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Asiorrhina, a new Oriental genus of Lygistorrhinidae (Diptera: Sciaroidea) and its phylogenetic position

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Abstract

A new genus of Lygistorrhinidae, *Asiorrhina* **gen. n.**, and a new species, *Asiorrhina parasiatica* **sp. n.**, are described. *Asiorrhina asiatica* (Senior-White) **comb. n.** is redescribed and selected as the type species for the new genus. The systematic position of the new genus is discussed. All recent taxa of Lygistorrhinidae form a monophyletic group with the fossil genus *Palaeognoriste* Meunier as the sister group.

Key words: taxonomy, new taxa, phylogeny, *Lygistorrhina asiatica*, Oriental region

Introduction

Lygistorrhinidae is a small family of fungus gnats (Diptera: Sciaroidea) distributed globally in warm temperate to tropical zones. Previously believed to be very rare, recently they have received more attention from taxonomists as more Malaise trap samples have become available. Currently the family includes 43 species in 13 genera; 6 genera are known only from fossils (Fungus Gnats Online 2009). The type genus of the family, *Lygistorrhina* Skuse, 1890, can be easily recognized on account of the very long proboscis, highly reduced wing venation and long and expanded hind femora and tibiae. However, one of the species, *Lygistorrhina asiatica* Senior-White, 1922, described from Sri Lanka, is significantly different from the other species of the genus. Tuomikoski (1966) proposed that the species actually belonged to *Palaeognoriste* Meunier, 1904, a genus known from the Baltic amber. Some authors (Grimaldi & Blagoderov 2001; Hippa et al. 2005) expressed an opinion that *L. asiatica* might be separated into a new genus, but failed to find any apomorphies of the species which would make description of a new genus practicable.

In August 2006 and January 2008, Jan Ševčík, while visiting the Natural History Museum in London, found two male specimens of *Lygistorrhina* in unsorted Malaise trap material from Sarawak with a relatively short proboscis and complete median fork. Examination of the specimens revealed their remarkable similarity to *L. asiatica*. The purpose of the present paper is to describe the new species from Borneo, to re-describe *L. asiatica*, and to establish a new genus for these two species supported by a new cladistic analysis.

Material and Methods

The holotype of *Lygistorrhina asiatica* was studied, together with additional material collected by Senior-

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White two years later at the type locality. One of the specimens was mounted in Canada balsam by him, the rest were pinned on minutens. Specimens of the new species were stored in alcohol and mounted later on slides in Euparal. Observations were carried out on different stereo- and compound microscopes by all authors with magnification up to 400 x. Type specimens of both species of *Palaeognoriste* were also studied. Although type material of both species should be housed in the Geowissenschaftlisches Zentrum der Georg-August-Universität, Göttingen, Germany, the syntype of *P. sciariforme* Meunier, 1904 is at present on loan to the Muséum national d'Histoire naturelle (Paris, France). Photographs were made with Zeiss Stemi SV11 stereomicroscope and Olympus CP-350 digital camera and Optem® digital camera coupler and Zeiss Axioskop with Canon EOS 450D camera. Increased depth of field for images was obtained using Helicon Focus v. 4.77 software which creates a completely focused image from several partially focused images by combining the focused areas. Additional photographs and materials are available on the Fungus Gnats Online web site (http://sciaroidea.info/en/image/tid/47788 and http://sciaroidea.info/en/taxonomy/47789).

For the phylogenetic analysis 60 morphological characters were coded for 18 taxa of Lygistorrhinidae, representing all known genera of Lygistorrhinidae and one species of Diadocidiidae, *Diadocidia ferruginosa* Meigen, 1830. A complex of Cretaceous genera shown to be an extinct stem group for the clade of Recent Lygistorrhinidae (Blagoderov & Grimaldi, 2004) also was used as a part of multiple outgroup to resolve relationships of extant genera. The character matrix (Appendix 1), including the choice of outgroup, was based on that used by Hippa et al. (2005) and new characters were added. Character states were coded as (-) if inapplicable and (?) when unknown. Morphological structures were surveyed by examining original specimens and photographs, except for *Lygistorrhina fijiensis* Evenhuis, 2008, for which coding was based on the description. *Lygistorrhina sanctaecatherinae* Thompson, 1975 was chosen as a representative of subgenus *Propolaeus* Williston, 1896. *Palaeognoriste sciariforme* is represented by two syntypes, a male and a female, which are most probably not conspecific. The male specimen (Meunier's # 6630) was coded. *Palaeognoriste affine* Meunier, 1912 is also represented by two syntypes, a male and a female, and since they are *in copula* in the same piece of amber (G1848==BST.03.382) we regard them as conspecific. The data matrix was created and edited in Mesquite ver. 2.6 (Maddison & Maddison 2009) and analysed in WinNONA (Goloboff 1999). The search parameters used were 'hold 100000; hold/1000; mult*1000; max*'. With these commands and settings, the program executes 1000 heuristic searches (randomizing the taxon input order between iterations), creating weighted Wagner tree for each, which is then submitted to tree bisection-reconnection (TBR) branch swapping, retaining in memory up to 1000 optimal trees. These cladograms are then submitted to a further round of TBR swapping, holding a maximum of 100000 most parsimonious cladograms. Bremer support values were calculated in WinNONA using following command sequence: ‘hold 2000; sub 1; find*; hold 4000; sub 2; find*; hold 8000; sub 3; find*; hold 16000; sub 4; find*; hold 32000; sub 5; find*; bsupport;’. All characters were equally weighted and multistate characters were treated as non-additive. The resulting cladograms and character distributions were analysed using WinClada (Nixon 2002).

Abbreviations used: BMNHE = Department of Entomology, Natural History Museum, London, NP = National Park.

Phylogenetic Analysis

The parsimony analysis resulted in two most parsimonious cladograms (164 steps, CI = 0.45, RI = 0.58). In the strict consensus tree (Fig. 1), the Cretaceous representatives of the family (*Archaeognoriste* Blagoderov et Grimaldi, 2004, *Lebanognoriste* Blagoderov et Grimaldi, 2004, *Leptognoriste* Blagoderov et Grimaldi, 2004, *Plesiognotiste* Blagoderov et Grimaldi, 2004, and *Protognoriste* Blagoderov et Grimaldi, 2004) form a monophyletic group, which is the sister group of *Palaeognoriste* plus all the Recent Lygistorrhinidae. *Palaeognoriste* is monophyletic. The clade of Recent Lygistorrhinidae is supported by several synapomorphies, such as the longer proboscis (Char. 1); presence of longer setae on the scutum (Chars. 14, 15); basal position of RS (Char. 25), absence of *m-cu* (Char. 28) and setae on R_5 (Char. 32), and the position of

flagellate setae on the gonostyli (Char. 59), although in many cases reversals have occurred in terminal taxa. *Asiorrhina* n. gen. occupies an intermediate position between *Palaeognoriste* and the other Recent Lygistorrhinidae. The relationship between the Recent genera is similar to an earlier analysis (Hippa et al. 2005) except for *Blagorrhina* Hippa, Mattison et Vilkamaa, 2009, *Gracilorrhina* Hippa, Mattisson et Vilkamaa, 2005 and *Labellorrhina* Hippa, Mattisson et Vilkamaa, 2005 appearing as a separate clade rather than as a paraphyletic assemblage with respect to a *Matileola* Papp, 2002 + *Loyugesa* Grimaldi et Blagoderov, 2001 + *Seguyola* Matile, 1990 clade.

