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## New Genera, Species, Synonymies, and Combinations in the “*Lygus* Complex” from Japan, with Discussion on *Peltidolygus* Poppius and *Warrisia* Carvalho (Heteroptera: Miridae: Mirinae)

TOMOHide YASUNAGA,<sup>1</sup> MICHAEL D. SCHWARTZ,<sup>2</sup> AND  
FRÉDÉRIC CHÉROT<sup>3</sup>

### ABSTRACT

Three new genera, *Pinalitopsis*, *Nepiolygus*, and *Apolygopsis*, are proposed to accommodate the following new species of Japanese mirine plant bugs: *P. rhodopotnia* from the Kii Peninsula and Shikoku, and *N. arare* and *A. furvocarinatus* from the Ryukyu Islands. A new species of the genus *Pachylygus* Yasunaga, 1994, *P. anthrax*, is also described from Shikoku. Several new synonymies are proposed: *Peltidolygus* Poppius, 1915 = *Zhengiella* Yasunaga and Lu, 1994; *Warrisia* Carvalho, 1986 = *Gotocapsus* Yasunaga and Nakatani, 1998; and *Warrisia huonensis* (Poppius, 1914) = *Lygus tonkinensis* Poppius, 1914. The following new combinations are established: *Peltidolygus scutellatus* (Yasunaga and Lu, 1994), *Warrisia deraeocoroides* (Yasunaga and Nakatani, 1998), *Apolygopsis elegans* (Zheng and Wang, 1983), *A. emeia* (Zheng and Wang, 1983), *A. mosaicus* (Zheng and Wang, 1983), *A. nigritulus* (Linnavuori, 1961), *A. picturatus* (Zheng and Wang, 1983), and *A. yunnananus* (Zheng and Wang, 1983). Two subgenera of *Lygocoris* Reuter, 1875, *Lygocorias* Yasunaga, 1992 new status and

<sup>1</sup> Associate Professor, Zoological Laboratory, Department of Science, Faculty of Education, Okayama University, Tsushimanaka 3-1-1, Okayama 700-8530, Japan. e-mail: yasunaga@ainosato.sap.hokkyodai.ac.jp

<sup>2</sup> Research Associate, Department of Entomology, American Museum of Natural History; c/o Systematic Entomology Section, ECORC, Agriculture and Agri-Food Canada, Central Experimental Farm, Ottawa, Ontario, K1A 0C6 Canada. e-mail: mds81052@hotmail.com

<sup>3</sup> Researcher, Laboratoire de Systématique et d'Ecologie animale, Université Libre de Bruxelles, c.p. 160/13, Av. F. D. Roosevelt 50, B-1050 Brussels, Belgium. e-mail: fcherot@ulb.ac.be

*Neolygus* Knight, 1917 new status, are raised to genera. The relationships between *Peltidolygus* and *Henrylygus* Schwartz, 1998, and among *Gianellia* Poppius, 1914, *Krausmiris* Carvalho, 1986, *Liistonotus* Reuter, 1906, and *Warrisia*, are discussed. Keys are provided to distinguish Japanese genera of the "Lygus complex" and species of *Peltidolygus* and *Warrisia*.

## INTRODUCTION

Many superficially similar species were placed in the genus *Lygus* Hahn 1833 by early workers. Schwartz and Foottit (1998) clearly diagnosed *Lygus*, noted that the genus is confined to the Northern Hemisphere, and agreed with the incertae sedis status for the majority of species currently placed in that genus (Schuh, 1995). Many former *Lygus* species presently placed in other mirine genera or not yet reclassified are cited as belonging to a taxonomically confused group loosely known as the "Lygus complex". This group of convenience is sorely in need of a critical worldwide investigation to correctly ascertain the generic placement of the contained species. Although some effort has been made to provide these correct generic assignments (e.g., Kelton, 1955; Carvalho, 1987; Schwartz, 1994; Schwartz and Kerzhner, 1997; Chérot and Schwartz, 1998; Lu and Zheng, 1998; Schwartz and Foottit 1998), many known and undescribed taxa in the complex still require systematic study.

In Japan, more than 70 species now placed in 16 genera within the "Lygus complex" were documented by Yasunaga (1991a, 1991b, 1991c, 1992a, 1992b, 1992c, 1994, 1996a, 1996b, 1996c), Yasunaga and Lu (1994), and Yasunaga and Nakatani (1998). As a result of recent investigations, four additional species were discovered in southwestern Japan. Of these, an undescribed species was found to belong to *Pachylygus* Yasunaga; however, the others could not be accommodated by any known genera. Herein we describe three new genera to provide appropriate systematic placement for these species, as well as the previously described *Apolygus elegans* (Zheng and Wang), *A. emeia* (Zheng and Wang), *A. mosaicus* (Zheng and Wang), *A. nigrutilus* (Linnavuori), *A. picturatus* (Zheng and Wang), and *A. yunnananus* (Zheng and Wang). Two genera recently described from Japan, *Zhengiella* Yasunaga and Lu and *Gotocapsus* Yasunaga and Nakatani, were found to be synonyms of

*Peltidolygus* Poppius and *Warrisia* Carvalho, respectively. The taxonomic status of these genera and their included species is also discussed. A key for the Japanese genera of "Lygus complex" is provided.

