

Research article

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A new genus of Clinocerinae (Diptera: Empididae) from Taiwan and Yunnan (China)

Toyohi Saigusa ¹ & Bradley J. Sinclair ^{2,*}

¹17-1-402 Baikoen 2-chome, Chuo-ku, Fukuoka-shi 810-0035, Japan

²Canadian National Collection of Insects & Canadian Food Inspection Agency, OPL-Entomology, K.W. Neatby Bldg., C.E.F.,
960 Carling Ave., Ottawa, ON, Canada K1A 0C6

*Corresponding author: Email: bradley.sinclair@inspection.gc.ca

¹[urn:lsid:zoobank.org:author:390F7B16-1B9D-419F-B0CD-F3279B89DF1D](https://zoobank.org/author:390F7B16-1B9D-419F-B0CD-F3279B89DF1D)

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Abstract. A new genus of Clinocerinae (Diptera: Empididae), *Asioclinocera* gen. nov. and two new species, *A. formosana* gen. et sp. nov. and *A. yunnanica* gen. et sp. nov., are described from Taiwan and Yunnan (China), respectively. An updated key to Palaearctic genera of Clinocerinae is provided and the phylogenetic affinities of the new genus are discussed.

Key words. Aquatic dance flies, new species, description, generic key.

INTRODUCTION

The Clinocerinae Melander, 1928 is a subfamily of aquatic dance flies (Diptera: Empididae), with adults frequently encountered in seeps, streams and rivers worldwide (Sinclair 1995). The genera are distinguished by: narrow wings; non-raptorial fore legs; broad, sucker-like labella; stout, erect costal setae; and upcurved male terminalia (Sinclair 1995). In the Northern Hemisphere there are 14 recorded genera, with *Hypenella* Collin, 1941 and *Rhyacodomia* Saigusa, 1986 restricted to eastern Asia (Saigusa 1986; Sinclair 1995). In recent years, odd new species of clinocerines were identified from Yunnan (China) and Taiwan. These species are distinct from other clinocerines, characterized by long slender arista-like stylus (usually strong, shorter than head), convex labrum (usually flattened), elongate radial fork (branching of vein R_{4+5} usually short), unmodified female terminalia (some genera with acanthophorites) and distinctive male terminalia (phallus usually elongate and separated).

In this study, we describe these specimens as a new genus, recognizing two new species. In addition, the phylogenetic affinities are discussed and an updated identification key to the Palaearctic genera of Clinocerinae is provided.

MATERIAL AND METHODS

This study is based on material deposited in the following institutions: Biosystematics Laboratory, Kyushu Univer-

sity, Fukuoka, Japan (KUMF); and Canadian National Collection of Insects, Ottawa, Canada (CNC). Label data for primary types are cited from the top downward, with the data from each label in quotation marks. Labels are cited in full, with original spelling, punctuation, and date, and label lines are delimited by a slash (/). The repository of each type is given in parentheses. Secondary type data are abridged and listed alphabetically.

Methods used in specimen preparation follow that of Sinclair (1994, 1995) and Saigusa & Sinclair (2016). Photographs were taken with a Leica camera model DFC5400 using Leica Application Suite X. The distribution map was created with SimpleMapp (Shorthouse 2010). Terms used for adult structures follow those of Cumming & Wood (2017).

RESULTS

Taxonomy

Asioclinocera gen. nov.

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Figs 1–10

Type-species

A. yunnanica gen. et sp. nov.

Diagnosis. This new genus is distinguished from all other genera of Clinocerinae by the following combination of characters: elongate, filamentous arista-like stylus, face

with deep cleft and ridge, labrum convex, radial fork elongate with vein R_{4+5} branching near apex of cell dm and cell r_4 about one-third length of wing, apical fifth of fore femur with spur-like anteroventral seta, male tergum 8 greatly narrowed medially and broadly plate-like laterally, and phallus broadly attached to hypandrium with large ejaculatory apodeme.

Etymology. The generic name is derived from Asia, referring to its distribution, and *Clinocera* Meigen, 1803, a related genus. The gender is feminine.