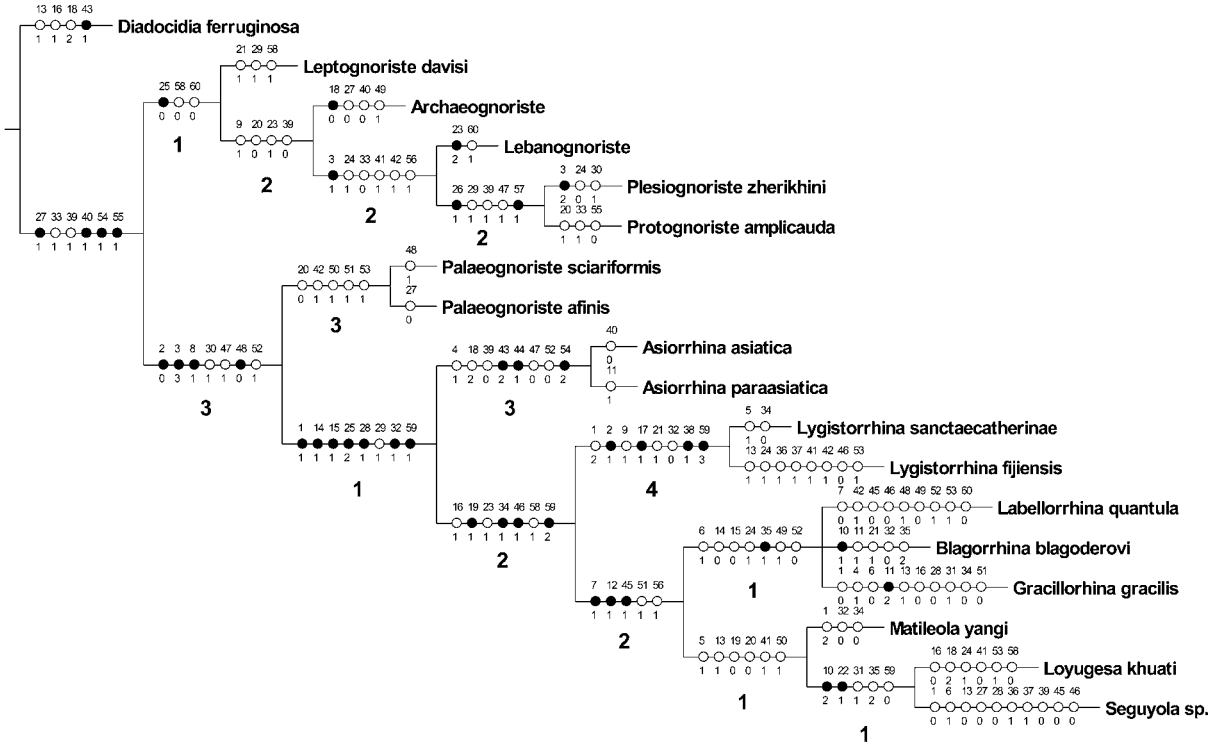

FIGURE 1. Phylogeny of Lygistorrhinidae. The strict consensus cladogram of two MPT (164 steps, CI = 0.45, RI = 0.58. Black dots = unique synapomorphy, open circle = non-unique synapomorphy. Numbers below branches refer to Bremer support values

The genus *Asiorrhina* is supported by the following synapomorphies: paraglossae of labellum are fused together except at extreme apex (Char. 4); anterodorsal angle of metepisternum at the same level as that of posterodorsal angle (Char. 18); tibial organ (anteroapical depression) of fore tibia with flap-like lobe distad of a comb of thick setae (Chars. 43, 44); and very short and directed dorsally apodeme of tergite 9 of the male (Char. 54). Short fore coxae (Char. 39) and pointed mid tarsal claws are also characteristic for the new genus. However, the phylogenetic value of these characters should be investigated further. The state of the last character is not yet known for the fossil genera, so it only can be considered a presumed synapomorphy.

Bremer support values are rather high for the *Palaeognoriste* (3), *Asiorrhina* (3) and *Lygistorrhina* (4) clades. Although the clade of Recent Lygistorrhinidae is supported by seven unambiguous changes, its Bremer support is only 1. This is due to homoplastic distribution of character states, which in many cases demonstrate reversals in terminal taxa, or due to ambiguity of character distributions due to missing data. More data is required for a stable phylogeny of the family; however, a position of *Asiorrhina* as a sister group for the rest of Recent Lygistorrhinidae basal position of *Palaeognoriste* is well established.

Characters used in the phylogenetic analysis of Lygistorrhinidae

1. *Length of proboscis*: (0) relatively short, shorter than width of fore femur; (1) long, shorter or equal to length of fore femur; (2) very long, longer than length of fore femur
2. *Length of maxillary palp*: (0) much shorter than labellum; (1) as long as labellum; (2) longer than labellum
3. *Number of palpomeres*: (0) four; (1) three; (2) two; (3) one
4. *Paraglossae of labium*: (0) two separate sclerites (Grimaldi & Blagoderov 2001, Fig. 3); (1) fused together except distally (Figs. 2A,B; Hippa et al. 2005, Fig. 3A)
5. *Male eyes*: (0) dichoptic; (1) holoptic
6. *Ommatidia size*: (0) ommatidia equal; (1) dorsal ommatidia larger
7. *Median ocellus*: (0) present; (1) absent
8. *Median ocellus*: (0) same size as lateral; (1) smaller than lateral
9. *Position of ocelli*: (0) in a triangle; (1) almost in line
10. *Number of antennal flagellomeres*: (0) 14; (1) 12; (2) 11; (3) 10
11. *Shape of flagellomeres:* (0) not flattened laterally; (1) laterally flattened, ventrally expanded; (2) laterally flattened, ventrally strongly expanded
12. *Shape of scutum:* (0) slightly convex; (1) dome-shaped
13. *Setosity of scutum:* (0) setose all over; (1) a non-setose strip between dorsocentral and lateral setosity
14. *Long lateral setae on scutum*: (0) present; (1) absent
15. *Long acrostichal setae on scutum*: (0) present; (1) absent
16. *Position of anterior edge of notum*: (0) just above fore coxa or barely anteriad; (1) well anteriad of fore coxa
17. *Position of anterior edge of episternum 3 in relation to anterior margin of laterotergite*: (0) approximately at the same level or posteriad; (1) much anteriad to laterotergite
18. *Anterodorsal angle of metepisternum*: (0) more dorsal than posterodorsal angle; (1) more ventral than posterodorsal angle; (2) on same level
19. *Form of laterotergite*: (0) slightly produced; (1) produced as strong lobe posteroventrally
20. *Setae on laterotergite*: (0) absent; (1) present
21. *Setae on laterotergite*: (0) irregular; (1) row of setae
22. *Shape of wing apex*: (0) normal; (1) unusually broadly rounded
23. *Sc*: (0) ending on C; (1) ending free; (2) ending on R
24. *Length of R_1 in relation to wing length*: (0) long and ending at middle of costal margin or more apically; (1) short and ending in basal half of costal margin
25. *Position of RS relative to Sc*: (0) beyond or at the level of Sc apex; (1) in the middle of Sc; (2) at the level of *h* crossvein
26. *Vein M_2*: (0) present; (1) absent
27. *Fork of M*: (0) complete; (1) incomplete
28. *m-cu crossvein*: (0) present; (1) absent
29. *m-cu position*: (0) proximal, aligned with r-m; (1) distal, making cubital fork
30. *Crossvein r-s*: (0) present; (1) absent or unsclerotized
31. *Setosity of R_1*: (0) setose; (1) non-setose
32. *Setosity of R_5*: (0) setose; (1) non-setose
33. *M and Cu*: (0) setose; (1) bare
34. *Colour of apical part of wing membrane*: (0) without a dark patch; (1) with a dark patch
35. *Dark basal patch on cell r1*: (0) absent; (1) a restricted patch present at tip; (2) an extensive patch present extending to apical half of the cell
36. *Colour of the area around bases of M_1 and M_2*: (0) without a dark patch; (1) with a dark patch