## MATERIALS AND METHODS

Terminology for genital structures, with slight modification, follows Slater (1950), Davis (1955), Kelton (1959), and Stonedahl (1988). Our abbreviations for structures are as follows: **ACH**: combined basal and sclerotized processes of the vesica, sensu Stonedahl (1988); **B structure**: B structure of the posterior wall, sensu Slater (1950) [or sigmoid process sensu Davis, 1955], plus the C structure of the posterior wall, sensu Slater (1950); **DLP**: dorsal labiate plate associated with the sclerotized rings, sensu Davis (1955) [F structure sensu Slater, 1950]; **PDL**: dorsolateral plate; **PmAp**: medial plate connecting the sclerotized rings; **PMS**: primary membranous sac of vesica, sensu Stonedahl (1988); **VLP**: ventral labiate plate of female genitalia, sensu Davis (1955) [near, G structure sensu Slater, 1950]. All measurements, if not noted, are given in millimeters. In the synonymic lists, only selected references are cited for known taxa; see Carvalho (1959), Kerzhner and Josifov (1999), Schuh (1995) for detailed listings. All scanning electron micrographs were of uncoated specimens taken on the FEI [Philips] XL30 ESEM of Agriculture and Agrifood Canada, Ottawa.

Depositories of the material examined are abbreviated in the text as follows: **AMNH** American Museum of Natural History, New York; **AM** Australian Museum, Sydney; **BPBM** Bernice P. Bishop Museum, Honolulu; **CAS** California Academy of Sciences, San Francisco; **CNC** Canadian National Collection, Agriculture and Agri-food Canada, Ottawa; **HUES** Biological Laboratory, Hokkaido University of Education, Sapporo; **MNHN** Muséum National d'Histoire Naturelle, Paris; **MNRJ** Museu Nacional (J.C.M. Carvalho collection), Rio de Janeiro; **MZHF**

Zoological Museum, University of Helsinki; **NSMT** Department of Zoology, National Science Museum, Tokyo; **ULB** Université Libre de Bruxelles, Brussels; **USNM** U.S. National Museum of Natural History, Washington, D.C.

## TAXONOMY

### *APOLYGOPSIS*, NEW GENUS

**TYPE SPECIES:** *Apolygopsis furvocarinatus*, new species.

**DIAGNOSIS:** Recognized by the small oval, rather tumid, brown body; the shiny and minutely punctate dorsum with densely distributed, silky simple vestiture; the short, vertical, anteriorly flattened head with a distinct, transverse basal carina on the vertex; the declivous posterior parts of the hemelytra; the fuscous, stout tibial spines; and the peculiar genitalia.

**DESCRIPTION:** Body brown, oval, rather tumid; dorsal surface shining, minutely punctate, with uniformly distributed, suberect simple vestiture. Head short with vertical orientation, distinctly flattened in front (fig. 14); vertex somewhat concave mesially, with a distinct, transverse basal carina (fig. 15); tylus slightly projecting (fig. 16). Antennal segment I shorter than eye or segment IV; segment II not incassate apically, shorter than pronotal width; segments III and IV filiform. Labium slender, reaching apex of mesocoxa. Pronotum uniformly and minutely punctate; calli weakly produced; collar about as thick as basal carina of vertex (fig. 14); scutellum flat, narrowly and transversely rugose; ostiolar peritreme rather large, subtriangular, with wide evaporative area. Hemelytra shallowly punctate, declivous at cuneal fracture. Metafemur rather tumid; tibial spines black, prominent; tarsomeres I shortest; tarsomeres II about as long as III. **Male genitalia:** Left paramere flattened basally, usually with a small, subapical prong (fig. 2), and expanded distal region with a constricted subapical region terminating in a little-curved apex (fig. 3); right paramere rather tumid, with a slightly reset apex (fig. 4). Vesica with two long, slender spiculi sheathed within a thin, trough-shaped sclerite, all three structures extend laterally from vesical base (figs. 5, 11). **Female genitalia:** Sclerotized

rings large, continuous mesially, with wide dorsal labiate plate (figs. 6, 12); posterior wall with mesially contiguous interrampal sclerites, lacking dorsal structure; interrampal lobes small, separated mesially; lateral lobes connected medially by a sclerite (figs. 7, 13).

**ETYMOLOGY:** Derived from the mirine generic name *Apolygus* China, to which the new genus seems to be related; gender feminine.

**DISCUSSION:** The new genus is similar in general appearance to *Apolygus* China, 1941, but the short head and peculiar genitalia of both sexes distinguish *Apolygopsis*. Specifically, the apical prong of the somewhat flattened left paramere and the vesica with two long, slender, basally fused spiculi sheathed within a trough-shaped sclerite are unique to *Apolygopsis*.