Description. Eye with dense ommatrichia. Arista-like stylus very slender and long, about as long as head height (Fig. 2). Face with median ridge on lower half. Gena divided by frontoclypeal suture extending from palpus to lower margin of eye. Mouthparts with labrum convex (Fig. 2); labellum sucker-like, without pseudotracheae. Fore femur with preapical anteroventral spine-like seta, slightly shorter than width of femur (Fig. 2); without subapical anterior comb, only cluster of short stiff setae; anteroventral and posteroventral rows of slender short setae (Fig. 5). Fore tibia with anteroventral row of short stout setae (Fig. 5). Tarsomere 5 without apical prolongation. Hind tibia with distinct anteroventral seta on apical third (Fig. 1). Scutum with long dorsocentral setae (Fig. 5); without acrostichal setae; notopleuron with weak anterior seta and strong posterior seta; scutellar setae very closely approximated at apex (width of anterior ocellus); laterotergite with setae; dorsal mesepimeral pocket present. Wing with basal costal seta; without pterostigma (Fig. 3); Sc complete; costa circumambient with strong, erect setae beyond R_1 ; R_1 ends before middle of wing; elongate cell dm; radial fork very long, arising near apex of cell dm; R_4 slightly arched to straight and divergent from R_5 ; cell r_4 about one-third length of wing; cell cua narrow, with truncate apical margin. Female abdomen telescopic, apparently unmodified, with cerci of *A. yunnanica* (unknown for *formosana*) short, shiny, sharply pointed (not dissected). Male terminalia (Figs 6–7) with setae of cercal plate not confined to small region (Fig. 8); phallus without distiphallus; base of phallus and hypandrium expanded; male tergum 8 narrow with inflated lateral margin bearing many setae (Fig. 9).

Distribution. This new genus is currently known from Taiwan and the Chinese province of Yunnan (Fig. 10).

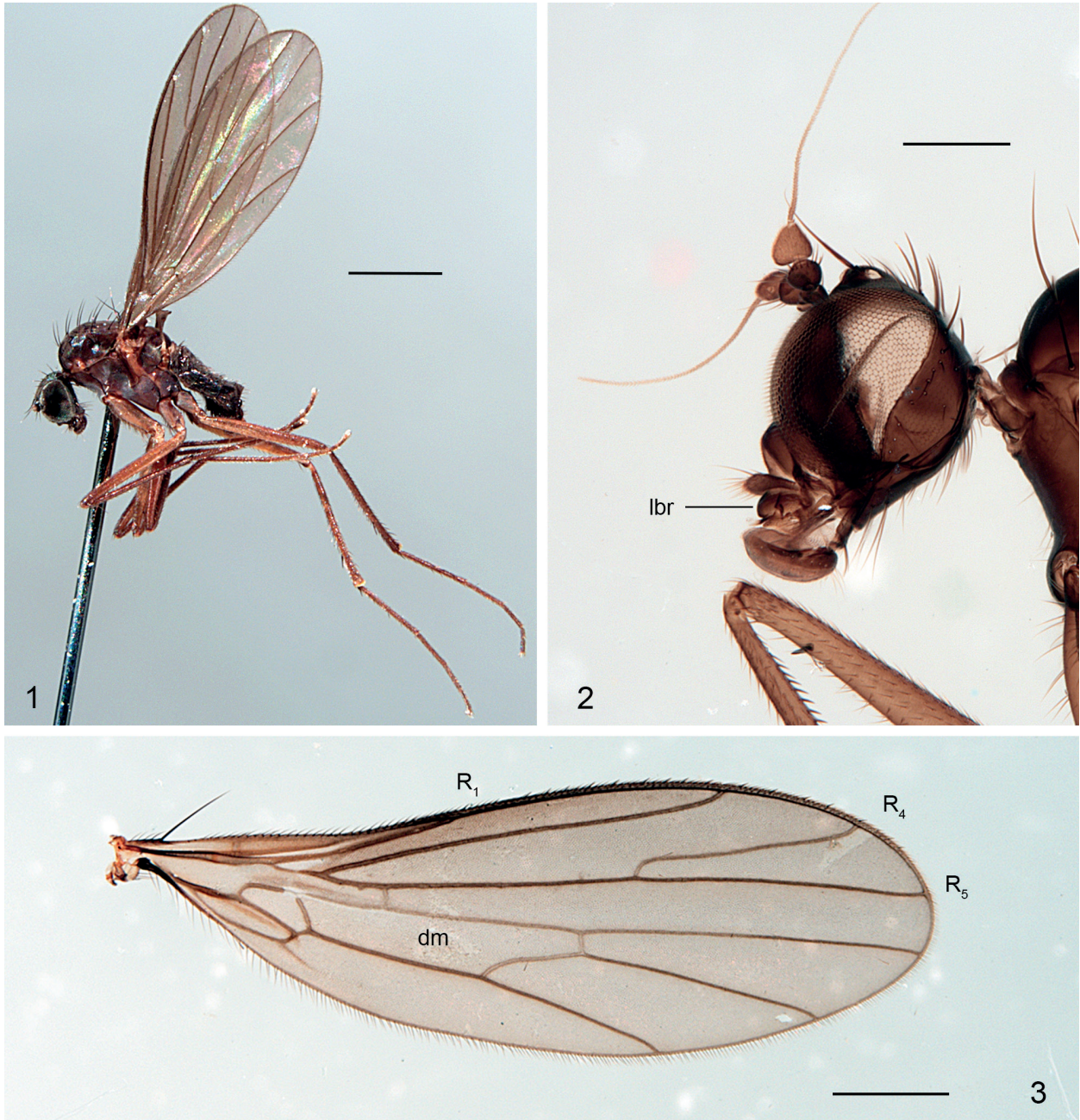
Remarks. This new genus of Clinocerinae appears to be most similar to *Rhyacodromia* on the basis of the convex-shaped labrum and spine-like setae on the fore femur. The convex labrum is a rather unique character within Clinocerinae and previously considered a synapomorphy of the clade *Rhyacodromia* + *Trichoclinocera* Collin, 1941 (Sinclair 1995, character 25). However, the male terminalia distinctly differ between *Rhyacodromia* and *Asioclinocera* gen. nov., specifically the connection of phallobase and hypandrium is unique in the former genus (anterolateral corner of hypandrium has unique one-point articulation with the anteroventral corner of epandrium

