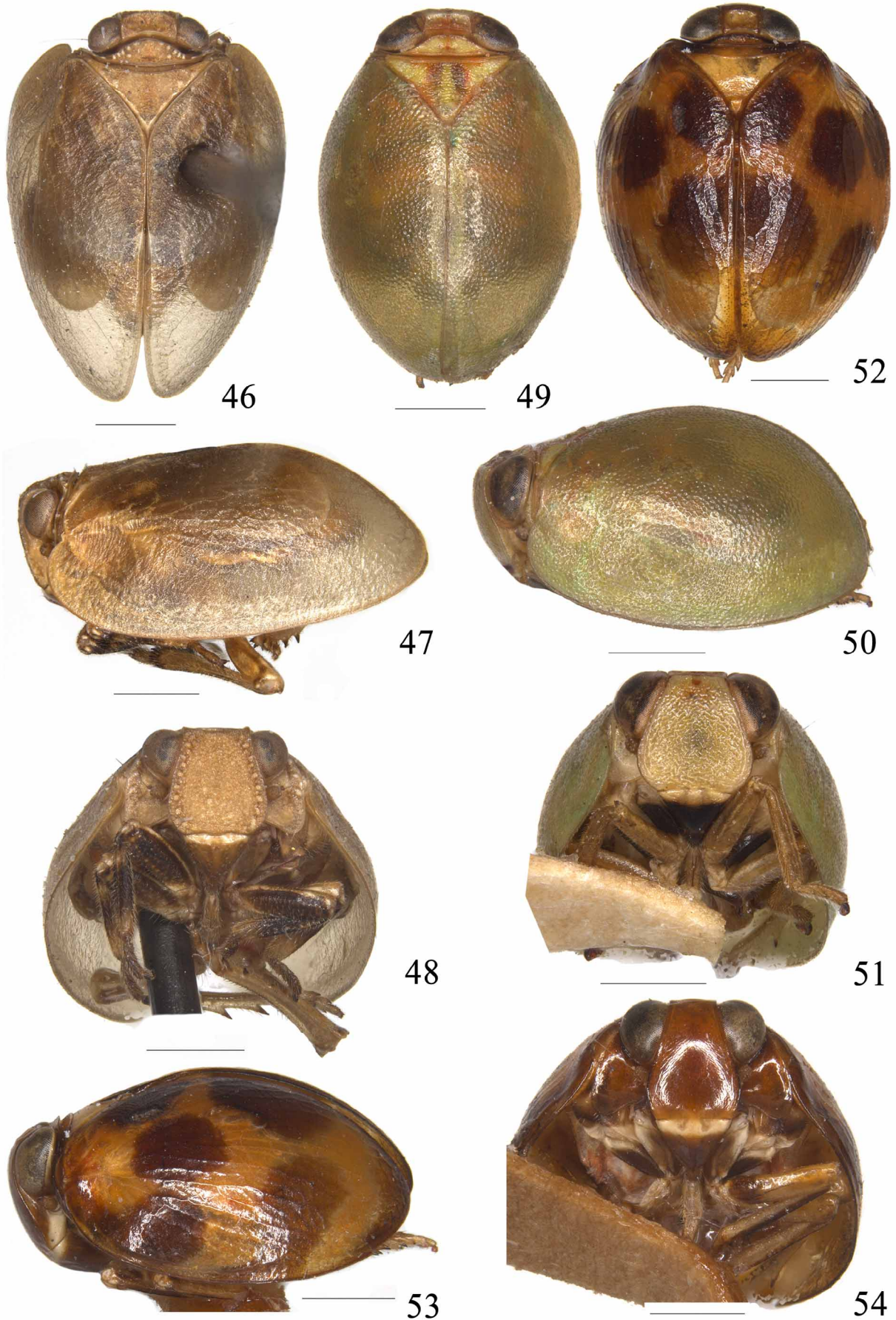
FIGURES 30–36 additional material with variation. 30. anal segment, dorsal view; 31. gonopods, dorsal view; 32. gonapophyses IX, dorsal view; 33. gonopods, left side; 34. gonapophysis VIII, ventral view; 35. gonapophysis VIII, right side; 36. sternite VII, ventral view. Scale bars = 0.5 mm

Remarks. The new species resembles *Gergithoides carinatifrons* Schumacher, 1915 (Figs. 43–45), but it can be distinguished by: 1) ocelli present, absent in *Gergithoides carinatifrons*; 2) vertex 1.7 times longer than broad, in *Gergithoides carinatifrons*, 1.2 times longer than wide in midline; 3) frons elevated at disc and smooth, clypeus with distinct median carina, in *Gergithoides carinatifrons*, frons plain and coarse, with a row of particles along apical margin and lateral margin at apical half, clypeus without median carina; 4) tegmen with a brown stripe along anterior and apical margins, and anterior margin moderately convex at one third of base, *Gergithoides carinatifrons* without such stripe and anterior margin arc; 5) genital style with one tubercular process at middle of dorsal margin, capitulum of style with two obtuse apical processes, style without any tubercular process and capitulum of style angulate at apex in *Gergithoides carinatifrons*.

The new species is also similar to *Macrodaruma pertinax* Fennah, 1978 (Figs. 37–39), but can be separated from the latter by the following characters: 1) vertex more or less hexagonal and slightly produced, vertex of *Macrodaruma pertinax* longer than broad and strongly produced, tapering and almost awl-shaped; 2) pronotum with median carina, anterior margin not elevated, in *Macrodaruma pertinax*, median carina absent, and anterior margin



FIGURES 37–45 37. *Macrodaruma pertinax* Fennah, female, dorsal view; 38. same, lateral view; 39. same, ventral view; 40. *Choutagus longicephalus* Zhang, Wang and Che, male, dorsal view; 41. same, lateral view; 42. same, ventral view; 43. *Gerghithoides carinatifrons* Schumacher, male, dorsal view; 44. same, lateral view; 45. same, ventral view. Scale bars = 1 mm



FIGURES 46–54 46. *Mongoliana chilochorides* (Walker), male, dorsal view; 47. same, lateral view; 48. same, ventral view; 49. *Hemisphaerius lysanias* Fennah, male, dorsal view; 50. same, lateral view; 51. same, ventral view; 52. *Gergithus iguchii* Matsumura, male, dorsal view; 53. same, lateral view; 54. same, ventral view. Scale bars = 1 mm

foliately elevated; 3) median carina and lateral margins of frons pale brown, and lateral margins elevated, median carina in *Macrodaruma pertinax* red, and lateral margins not elevated; 4) genital style with one tubercular process at middle of dorsal margin, but *Macrodaruma pertinax* absent.

Discussion

The genus is known from Guangxi Zhuang Autonomous Region and Hainan Province, South China, with an altitude from 650m to 1200m. *Neogergithoides tubercularis* could be the dominant species of Hemisphaeriini in Hainan Province, as it is very common in the nature reserves.

The three females (see additional material) are temporarily placed in *Neogergithoides tubercularis* **sp. n.** here, as they match the types with respect to almost all features except the darkened color (nearly black) (Figs. 24–36). However, the identity of this material needs to be studied further when more specimens become available.

Acknowledgements

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