*Apolygopsis* appears to be related to *Apolygus* based on the general habitus and structure of the female genitalia, particularly the medially fused, ventrally curved, lateral lobes of the posterior wall with a protruding, spinulose median sclerite. This latter accessory structure is absent in *Neolygus* Knight, 1917, and although present in *Apolygus*, is not as spinulose. The narrow interrampal lobes of the new genus, while similar to those of *Apolygus*, are nevertheless not apically bulbous as in the latter genus, and in this feature, are like some species of *Neolygus*. The ventral margin of the posterior wall in the new genus is superficially similar to that of the insufficiently diagnosed species, *N. deraeocoroides* Knight, 1925, from North America (see Clayton, 1982: 35, fig. 36). The ventral margin of the new genus and *N. deraeocoroides* are elongated and not basally narrowed as in *Apolygus*, but more narrowed than in *Neolygus*.

Currently *Apolygus* is awarded generic rank, whereas *Neolygus* is considered a subgenus of *Lygocoris*, based primarily on similar habitus. Our analysis, as well as our phylogenetic studies (unpublished data) challenge this classical taxonomy. *Lygocoris* s. lat. is probably a polyphyletic group, lacking synapomorphic characters contrary to *Lygocoris* s. str., *Lygocoris* Yasunaga, 1992, and *Neolygus* which are diagnosed on unique male and female genital structure. Consequently, we suggest that these subgenera be

regarded as distinct genera and propose the following taxonomic changes: *Lygocorias*, new status and *Neolygus*, new status, as well as the implied new combinations for the species contained in both genera.

We consider *Apolygus nigrutilus* (Linnaevuori, 1961) (see Yasunaga, 1992b) with its similar habitus and vesical structure to belong to the new genus and therefore propose the new combination, *Apolygopsis nigrutilus*. Based on examination of the holotypes and illustrations of the male and female genitalia in Zheng and Wang (1983), we are in agreement with the remarks of Yasunaga and Yasunaga (2000) and consider herein as members of our new genus the species originally described as *Lygus* (*Apolygus*) *elegans* Zheng and Wang, *L.* (*A.*) *emeia* Zheng and Wang, *L.* (*A.*) *mosaicus* Zheng and Wang, *L.* (*A.*) *picturatus* Zheng and Wang, and *L.* (*A.*) *yunnananus* Zheng and Wang. The left paramere, right paramere, vesical spiculi and posterior wall of these Chinese species are apparently very similar to those of the new species herein described as *A. furvocarinatus*. All of Zheng and Wang's species have tumid right parameres and vesicae, which include two narrow, basally connected spiculi enclosed in a large trough-shaped sclerite. All the species, except *A. picturatus*, also possess a subapical prong on the left paramere. The subapical region of the left paramere in *A. picturatus* is more similar to that of *A. nigrutilus*. The female genitalia of the aforementioned species are most similar to those of *A. nigrutilus*. Zheng and Wang's taxa are undoubtedly congeneric with *A. furvocarinatus*; consequently, we transfer them to *Apolygopsis*.

***Apolygopsis furvocarinatus*, new species**

Figures 1–7, 14

**HOLOTYPE** ♂: JAPAN, **Ryukyus**, Yaeyama-Group, *Iriomote Is.*, Funaura, 10.v.1993, light trap, T. Yasunaga; deposited in the Biological Laboratory, Hokkaido University of Education, Sapporo.

**DIAGNOSIS:** Recognized by the small, oval body (fig. 1), brown general coloration, infusate transverse basal margin of the vertex, apical part of the tylus, and apex of the cuneus. Easily separated from congeners by the