and posterolateral corner of sternum 7 (Saigusa 1986: fig. 9; Sinclair 1995: fig. 15)), whereas the connection in *Asioclinocera* gen. nov. is similar to *Clinocera* and *Wiedemannia* Zetterstedt, 1838; the surstylus is widely connected with the distal margin of the epandrium in *Rhyacodromia* compared to the narrow connection with the epandrium in *Asioclinocera* gen. nov.; and tergum 7 bears a denticulate posterior swelling in *Rhyacodromia* and is unmodified in *Asioclinocera* gen. nov. The new genus is further distinguished in the following identification key.

Key to Palearctic genera of Clinocerinae

1. Sc evanescent apically (Sinclair 1995: fig. 64)
..... *Proclinopyga* Melander
– Sc complete, reaching costal vein 2
2. R_1 with macrotrichia arising from dorsal surface (Saigusa & Sinclair 2021: fig. 40)
..... *Trichoclinocera* Collin
– R_1 without macrotrichia 3
3. Proboscis as long as height of head; labrum long and blade-like, extending length of proboscis; labellum narrow, not sucker-like (Sinclair 1995: fig. 58)
..... *Roederiodes* Coquillett
– Proboscis shorter than height of head; labrum short, subtriangular, encircled by large sucker-like labellum 4
4. Gena divided by frontoclypeal suture extending from palpus to lower margin of eye (Sinclair 1995: fig. 60) 5
– Gena divided by frontoclypeal suture extending from palpus to facial ridge (Sinclair 1995: fig. 59) 11
5. Neck arising high on occiput; head usually narrow, extending obliquely forward (Sinclair 1995: fig. 60); wing usually with circular white spots (Sinclair 1995: fig. 69) *Dolichocephala* Macquart
– Neck arising near centre of occiput; head hypognathous; wing without circular white spots .. 6
6. R_{4+5} forked distal to apex of R_{2+3} (Smith 1965: fig. 53) *Rhyacodromia* Saigusa
– R_{4+5} forked proximal to apex of R_{2+3} 7
7. Arista-like stylus very slender, about as long as head height (Fig. 2); apical scutellar setae closely approximated; radial fork arising near apex of cell dm, with cell r_4 nearly one-third length of wing (Fig. 3) *Asioclinocera* gen. nov.
– Arista-like stylus usually thickened, shorter than height of head (Sinclair 1995: fig. 57); apical scutellar setae widely separated; radial fork arising well distant of cell dm, with cell r_4 nearly one-fifth length of wing (Sinclair 1995: fig. 67) 8
8. Lower margin of face entire, without median notch and ridge; phallus with non-articulated apical filament or distiphallus (Sinclair 1995: fig. 21); female abdomen attenuated *Clinocera* Meigen