37. *Colour of the area around apex of CuA*: (0) without a dark patch; (1) with a dark patch
38. *Concavity on proximal half of lateral surface of hind coxa*: (0) absent; (1) present
39. *Length of coxae*: (0) approximately the same length; (1) coxa 1 longer than coxae 2 and 3
40. *Coxa 3 setosity*: (0) all over; (1) base bare
41. *Tibia 1 length*: (0) longer than femur 1; (1) shorter than femur 1
42. *Tibial and tarsal setae*: (0) irregular; (1) in rows
43. *Tibial organ (antero-apical depression)*: (0) absent; (1) fine setae; (2) stout setae
44. *Flap-like lobe distal of tibial organ*: (0) absent; (1) present
45. *Spur on T1*: (0) present; (1) absent
46. *Number of spurs on T2*: (0) two; (1) one
47. *Shape of T3*: (0) normal; (1) club-shaped
48. *Row of thick setae at apex of T3*: (0) absent; (1) present
49. *Microtrichia on T3*: (0) absent; (1) present
50. *Shape of basitarsomere 3*: (0) slender, at most slightly broader than basitarsomere 1; (1) inflated, conspicuously broader than basitarsomere 1
51. *Tip of claws of tarsus 1*: (0) pointed; (1) blunt
52. *Tip of claws of tarsus 2*: (0) pointed; (1) blunt
53. *Aggregation of thickened setae at apex of male tergite 9*: (0) absent; (1) present
54. *Tergite 9 apodeme*: (0) absent; (1) long and directed anteriorly; (2) short and directed dorsally
55. *Abdomen insertion*: (0) wide; (1) narrow
56. *Shape of gonostylus*: (0) slender; (1) stout
57. *Shape of gonostylus*: (0) bacilliform; (1) complicated shape
58. *Apex of gonostylus*: (0) simple; (1) one tooth-like lobe; (2) two lobes
59. *Flagellate setae on medial edge of gonostylus*: (0) absent; (1) medial; (2) basal; (3) both basal and medial
60. *Size*: (0) wing length 1 mm; (1) wing length 1.4 mm or more

New taxa of Lygistorrhinidae

***Asiorrhina* gen. nov.**

Type species *Lygistorrhina asiatica* Senior-White, 1922

Differential diagnosis. The genus *Asiorrhina* differs from all other Lygistorrhinidae, both Recent and fossil except *Palaeognoriste*, in the double-lobed apex of the gonostylus. *Asiorrhina* is distinguished from all other Recent Lygistorrhinidae by having the apodeme of the male tergite 9 directed dorsad, not anteriad, and the tibial organ having a comb-like transverse row of stout vestiture and a flap-like lobe on its distal side, the latter character probably also distinguishing the unknown females. *Seguyola*, *Loyugesa*, *Blagorrhina*, *Gracillorhina* and *Labellorrhina* lack a recognizable tibial organ. In *Lygistorrhina* and *Probolaeus* there is a row of setae but these setae are fine and situated more apically. The exact structure of the tibial organ in *Palaeognoriste* is unknown, but the specimens we have studied probably do not have an organ similar to *Asiorrhina*. The genus *Asiorrhina* resembles *Gracillorrhina* in having the labium medially divided only on the apical part and by having the antennal flagellomeres flattened and expanded. In *Gracillorrhina*, however, the proboscis is very short, less than half the height of the head, and the flagellomeres are expanded only over the basal two thirds. *Asiorrhina*, like *Blagorrhina* and *Gracillorhina*, but not *Palaeognoriste* and the rest of the Recent Lygistorrhinidae, has pointed, not blunt mid tarsal claws.

Description. Small Lygistorrhinidae with medium-length proboscis.

Head. Number of ocelli three or two. Compound eyes widely separated, all facets/ommatidia equal in size, interommatidial setae longer than the diameter of ommatidium. Frons and vertex short setose, frons without conspicuously strong setae laterally. Face non-setose. Clypeus setose. Labrum setose. Proboscis about 1.5-2x height of head. Maxillary palpus a little longer than half of length of labellum. Labellum entire, only shortly divided at extreme apex (Fig. 2). Hypopharynx nearly as long as labium. Antenna about two and a half times height of head. Flagellomeres flattened, broader than long, setosity uniform. Number of flagellomeres 14. Flagellomeres 1–13 with several strong dorsal setae; flagellomere 14 with a small constricted nib, more clear in *A. parasiatica* than in *A. asiatica*.