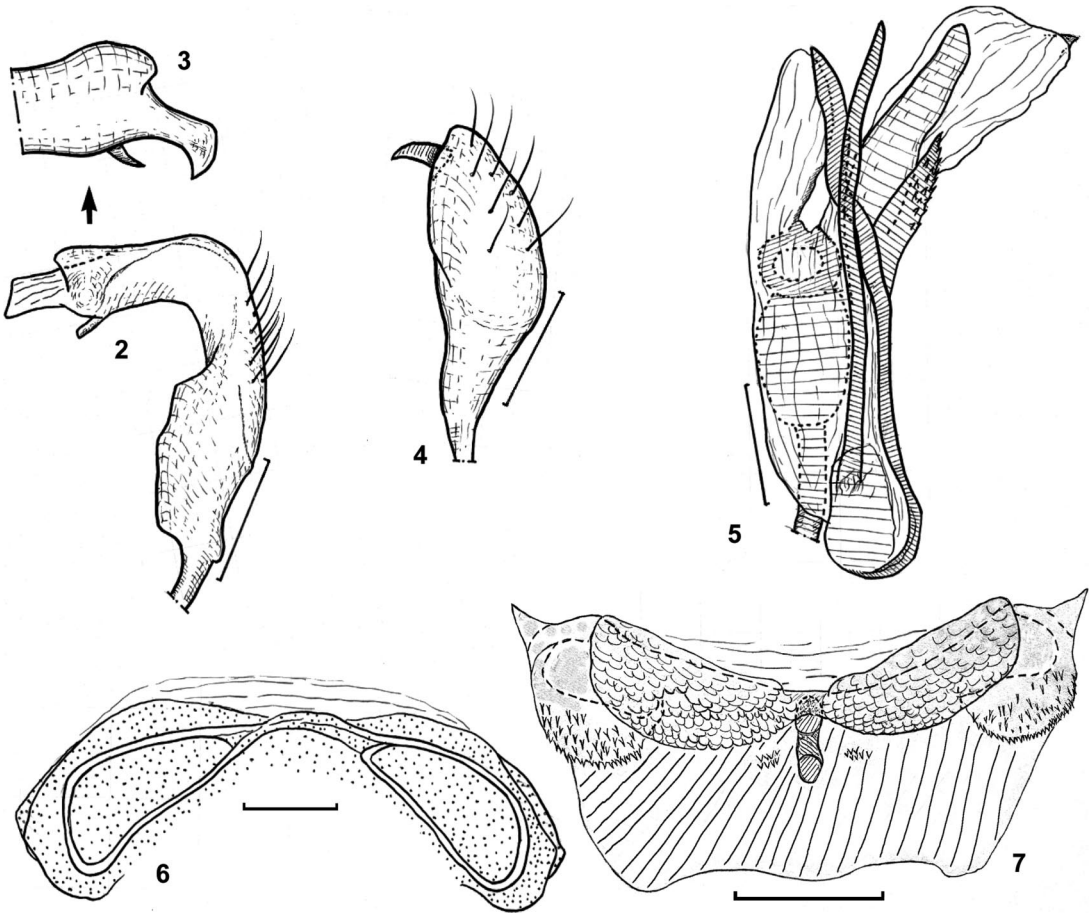


Fig. 1. *Apolygopsis furvocarinatus*, habitus photograph of adult male.

unique genitalia, particularly the left paramere of the male with an obvious subapical prong on the primary apophysis (figs. 2, 3) and large sclerotized rings and strongly developed ventral portion of the sigmoid process of the female (fig. 7).

**DESCRIPTION:** Body generally castaneous or sometimes pale brown; dorsal surface shining. Head with sparse, silky, erect setae; vertex shiny, rather narrow, 0.26–0.28 (♂)/0.34–0.38 (♀) times as wide as head across eyes, with fuscous, transverse basal carina; apical half of clypeus extensively fuscous (fig. 14). Antenna dark brown; segment I partly pale brown; basal third to half of segment II pale brown except fuscous extreme base; extreme bases of segments III and IV yellowish brown; lengths of segments I–IV (♂/♀): 0.40–0.44/0.37–0.45, 1.23–1.40/1.17–1.45, 0.64–0.74/0.63–0.75, 0.48–0.51/0.49–0.60. Labium pale brown; apical half of segment IV darker. Pronotum usually with a pair of dark spots on calli; collar shining,





Figs. 2–7. *Apolygopsis furvocarinatus*, male (2–5) and female (6–7) genitalic structures. 2. Left paramere. 3. Hypophysis. 4. Right paramere. 5. Vesica. 6. Sclerotized rings. 7. Posterior wall. Scales: 0.1 mm.

about as thick as basal carina of vertex. Hemelytra sometimes partly tinged with red; apical inner part of corium and apex of cuneus infusate; membrane somber grayish brown, with a few, semitransparent areas near apex of cuneus. Legs pale brown; metafemur usually with two dark apical annuli; tarsi pale brown; apical parts of tarsomeres III darkened; lengths of metafemur, tibia and tarsus ( $\delta/\eta$ ): 1.32–1.47/1.30–1.59, 1.87–2.10/1.80–2.22, 0.45–0.51/0.46–0.53. Genitalia as described above. **Dimensions** ( $\delta/\eta$ ): Total length 3.1–3.9/3.0–4.2; head width across eyes 0.88–0.98/0.86–1.01; vertex width 0.24–0.27/0.30–0.38; rostral length 1.21–1.35/1.30–1.43; mesal length of pronotum including collar 0.69–0.82/0.64–0.89; basal

pronotal width 1.21–1.46/1.24–1.65; width across hemelytra 1.44–1.71/1.48–1.95.

**ETYMOLOGY:** From the Latin *furvus* (= dark) in combination with *carinatus* (= keeled, carinate), referring to the prominent, darkened basal carina of the vertex of the new species.