- Lower margin of face with notch; if notch lacking, phallus with biarticulated distiphallus (Sinclair 1995: fig. 49) and female abdomen truncate (e.g., *Bergenstammia nudipes* (Loew, 1858)) 9
- 9. Face with setulae along inner margin of eye *Kowarzia* Mik
- Face lacking setulae along inner margin of eye ... 10
- 10. Pulvilli vestigial and empodia reduced, length less than one-third length of tarsal claws *Bergenstammia* Mik
- Pulvilli and empodia well developed and pad-like, at least as long as tarsal claws *Phaeobalia* Mik
- 11. Clypeus prominent and clearly separated from face (Sinclair 1995: fig. 59) *Hypenella* Collin
- Clypeus not prominent or separated from face 12



Figs 1–3. *Asioclinocera formosana* gen. et sp. nov., lateral view. **1.** Habitus. **2.** Head, antennae and fore leg, cleared specimen. **3.** Wing. Scale bars: 1 = 1.0 mm; 2 = 0.25 mm; 3 = 0.3 mm. Abbreviations: dm = discal medial cell; lbr = labrum; R_1 = anterior branch of radius; R_4 = upper branch of third branch of radius; R_5 = lower branch of third branch of radius.



Figs 4–5. *Asioclinocera yunnanica* gen. et sp. nov., lateral view. 4. Habitus. 5. Head, fore legs and thorax. Scale bars: 4 = 1.0 mm; 5 = 0.5 mm.

12. Gena strongly tapered with similar sized proboscis; posterior margin of eye straight *Clinocera* Engel
 – Gena gradually tapered with broad proboscis; posterior margin of eye rounded (Sinclair 1995: fig. 61) *Wiedemannia* Zetterstedt

***Asioclinocera formosana* gen. et sp. nov.**

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 (Figs 1–3, 6, 8, 10)

Diagnosis. This species is distinguished from *Asioclinocera yunnanica* gen. et sp. nov. by the dark scutum, lacking dark vittae; anteroventral and posteroventral rows of setae less than half width of fore femur; and shape of the clasping cercus.

Etymology. This species is named after the country of origin, ‘Formosa’, a common name used by Europeans until the 20th century.

Type material. **Holotype.** ♂, labelled: “[Taiwan: Tai-chung-hs.] / Suchilanchi [24.32073° N, 121.28708° E] 1600m / Huangshan nr Lishan / Nov. 24, 1997 / T. SAIGUSA col.”; “HOLOTYPE / *Asioclinocera* / formosana / Saigusa & Sinclair [red label]” (KUMF).

Paratype. 1 ♂, same collection data as for holotype, except K. Masunaga leg. (CNC) [entire body dissected/cleared].

Description (wing length 3.5–3.8 mm). **Male.** *Head* (Fig. 2): Oval, tapered ventrally, dark brown. Face with thin pruinescence, narrower than width of antennal bases. Ocellar triangle with pair of straight, anteriorly-directed ocellar setae, longer and stronger than vertical setae; pair of vertical setae. Postocular row of setae on upper half strong; lower half slender; occipital setae scattered, setae posterior to mouth slender. Antenna brown (Fig. 2); scape shorter than pedicel, with several setulae; pedicel with circlet of apical setae; postpedicel short-ovate; basal segment of arista-like stylus wider than long; arista-like stylus as long as head height. *Thorax:* Scutum dark brown, with thin pruinescence; prescutellar depression with whitish pruinescence in anterior view. Pleura dark brown, concolourous with scutum (Fig. 1). Scutal setae long, slender; acrostichals absent; 5 dorsocentral setae; 1 postpronotal seta; 1 presutural supra-alar seta; notopleuron with several anterior setulae, 1 upper posterior notopleural seta; 2 postsutural supra-alar setae; 1 postalar seta; pair of scutellar setae, closely approximated, longer than prescutellar dorsocentral. Laterotergite with several long, slender setae. *Legs:* Coxae and femora brown,