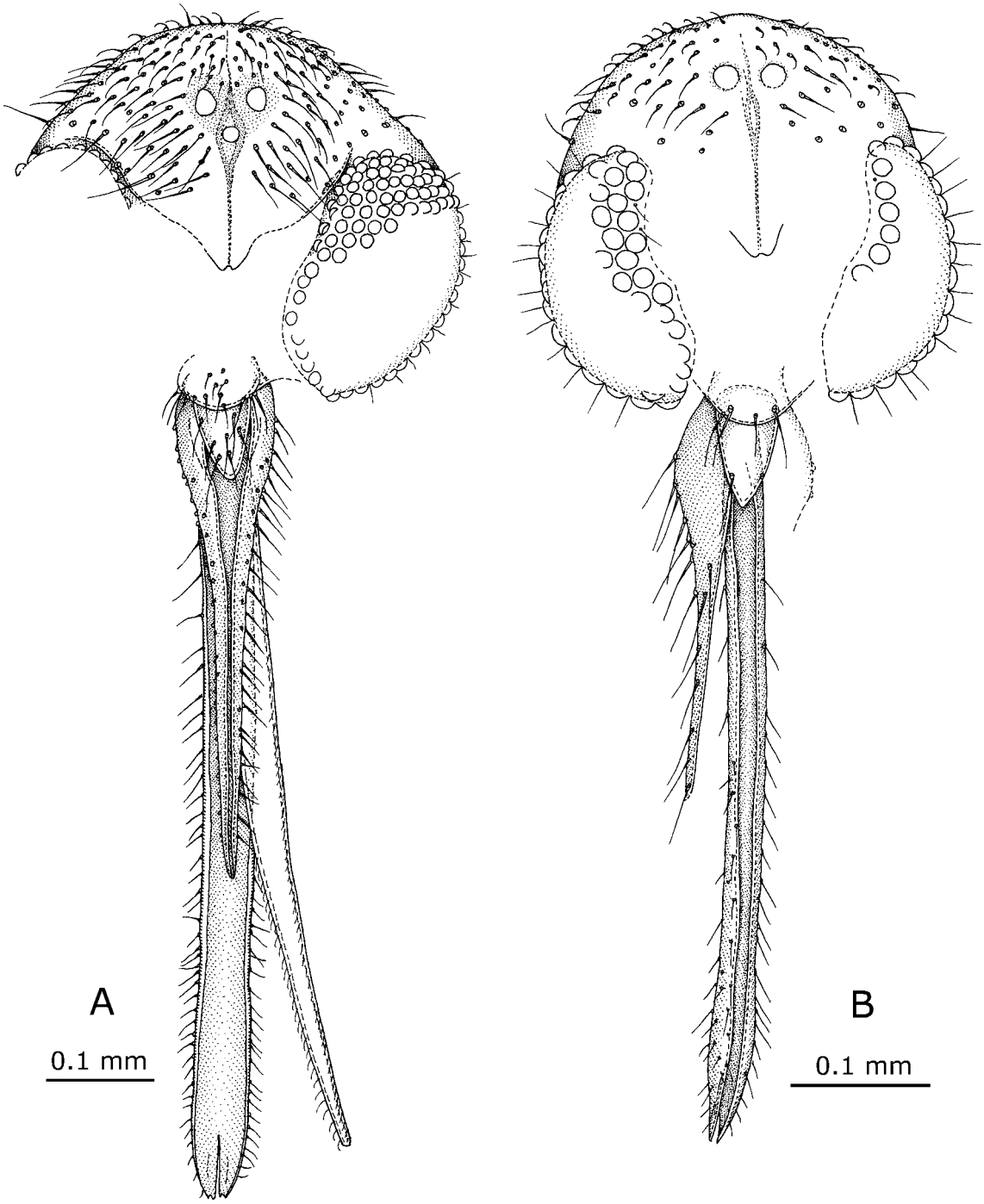

FIGURE 2. Male head, frontal view. A: *Asiorrhina asiatica* (Senior-White), comb. n.; B: *Asiorrhina parasiatica*, sp. n. (holotype).

Thorax. Scutum roundly dome-shaped, anteriorly extending to the same level as base of coxa 1, setae evenly distributed, without a non-setose stripe between medial and lateral setae. Mediotergite evenly curved, bare. Posterior margin of metepisternum only slightly longer than anterior, not extending level of ventral margin of laterotergite. Pleural pit indistinct. Laterotergite slightly lobe-like posteroventrally, setose. Posterior margin of metepisternum only slightly longer than anterior, not extending level of ventral margin of laterotergite.

Legs. Long: tibia 1 slightly longer than scutum plus scutellum. Coxa 1 equal in length to coxa 3, coxa 2 conspicuously longer, its apex reaching the apex of coxa 3. Femora thickened, femur 3 thickest. Tibia 1 longer than femur 1. Tibial setae in rows. Tibial microtrichia absent. Tibia 1 with one spur, tibia 2 and 3 with two spurs. Tibia 3 rather slender, not club-like swollen on apical part, with transverse comb of strong setae subapically on prolateral side. Tibial organ on tibia 1 composed of transverse comb-like row of stout setae and flap-like lobe on the distal side of it (Figs. 4B, C). Basitarsomere 3 slender, slightly broader than basitarsomere 1, narrower than basal part of tibia 3.

Wing (Fig. 5) relatively wide, length about 2.5x width; unicolorous greyish brown. Microtrichia on membrane short, 0.01-0.012 mm. Sc complete, weak and short, ending on costa. R_1 meeting C at middle of wing. Costa reaches wing apex, ends at $5/6^{th}$ of distance between R_5 and M_1 apices. RS not apparent. M_1 and M_2 basally weak but medial fork complete (*A. parasiatica*) or extreme basal part of M_1 not visible so that medial fork absent (*A. asiatica*). C setose, R_1 dorsally setose, other veins non-setose. Posterior margin of wing with alternating longer (dorsal) and shorter trichia. Haltere short, about half length of thorax.

Abdomen. Male sternite 8 simple. Setosity of male tergite 9 uniform or setae at apical part shorter and more curved; apodeme of tergite 9 short, without distinct stalk and directed dorsally. Gonostylus narrow, with two apical lobes. One long flagellate seta on mesial surface of gonostylus situated at midlength, not on basal half. Medial structures of hypopygium, parameres, tegmen and aedeagus, not studied.

Etymology. The generic name is a combination of Asia, with reference to the place of origin of the taxon, and *-rrhina*, a common ending in generic names in the family, derived from the Greek *rhis*, nose. The name is feminine.

Comments. Although the wing venation of *Asiorrhina* plesiomorphically resembles that of *Palaeognoriste*, phylogenetic analysis undoubtedly places it with the rest of Recent Lygistorrhinidae.

Asiorrhina asiatica (Senior-White, 1922), comb. n.

Lygistorrhina asiatica Senior-White, 1922: 196

Material studied. **Holotype**: Male, Ceylon, Suduganga, 20/4/1920, R. Senior-White, on window, 7 am; pinned male, moulded, thorax and one wing preserved, abdomen glued on plastic next to minuten (BMNHE 254360)**.** **Other material**: Male, Ceylon, Suduganga, 21/6/1922, R. Senior-White; slide mount in Canada balsam; male (BMNHE 819008); Suduganga, 5.vi. 1922., on window, R. Senior-White; slide mount in Euparal (BMNHE 819007); all in BMNH.

*Description***. Male**. **Measurements**: Head height 0.34–0.38 mm (holotype 0.34); body without head 2.7-3.2 mm; wing, measured from humeral vein, 1.5–1.7 mm (holotype 1.5); antenna 1.0 mm; proboscis 0.8 mm; palpus 0.5 mm.

Head (Fig. 2A) rounded, slightly wider than high. Frons, vertex and occiput uniformly dark brown, covered with short setae. Three ocelli in triangle, diameter of lateral ocellus 1.8x diameter of median one. Frontal furrow surrounds median ocellus and continues on vertex. Eyes dichoptic, oval, without emarginations. Ommatidia round, equal in size, 19-20 ommatidia across eye, with interocular setae as long as diameter of ommatidium. Antennae set a little lower than middle of head. Scape very short, obovate, dorsal

side longer than ventral; pedicel spherical. Flagellum 14-segmented, flagellomeres with polygonal setal pattern (Fig. 3A). Flagellomeres cylindrical, slightly compressed laterally. Scape, pedicel and flagellomeres 1–13 with long dorsal setae spread widely apart; flagellomeres 1–9 with short, thick ventral setae. Flagellomere 1 length 0.9x width, flagellomere 4 width 0.5x length in lateral view (Fig. 3A) and 1.7x width in dorsal view, apical flagellomere length 2x width in lateral view and 3.5x width in dorsal view; apical appendage on flagellomere 14 weak (Fig. 3B). Clypeus as long as wide, with 8-9 dorsal setae. Length of proboscis approximately 2x height of head. Palpi one-segmented, 0.65x length of proboscis, narrow at base, evenly tapering towards apex, with setae spread out in basal third and single row of setae in apical 2/3. Labellum same width through whole length, uniformly covered with short setae and microtrichia (except extreme apex), rounded at apex.