**PARATYPES:** 52 specimens (CNC, HUES, NSMT, USNM) from the following localities: JAPAN: **Ryukyus**, Yaeyama-Group: *Iriomote Is.*: Nadara Riv.; Shirahama; Sonai; Urauchigawa Riv. *Ishigaki Is.*: Mt. Ban'na; Mt. Bansei (Maese); Mt. Omotodake; Nosoko; Omoto; Takeda, 140 m; without detailed locality.

**BIOLOGY:** Although the senior author collected some specimens by sweeping several

species of evergreen broadleaved trees, the only confirmed breeding host is *Pittosporum tobira* (Thunb. and Murray) Aiton (Pittosporaceae), on which teneral adults were found. Adults are often attracted to light.

*Apolygopsis nigrutilus* (Linnavuori, 1961),  
new combination

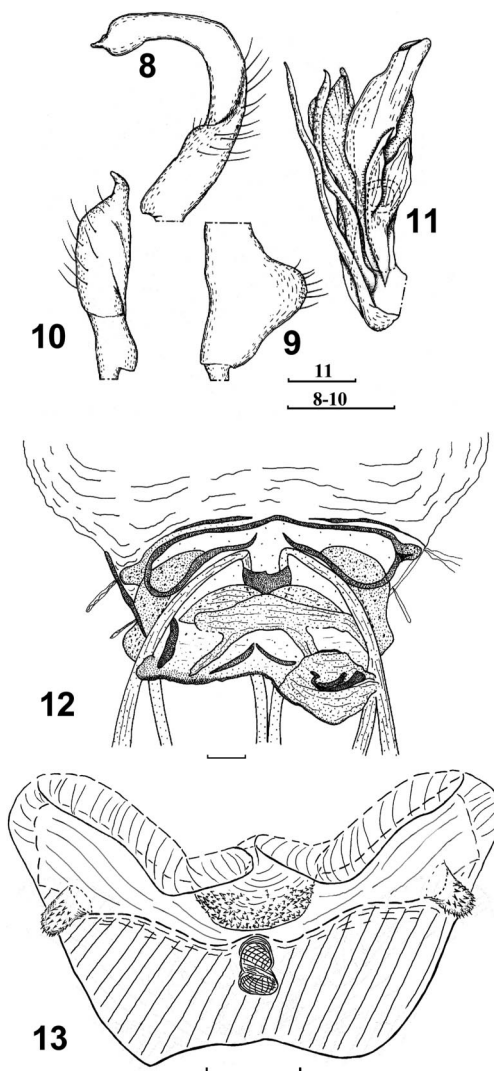
Figures 8–13, 15–16

*Cyphodema hilare* f. *nigritula* Linnavuori, 1961: 162 (as n. var.). *Lygus nigrutilus*: Linnavuori, 1963: 81 (n. comb., n. rank, male genitalia). *Lygocoris (Apolygus) nigrutilus*: Yasunaga, 1992b: 302–304 (redescription, male genitalia); Schuh, 1995: 800 (catalog). *Apolygus nigrutilus*: Kerzhner and Josifov, 1999: 66 (catalog); Yasunaga, 1999: 20 (list); Yasunaga and Yasunaga, 2000: 87 (list).

DIAGNOSIS: *Apolygopsis nigrutilus* is easily distinguished from *A. furvocarinatus* by the genitalia (figs. 8–13), especially the primary apophysis of the left paramere (fig. 8), the open medioposterior margin of the sclerotized rings (fig. 12), and the weak ventral development of the sigmoid process (fig. 13).

SPECIMENS EXAMINED: CHINA: **W. Hupeh**: Lichuan Distr.: Hsiaoho, 11, 22.viii.1948, Gressitt and Djou 1♂, 1♀ (CAS); Leong-Ho-Kow, 3400 ft, 6.ix.1948, Y.W. Djou 1♂ (CAS); Suisapa, 1000 m, 23, 25.vii.1948, 6, 9–21, 23, 27.VIII.1948, 8♂, 14♀ (CAS). JAPAN: Aoiva-Zawa, Kodomari-Mura, Aomori-Ken, 4.x.1987, T. Ichita 1♂ (HUES); Kamikoyano, Iwasaki-Mura, Aomori-Ken, 16.vii.1986, T. Ichita 1♂, 1♀ (HUES); Manodake, Aomori-shi, Aomori-ken, 14.viii.1988, T. Ichita 2♀ (CNC, HUES); Mitsumenai-gawa, Oowani-machi, Aomori-ken, 16.V.1987 and 20.iv.1986, T. Ichita 1♂, 2♀ (CNC); Tsubaigawa, Iwasaki-mura, Aomori-ken, 31.vii.1988 and 9.viii.1988, T. Ichita 1♂, 1♀ (CNC); Tsuta, Towadako-machi, Aomori-ken, 6.ix.1987, T. Ichita 1♂ (CNC).