paler than pleura, remaining segments dark brown. Fore femur with rows of fine anteroventral and posteroventral setae, length less than half width of femur; preapical anteroventral spine-like seta longer than width of tibia (Fig. 2). Fore tibia with row of strong, short anteroventral setae, less than half length of tibia. Mid tibia with basal posterodorsal seta, twice width of tibia. Hind tibia with strong anteroventral seta on distal third, nearly twice width of tibia; row of strong, erect posterodorsal setae on distal third, subequal to width of tibia. *Wing* (Fig. 3): Infusate, without cloudy pattern; R_4 nearly straight, ending in costa slightly beyond middle between R_{2+3} and R_5 . Halter brown. *Abdomen*: Sclerites dark brown, darker than thorax, with short, scattered setae and thin pruinescence. Tergum 7 membranous medially; sternum 7 with anterolateral corner prolonged into distinct projection. Tergum 8 roundly expanded laterally with numerous long setae; sternum 8 as long as sternum 7, posterior margin truncate, not prolonged beneath hypandrium. *Terminalia* (Figs 6, 8): Hypandrium triangular, similar in length to epandrium, with 6 apical setae. Phallus with broad triangular base arising from hypandrium, articulated with straight, stout apical section; apex expanded with narrow, membranous crest. Ejaculatory apodeme broad, rounded, narrowly extended into base of phallus.

Epandrium rounded, with long setae along dorsal margin. Cercal plate with long setae on apical half. Clasping cercus broad, flattened, spatulate; inner face clothed with peg-like setae over most of surface. Surstylus narrow, tapered to pointed apex; shorter than half length of clasping cercus.

Female. Unknown.

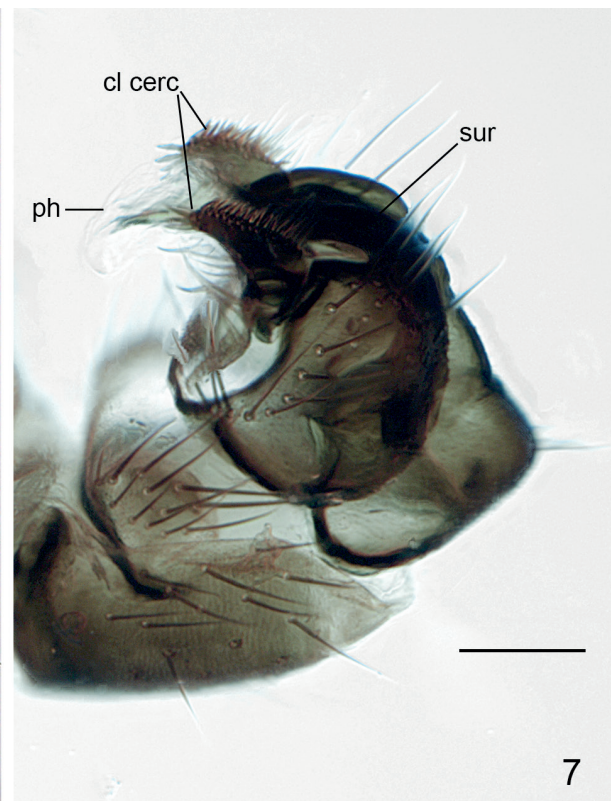
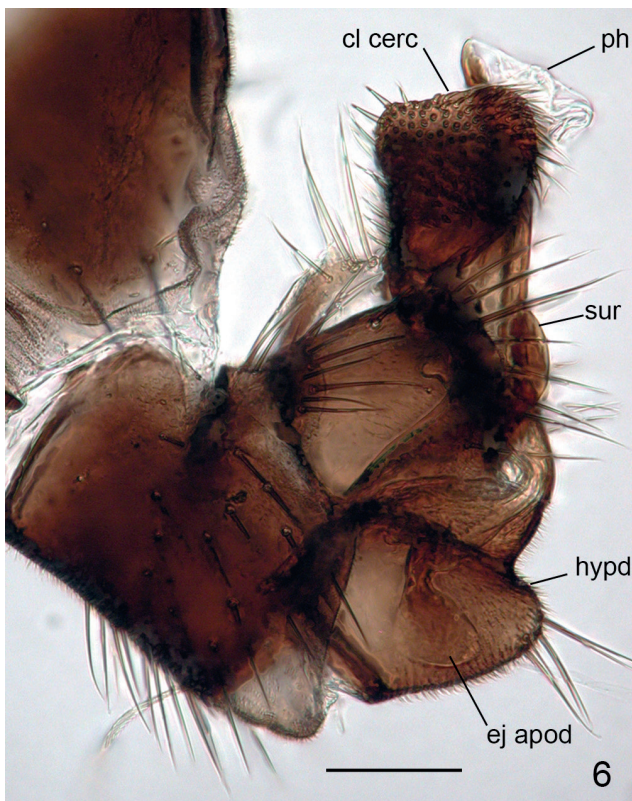
Asioclinocera yunnanica gen. et sp. nov.