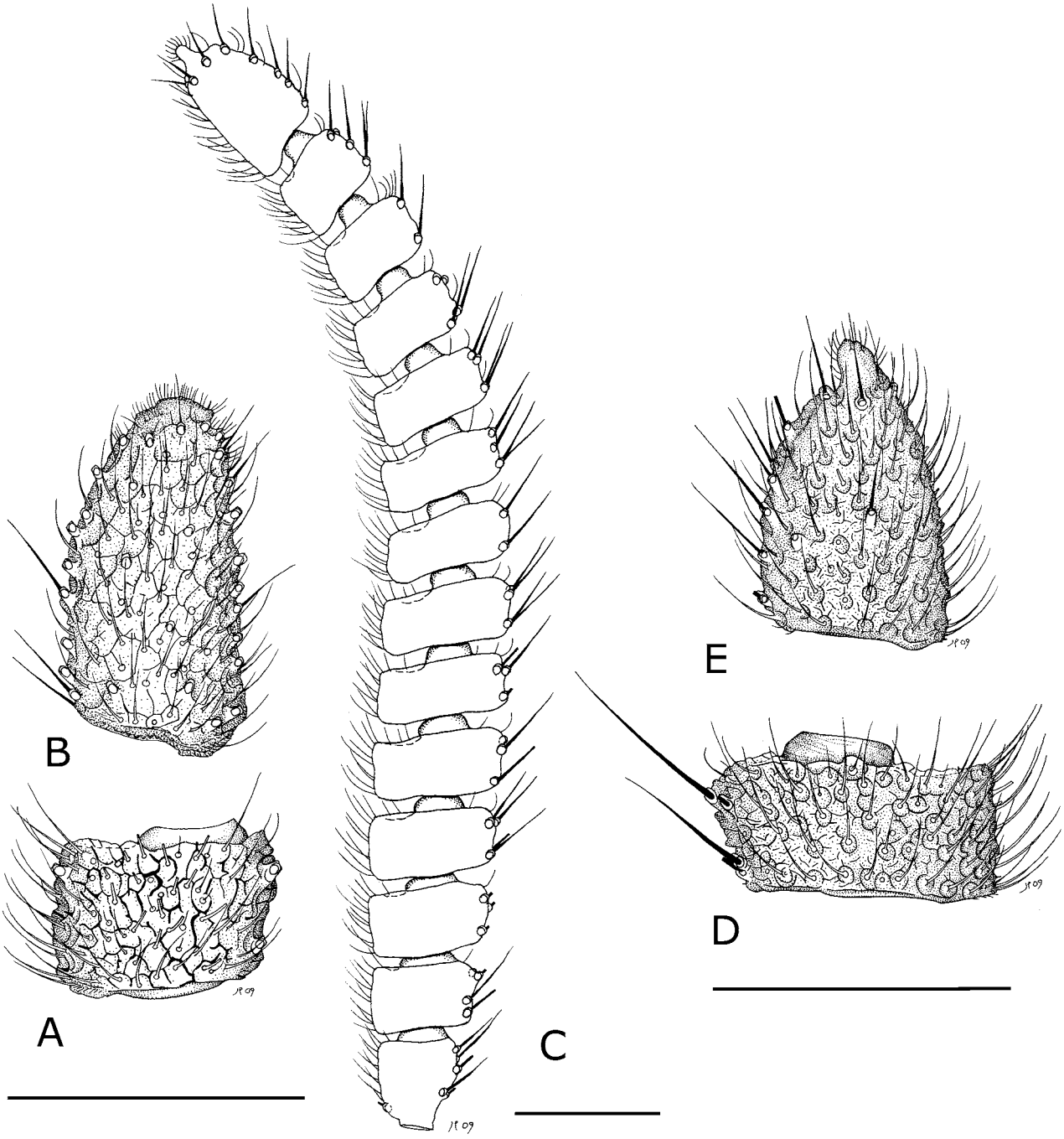

FIGURE 3. Antenna (C), antennal flagellomere 4 (A, D) and antennal flagellomere 14 (B, E), lateral view. A, B. *Asiorrhina asiatica* (Senior-White). C–E. *A. parasiatica* sp. n., (holotype); scale 0.1 mm.

Thorax. Scutum moderately convex, uniformly covered with short setae, with longer lateral setae in irregular row and a few stronger dorsocentral setae. Scutellum with 6 pairs of long setae. Antepronotum divided from proepisternum with distinct suture, bearing 9–10 setae, proepisternum with 8–9 setae. Laterotergite medium size, defined, with 10–11 setae in central part.

Legs. Fore coxae densely setose anteriorly, with 3–4 postero-apical setae. Mid coxa densely setose on apical third. Hind coxa with a row of 6–7 postero-lateral setae and a row of 5 latero-apical setae. Tibial organ on fore tibia without horseshoe-shaped sclerotized crest (Fig. 4B). Mid tibiae not preserved on studied specimens. Hind tibia gradually slightly expanding towards apex, hind tibial spurs subequal. All tarsal claws pointed.