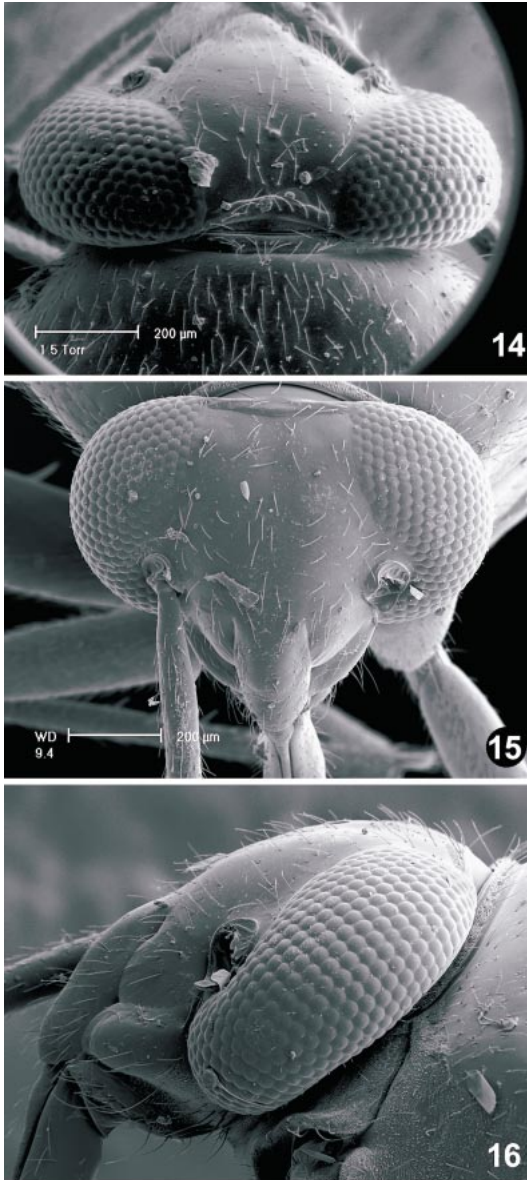
DISCUSSION: Even though the accessory lobes on the primary apophysis of the left paramere in *A. nigrutilus* (fig. 8) are smaller and more rounded than the subapical prong in *A. furvocarinatus* (figs. 2, 3), we deem both to be structurally similar. In the female, the posterior walls of both species are also similar, particularly the shared absence of a dorsal structure, the wide lateral lobe, includ-



Figs. 8–13. *Apolygopsis nigrutilus*, male (8–11) and female (12–13) genitalic structures. **8.** Left paramere. **9.** Sensory lobe of left paramere. **10.** Right paramere. **11.** Vesica. **12.** Sclerotized rings. **13.** Posterior wall. Scales: 0.1 mm.

ing a medial protuberance, and the small interramal lobes. However, the sigmoid process is more reduced in *A. nigrutilus* (fig. 13) than in *A. furvocarinatus* (fig. 7). The sclerotized rings are medioanteriorly joined in both species; however, but open posteriorly only in *A. nigrutilus* (fig. 12).

BIOLOGY: This bivoltine species is a known associate of Urticaceae, such as *Boehmeria spicata* (Thunb.) Thunb. and *Urtica*



Figs. 14–16. *Apolygopsis* species, scanning electron micrographs of adult male head. 14. *A. flavocarيناتus*, dorsal view. 15–16. *A. nigrifolius*. 15. Dorsal view. 16. Lateral view.

species (Yasunaga, 1992b). The two generations have distinct seasonal color variation: the dorsum of summer individuals is almost completely black, whereas the hibernating generation, which emerges in autumn, has a somber brownish body. This dull coloration may afford cryptic protection to the late sea-

son adults, which overwinter under litter at the base of trees (Yasunaga, 1992b).

#### *NEPIOLYGUS*, NEW GENUS

TYPE SPECIES: *Nepiolygus arare*, new species.

DIAGNOSIS: Distinguished by the thick, tiny, rounded body; continuously convex, oblique head and pronotum; fine, transverse basal carina of the vertex; strongly declivous posterior portion of the hemelytra; and the unique genital structure.

DESCRIPTION: Body rounded, tumid, tiny, 2.1–3.3 mm in length (fig. 17); dorsal surface shining, with uniformly distributed, suberect, silky simple setae. Head roundly oblique; eyes contiguous to pronotum, covering lateral part of collar; vertex with fine, but continuous, transverse basal carina; frons flat (fig. 29); tylus somewhat rounded distally. Antenna slender; segment I much shorter than eye; segment II slightly incrassate toward apex; segments III and IV filiform; the former about as long as pronotal length. Labium reaching apex of mesocoxa. Pronotum tumid, roundly declivous toward head, impunctate, shallowly and transversely rugose; calli reduced; collar very narrow, about as thick as basal carina of vertex (fig. 29); scutellum flat, weakly rugose; ostiolar peritreme rather large. Hemelytra short, rounded laterally, finely punctate, strongly declivous at cueneal fracture; membrane narrowed. Metafemur tumid; tibial spines pale brown, prominent; tarsomeres I shortest; tarsomeres II as long as III. Abdomen short. **Male genitalia:** Left paramere broad, with slightly developed sensory lobe (fig. 19); right paramere straight with somewhat flattened inward surface (fig. 20). Vesica strongly expanded laterally when inflated, widely and minutely spinulate, with two distinct, long spiculi; secondary gonopore small (fig. 21). **Female genitalia:** Sclerotized rings elongate oval, large (fig. 22); ventral labiate plate interrupted mesially; posterior wall with small, laterally situated interramal lobes and wide and mesially narrowed dorsal structure; interramal sclerite W-shaped, with a pair of small processes mesially (fig. 23).