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(Figs 4–5, 7, 9–10)

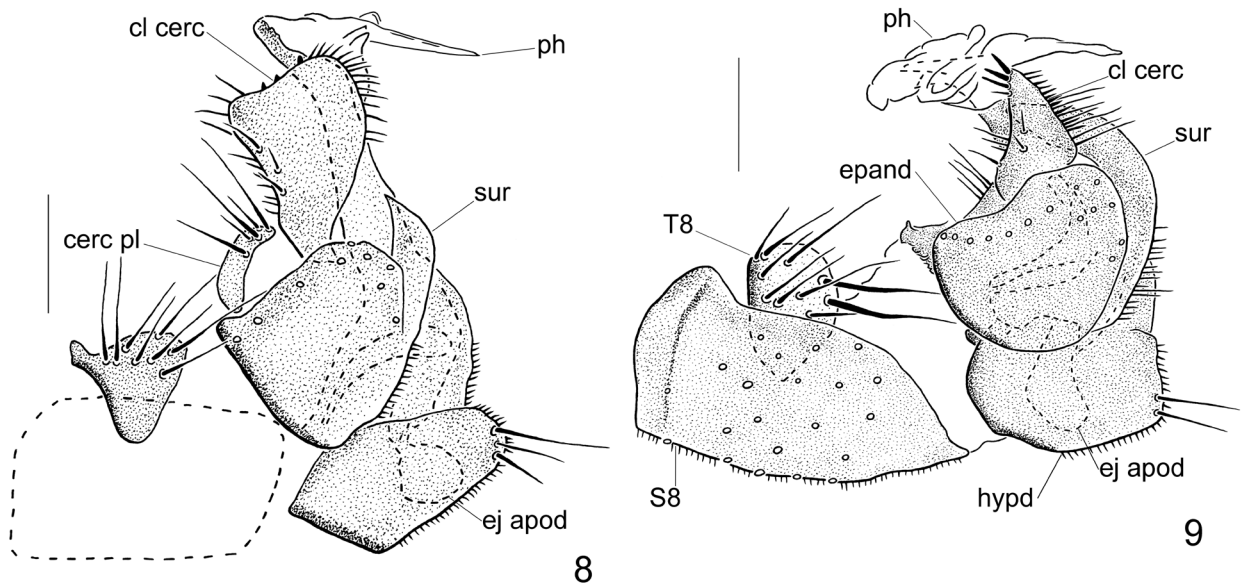
Diagnosis. This species is distinguished from *Asioclinocera formosana* gen. et sp. nov. by the pale brown scutum, with dark median vittae and dark border around pruinescence of prescutellar depression; anteroventral and posteroventral rows of setae longer than half width of fore femur; and shape of the clasping cercus.

Etymology. The species is named after the Chinese province of Yunnan.