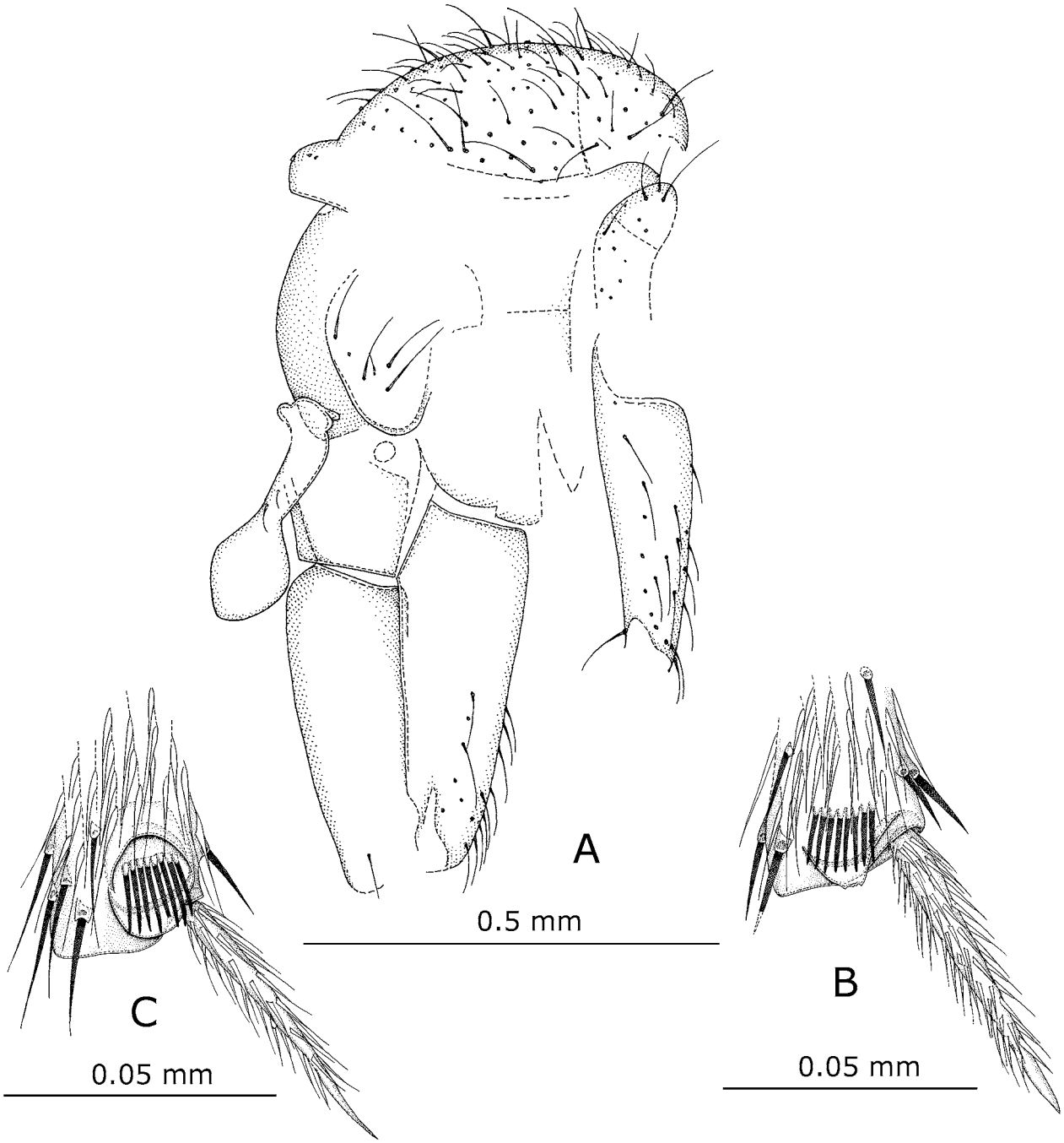

FIGURE 4. Thorax, lateral view, (A) and tibial organ (B, C) of *Asiorrhina*. A, C: *Asiorrhina parasiatica*, sp. n. (holotype); B: *Asiorrhina asiatica* (Senior-White), comb. n.

Wing (Fig. 5A). Costal setae about 2x width of Costa. R with 29-30 dorsal setae, other veins bare. R_5 slightly sinusoid. M stem and base of fork M_1 and M_2 reduced, M_2 extends more basally than M_1. M_1 and M_2 gently curved posteriorly, slightly diverging, so M_1 ends at wing apex. M_{3+4} and CuA strongly curved posteriorly, M_{3+4} slightly sinuous apically. Distance between apices of M_2 and M_{3+4} 1.3x distance between M_{3+4} and CuA. Vein *iCu* strong, vein A_1 not apparent.

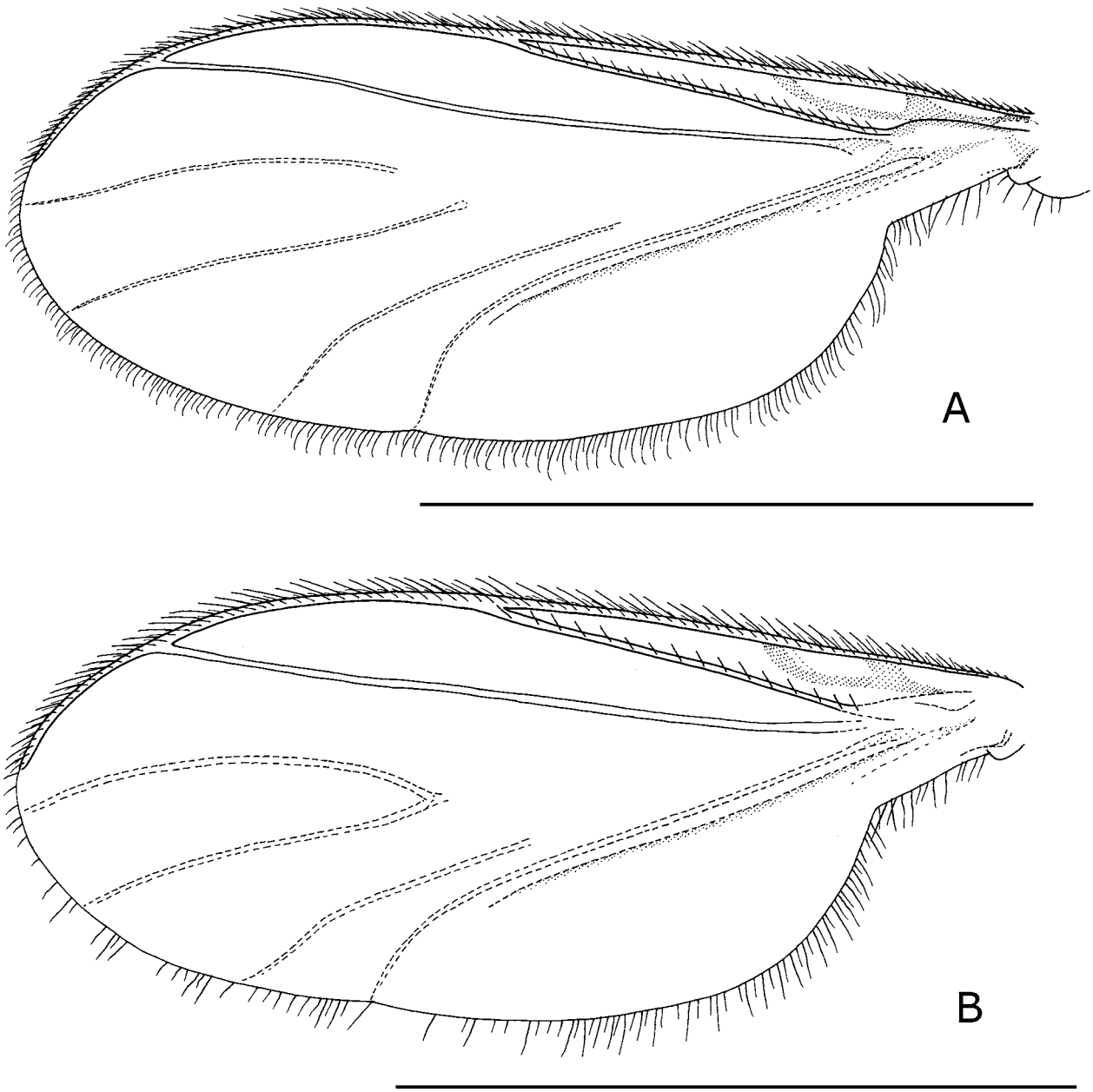

FIGURE 5. Wings, dorsal view. A: *Asiorrhina asiatica* (Senior-White), comb. n.; B: *Asiorrhina parasiatica*, sp. n.; scale 0.5 mm.

Abdomen. Tergite 8 elongated, slightly pointed at apex, with long setae in apical half. Tergite 9 pear-shaped (Fig 6A), a little longer than gonocoxites; evenly covered dorsally with long setae, with a group of densely spaced short setae at apex. Gonocoxites wide ventrally in apical half, irregularly setose (Fig. 6B). Gonostylus shorter than gonocoxite, with two blunt, apical lobe-like teeth (the ventral one being slightly longer), and a thin, long medial flagellate seta at the middle of mesial margin (Fig. 6C).

Differential diagnosis. For characters distinguishing *A. asiatica* from *A. parasiatica*, see under the latter.