ETYMOLOGY: From the Greek, *nepios* (= child, infant), in combination with the ge-





Figs. 17–18. *Nepiolygus arare*, habitus photographs. 17. Adult female. 18. Fifth instar nymph.

neric name *Lygus* Hahn, referring to petite size of the type species; gender masculine.

DISCUSSION: Judging from the structure of the vesica, this new genus appears to be related to *Prolygus* Carvalho, 1987, but is distinct in having the tiny, rounded body, continuously oblique head and pronotum, fine basal carina of the vertex, strongly declivous posterior part of the hemelytra, and unique genitalia. The following features are regarded as autapomorphies for the new genus: small, laterally situated interrampal lobe, widely and mesially narrowed dorsal structure, and a pair of small, mesal processes of the W-shaped interrampal sclerites. Along with *Nannomiris* Carvalho and Gomes, 1971, from Central America, the single species of *Nepiolygus* is one of the world smallest mirine plant bugs.

*Nepiolygus arare*, new species

Figures 17–23, 29

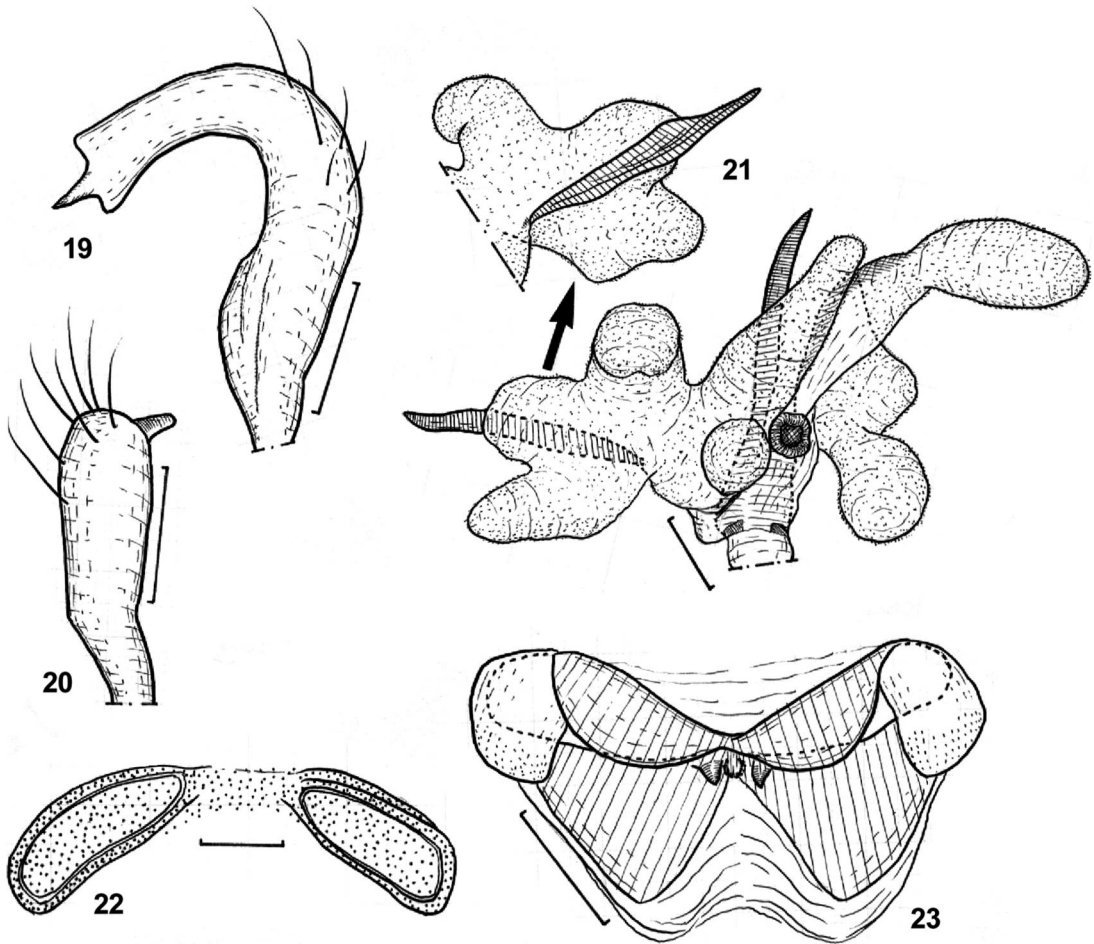
HOLOTYPE ♂: JAPAN, **Ryukyus**, Yaeyama-Group, *Ishigaki Is.*, Ban'na Park, 1997, M. Yasunaga; deposited in the Biological Laboratory, Hokkaido University of Education, Sapporo.