Type material. **Holotype.** ♂, labelled: “[Yunnan: Lushui] / Gaolikushan Nat. / Res.(2550-2700m) nr. / Lushui [25.968736° N, 98.711538° E], 13. Aug. 1995 / T. Saigusa col.”; “HOLOTYPE / *Asioclinocera* / *yunnanica* / Saigusa & Sinclair [red label]” (KUMF).



Figs 6–7. Male terminalia of *Asioclinocera* gen. nov., lateral view. **6.** *A. formosana* gen. et sp. nov. **7.** *A. yunnanica* gen. et sp. nov. Scale bars: 6 = 1.0 mm; 7 = 0.1 mm. Abbreviations: cl cerc = clasping cercus; ej apod = ejaculatory apodeme; hypd = hypandrium; ph = phallus; sur = surstylus.



Figs 8–9. Male terminalia of *Asioclinocera* gen. nov., lateral view. **8.** *A. formosana* gen. et sp. nov. **9.** *A. yunnanica* gen. et sp. nov. Scale bars: 8 = 1.0 mm; 9 = 0.1 mm. Abbreviations: cerc pl = cercal plate; cl cerc = clasper cercus; ej apod = ejaculatory apodeme; epand = epandrium; hypd = hypandrium; ph = phallus; S = sternum; sur = surstylus; T = tergum.

Paratypes. Same collection data as for holotype (1 ♀, KUMF); Yunlong-x. [25.79032° N, 99.10223° E], 3 km NNW Zhichangm, 2500–2600 m, 7.vi.1996, T. Saigusa, col. (1 ♂, CNC) [dissected].

Description (wing length 3.3–3.8 mm). **Male.** *Head* (Fig. 5): Oval, tapered ventrally, dark brown. Face with thin pruinescence, narrower than width of antennal bases. Ocellar triangle with pair of straight, anteriorly-directed ocellar setae, longer and stronger than vertical setae; pair of vertical setae. Postocular row of setae on upper half strong; lower half slender; occipital setae scattered, setae posterior to mouth slender. Antenna brown (Fig. 5); scape shorter than pedicel, with several setulae; pedicel with circlet of apical setae; postpedicel short-ovate; basal segment of arista-like stylus wider than long; arista-like stylus as long as head height. *Thorax*: Scutum pale brown, with thin pruinescence; medially with broad, dark brown vitta extending to prescutellar depression; prescutellar depression with whitish pruinescence with dark border in anterior view. Pleura pale brown, concolourous with scutum (Fig. 5). Scutal setae long, slender; acrostichals absent; 5 dorsocentral setae; 1 postpronotal seta; 1 presutural supra-alar seta; notopleuron with several anterior setulae, 1 upper posterior notopleural seta; 2 postsutural supra-alar setae; 1 postalar seta; pair of scutellar setae, closely approximated, longer than prescutellar dorsocentral. Laterotergite with several long, slender setae. *Legs*: Pale brown, concolourous with pleura, segments gradually darker apically. Fore femur with rows of long, fine anteroventral and posteroventral setae, longer than half width of femur, similar to length of spine-like seta (Fig. 5); preapical anteroventral spine-like seta longer than width of tibia. Fore tibia with row

of strong, short anteroventral setae, less than half width of tibia (Fig. 5). Mid tibia with basal posterodorsal seta, twice width of tibia. Hind tibia with thin anteroventral seta on distal third, less than twice width of tibia; row of strong, erect posterodorsal setae on distal third, longer than width of tibia. *Wing* (Fig. 4): Infusate, without cloudy pattern; R_4 distinctly arched, ending in costa near middle between R_{2+3} and R_5 . Halter brown. *Abdomen*: Sclerites dark brown, darker than thorax, with short, scattered setae and thin pruinescence. Tergum 7 membranous medially; sternum 7 with anterolateral corner prolonged into distinct projection. Tergum 8 roundly expanded laterally with numerous long setae; sternum 8 as long as sternum 7, posterior margin prolonged beneath hypandrium. *Terminalia* (Figs 7, 9): Hypandrium rectangular, similar in length to epandrium, apex slightly tapered with 6 apical setae. Phallus with broad triangular base arising from hypandrium, stout apical section sinuous; apex expanded with narrow, membranous crest. Ejaculatory apodeme broad, rounded, narrowly extended into base of phallus. Epandrium rounded, with long setae mostly along dorsal margin. Cercal plate with long setae on apical half. Clasper cercus digitiform, tapered apically with rounded apex; strong, thickened setae along inner posterior margin and inner apex; apex crowned with 3 spine-like setae; without peg-like setae on inner surface. Surstylus digitiform, strongly arched, tapered to rounded apex; longer than length of clasper cercus.