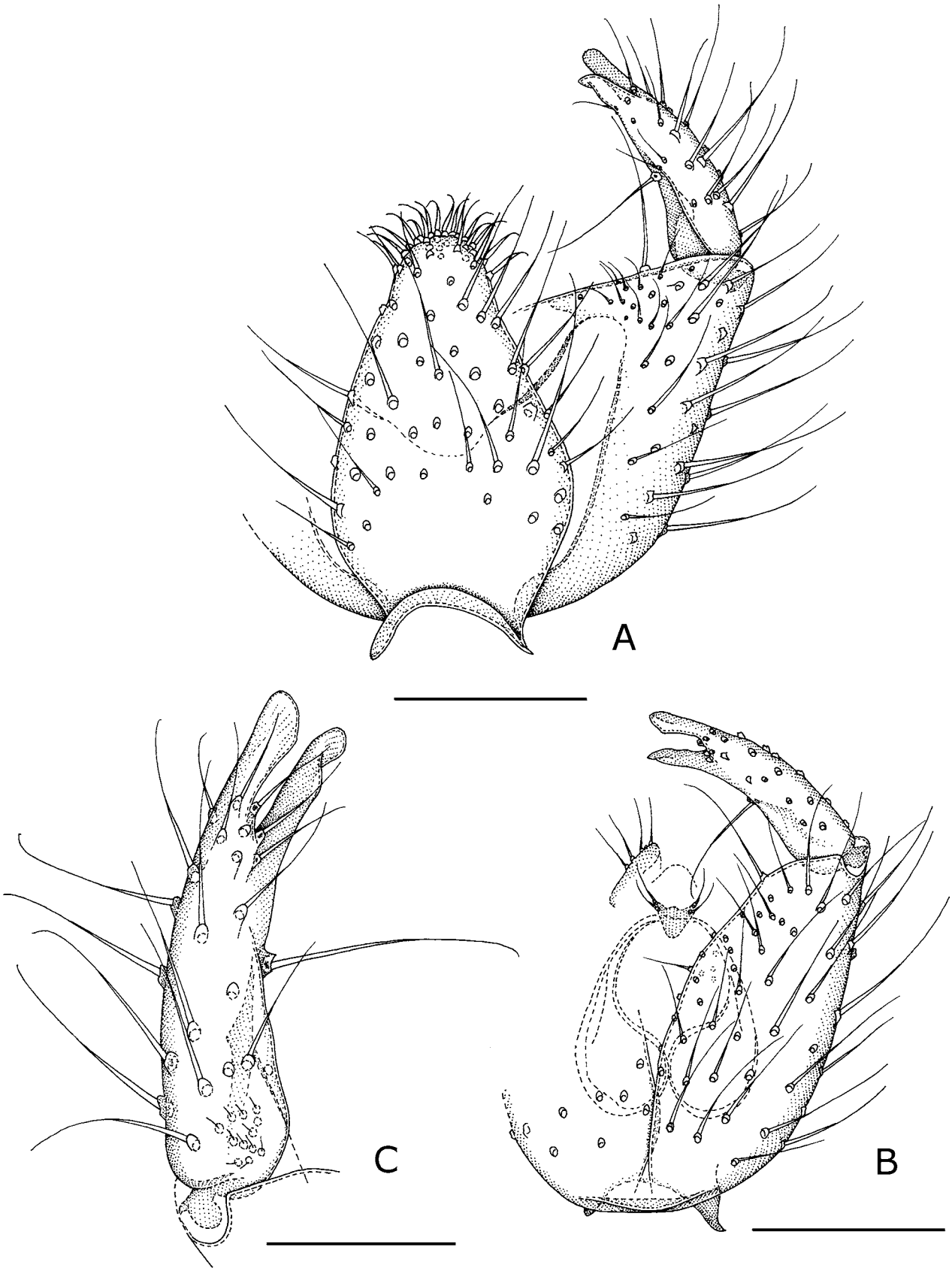

FIGURE 6. *Asiorrhina asiatica* (Senior-White), comb. n. A: Hypopygium, dorsal view; B: Hypopygium, ventral view; C: Gonostylus, ventral view; scale for A, B 0.1 mm, for C 0.05 mm.

***Asiorrhina parasiatica* sp. nov.**

Material studied. Holotype: Male, Malaysia, Sarawak, Gunung Mulu NP, Alluvial Forest, 23-29.10.1977, N.M. Collins, Malaise trap; slide mount in Euparal (BMNHE 819006). Paratype: male, same data as holotype (BMNHE 819004). Both specimens in BMNH.

Description. **Male. Measurements:** Head height 0.3 mm; body without head 2.0–2.3 mm (holotype 2.0); wing, measured from humeral vein, 1.3 mm; antenna 0.8 mm; proboscis 0.54–0.74 mm (holotype 0.54); palpus 0.28 mm.

Head (Fig. 2B) rounded, a little higher than wide. Frons bare; vertex and occiput covered uniformly with sparse dark setae. Two ocelli at vertex. Frontal furrow continues on vertex, forming a swelling at site of median ocellus. Eyes dichoptic, reniform, slightly protruding dorsally and with very slight emargination at antennal base. Ommatidia, round, relatively larger than in *A. asiatica*, 14-15 ommatidia across eye, equal in size, with interocular setae 1.3x ommatidium diameter. Antennae set in middle of head. Scape short, conical, pedicel more or less spherical. Flagellum 14-segmented (Fig. 3C). Bases of setae on flagellomeres form round depressions with indistinct folds between them rather than polygons. Flagellomeres 3–14 strongly compressed laterally, with long dorsal setae (length 0.5–1x width of flagellomeres) and short setulae anteriorly. Flagellomere 1 length 1.3x width, flagellomere 4 width 0.5x length, apical flagellomere length 2x width, also bearing a small apical articulated appendage (Fig. 3E). Clypeus elongated, length ~1.7x width, with two lateral setae at the middle of each side. Length of proboscis approximately 1.8x height of head. Palpi one-segmented, 0.65x length of proboscis, narrow in apical half. Labellum slightly swollen in apical 1/10, pointed apically.

Thorax (Fig. 4A). Scutum moderately convex, irregularly setose, with longer setae in anterior part; anterior margin same level as fore coxa. Scutellum with three pairs of setae. Antepronotum not separated clearly from proepisternum, bearing 4 long setae, proepisternum with 9 long setae. Laterotergite medium size, defined, with posteroventral group of 4–5 setae.

Legs. Fore coxae sparsely setose, with 9–10 anterior setae, 6–7 long medio-apical setae and one postero-apical seta. Mid coxae with 8–10 antero-apical and 6–8 latero-apical setae. Hind coxae bare. Tibial organ bordered on proximal side by horseshoe-shaped sclerotized crest (Fig. 4C). Mid tibia expanded in apical 1/3, width at apex 2x width at base. Mid tibial spur not equal, external about 2x internal. Hind legs not preserved on both specimens. Claws on fore and mid tarsi pointed.

Wing (Fig. 5B). Costal setae long, about 3x width of Costa. R with 15 long setae, other veins bare. Costa reaches wing apex, ends at $5/6^{th}$ of distance between R_5 and M_1 apices. R_5 straight. M stem reduced, though base of M_1 and M_2 fork conspicuous. M_1 strongly curved back, so reaches wing margin well posteriorly of wing apex. M_{3+4} sinusoid apically; CuA moderately curved posteriorly. Distance between apices of M_2 and M_{3+4} 1.7x distance between M_{3+4} and CuA. Vein *iCu* apparent, as strong as CuA. A_1 reaches only half of CuA length.

Abdomen. Tergite 8 not preserved. Tergite 9 shorter and more rounded than in *A. asiatica*, slightly shorter than gonocoxites, with long setae mainly in apical part but without apical spicules (Fig. 7A). Gonocoxites slightly tapering towards apex ventrally, less densely setose than in *A. asiatica*. (Fig 7B). Gonostylus shorter than gonocoxite, with two blunt, apical lobe-like teeth of equal length and a thin, long medial flagellate seta slightly distad of the middle of mesial margin (Fig. 7C).

Etymology. The specific name refers to its similarity to *A. asiatica*

Differential diagnosis. A. parasiatica is distinguished from *A. asiatica* by the following characters: 1) smaller, wing length 1.3 mm (compared to 1.5–1.7 mm); 2) two ocelli (not 3); 3) antennal flagellum strongly laterally compressed (rather than subcylindrical); 4) vein M_1 is complete (not basally reduced); 5) tibial organ proximally bordered by a horse-shoe shaped margin (not unbordered); and 6), male tergite 9 broader and its setosity is rather uniform (the apical setae not being shorter and stronger).

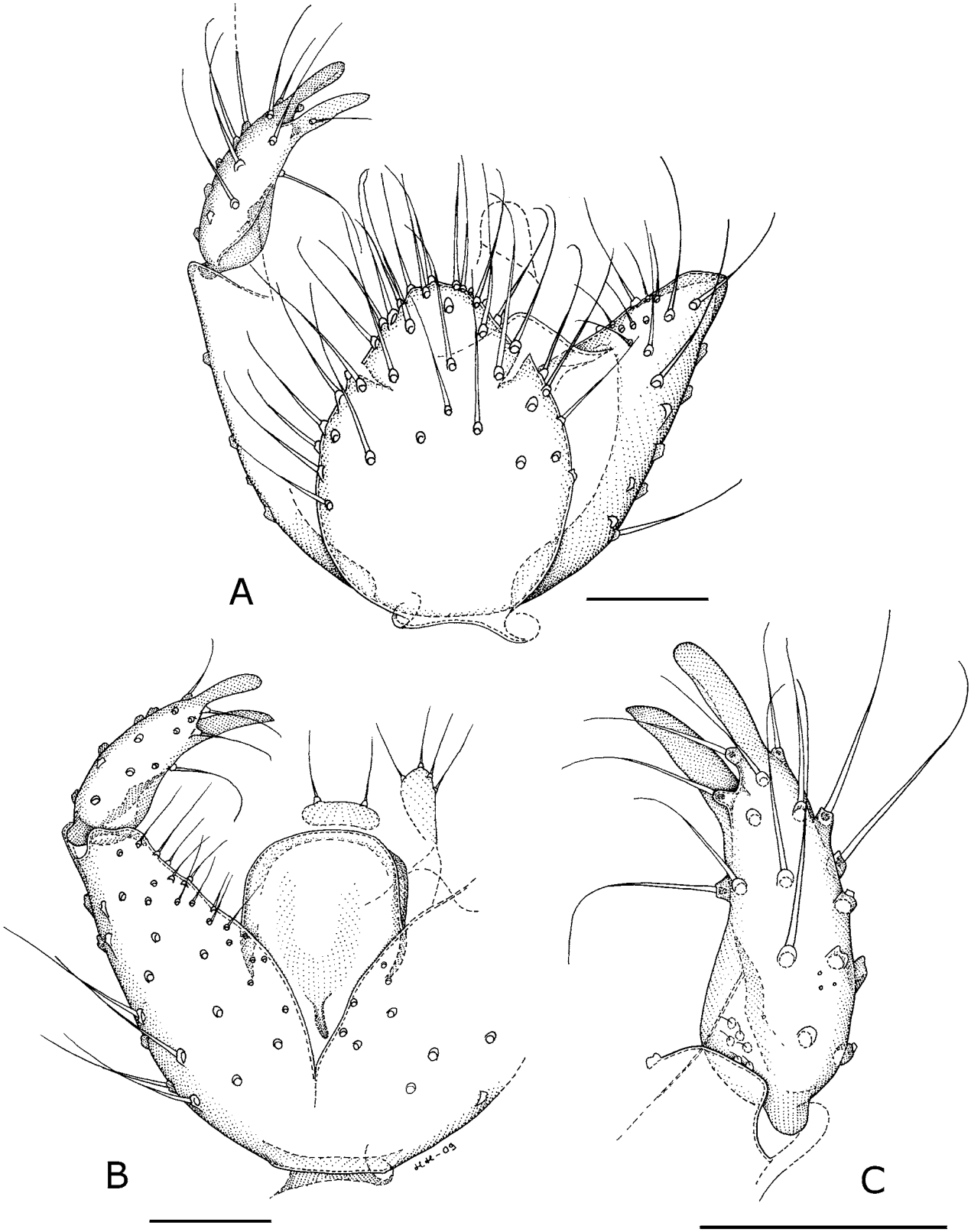

FIGURE 7. *Asiorrhina parasiatica*, sp. n. (paratype). A: Hypopygium, dorsal view; B: Hypopygium, ventral view; C: Gonostylus, ventral view; scale 0.05 mm.

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APPENDIX 1. Data matrix for phylogenetic analysis of Lygistorrhinidae.

	1111111111 2	22222222233333333334444444444555555555556
	1234567890123456789 0	12345678901234567890123456789012345678901234567890
Diadocidia ferruginosa	020?000000001001020 1	00001000000000000000001000010000000000201
Archaeognoriste	020000?010000000000 0	-0100000000010000000000?0000110??0?100-?0
Lebanognoriste	021000???0000000??0 0	-0210010000000000000?11?0000?0?000?1100?1
Plesiognoriste zherikhini	0220000010000000010 0	-0100110110000000001111?0001?00000?111-?0
Protognoriste amplicauda	0210000010000000010 1	0011011010001000001111?00011?0??0?011-?0
Leptognoriste davisi	0200000000000000010 1	1000001010??1000001100?00001?0000?1001?0
Palaeognoriste sciariforme	0030000100000000010 0	-?0010100100100000001101?00011?1111?100201
Palaeognoriste affine	0030000100000000010 0	-0001000010010000001101?00010?1111?100??1
Asiorrhina asiatica	1031000100000110020 1	00002011-1011000000000210000?00002100211
Asiorrhina parasiatica	1031000100100110020 1	00002011-1011000000100210???0002100211
Lygistorrhina sanctaecatherinae	2130100110000111111 1	10102011-1001000011100?00110000101100131
Lygistorrhina fijiensis	2130000110001111111 1	10112011-1???10111111?00010?0??11100131
Labellorrhina quantula	1030010100010001011 1	00112011110111100011010000110011111110120
Blagorrhina blagoderovi	1030011--1110001011 1	10112011-1001120001?000111010100111012 1
Gracillorrhina gracilis	0031001--0211000011[01]	00112010111110100011?000111010000111012 1
Loyugesa khuati	1030101--2011110020 0	-1112011-1111120001100001110?1??11110?1
Matileola yangi	2030101--0011111010 0	-0102011-1001000001110001110011101110121
Seguyola sp.	0030111--2010111010 0	-1102000111111121100?1000001001??0?110101