Female. Similar to male except face slightly broader than width of antennal sockets.

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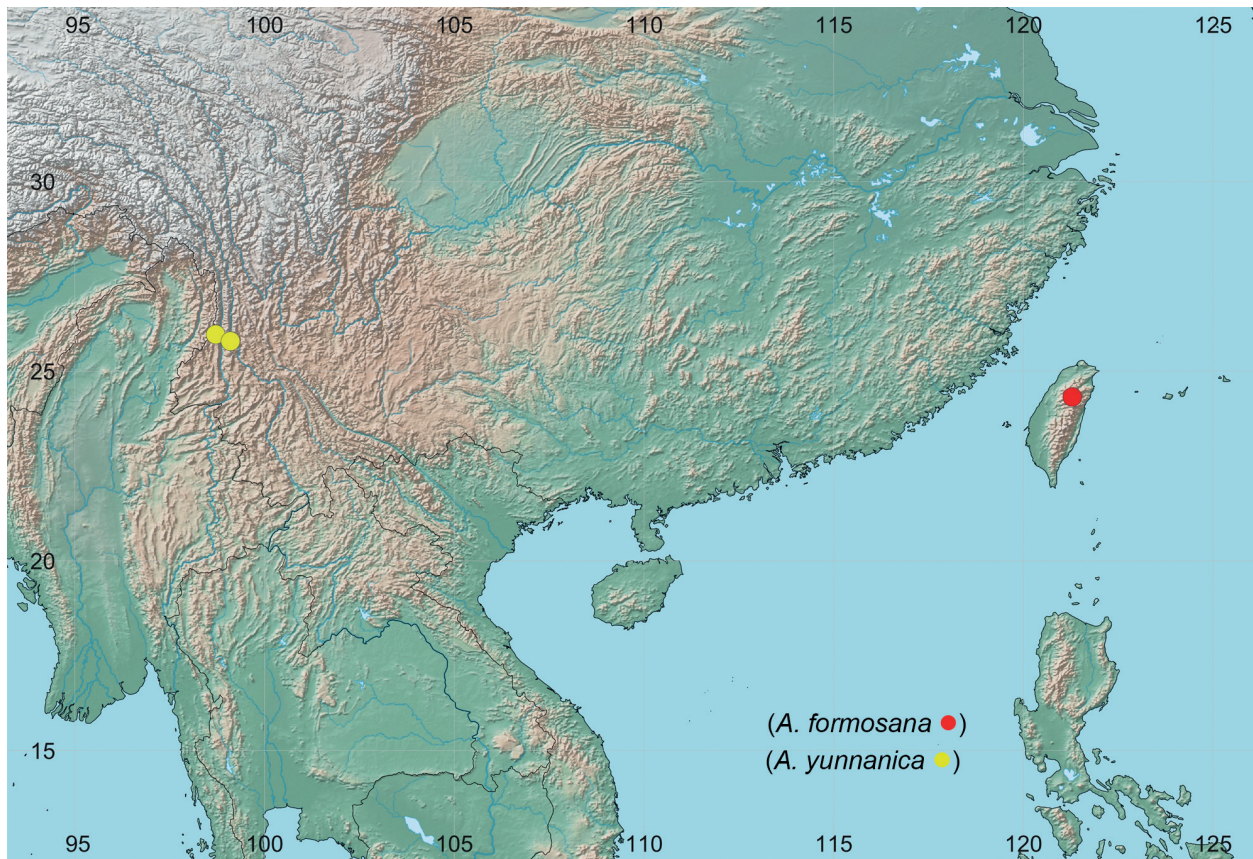


Fig. 10. Distribution of *Asioclinocera* gen. nov.

(Canada) and Marija Ivković (Croatia) kindly commented on the manuscript.

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