DIAGNOSIS: Easily recognized by the characters mentioned in generic diagnosis and the

generally pale green body with the narrowly infusate apical inner part of corium and apex of cuneus. The pretty green body fades quickly to yellow or brown after death. The final instar nymph has an almost entirely pale green, rounded body (fig. 18).

DESCRIPTION: Body generally shiny pale green. Head with silky, short pubescence; vertex 0.31–0.33 (♂)/0.37–0.40 (♀) times as wide as head across eyes. Antenna pale green; segments III and IV brown; lengths of segments I–IV (♂/♀): 0.33–0.41/0.33–0.42, 1.12–1.31/1.08–1.28, 0.73–0.75/0.69–0.80, 0.45–0.47/0.44–0.48. Labium pale brown, with infusate apex of segment IV. Pronotum shining, 0.3–0.4 times as long as width. Apical inner part of corium, apex of cuneus and anal ridge infusate; membrane pale grayish brown, with pale veins and a semitransparent area along apical part of cuneus. Legs pale green; tibial spines and tarsi pale brown; lengths of metafemur, tibia, and tarsus (♂/♀): 1.05–1.29/1.27–1.35, 1.50–1.79/1.69–1.92, 0.39–0.42/0.36–0.44. Genitalia as described above for genus. **Dimensions** (♂/♀): Total length 2.1–3.0/2.8–3.3; head width across eyes 0.72–0.86/0.76–0.87; vertex width 0.22–0.29/0.30–0.33; labium length 1.05–1.10/1.16–1.20; mesal length of pron-





Figs. 19–23. *Nepiolygus arare*, male (19–21) and female (22–23) genitalic structures. **19.** Left paramere. **20.** Right paramere. **21.** Vesica, posterior detail of lateral spicule. **22.** Sclerotized rings. **23.** Posterior wall. Scales: 0.1 mm.

otum including collar 0.60–0.75/0.75–0.84; basal pronotal width 1.08–1.29/1.21–1.44; width across hemelytra 1.32–1.47/1.44–1.76.

**ETYMOLOGY:** Named after Yasunaga's wife Miho-Arare, who enthusiastically collected specimens, including the holotype of this new species.

**PARATYPES:** 186 specimens (BPBM, CNC, HUES, NSMT, USNM) from the following localities: **JAPAN: Ryukyus:** *Iriomote Is.:* Komi; Mombanare nr. Otomi; Otomi; Shirahama; Takana; Torogawa. *Ishigaki Is.:* Ban'n'a Park; Mt. Ban'n'a; Mt. Omoto. *Okinawa Is.:* Yona, Kunigami Vil. *Yonaguni Is.:* Mt. Donan-dake.

**DISTRIBUTION:** Japan (Ryukyu Islands: Ishigaki, Iriomote, and Yonaguni islands).

**BIOLOGY:** Many specimens, including nymphs, were collected from the buds, fruits, and flowers of the presumed breeding hosts *Glochidion obovatum* Sieb. and Zucc. and *G. zeylanicum* (Gaertn.) A. Juss [= *G. hongkongense*] (Euphorbiaceae). Adults are sometimes attracted to light. This unique mirid is assumed to be multivoltine.

#### *PACHYLYGUS* YASUNAGA

*Pachylygus* Yasunaga, 1994: 124; Schwartz, 1994: 978 (discussion on diagnostic characters); Schuh, 1995: 860; Kerzhner and Josifov, 1999:

135. Type species: *Orthops japonicus* Kerzhner, 1977: 15, original designation.

**DISCUSSION:** This small genus, previously represented by three species, is distinguished from other Mirini by the oval, rather tumid body, noticeably arched scutellum; the left paramere with a thickened hypophysis; apical part of the vesica with a single, broad spiculum; front of secondary gonopore with a sclerotized plate; female genitalia with thick, rectangular sclerotized rings. Detailed generic characters were provided by Yasunaga (1994) and Schwartz (1994).

*Pachylygus* now contains four species endemic to Japan proper [two species are also found on Kanshir Island, the southernmost Kurile Island, currently in the Russian Federation, but of disputed political status]. Three species inhabit *Kalopanax pictus* (Thunb.) Nakai (Araliaceae); *Pachylygus japonicus* (Kerzhner, 1977) is associated with *Rosa multiflora* Thunb. (Rosaceae) (Yasunaga, 1994).

***Pachylygus anthrax*, new species**

Figures 24–28, 33–34

**HOLOTYPE** ♂: JAPAN, **Shikoku**, *Kochi Pref.*, Hongawa Vil., Teragawa, 1300–1400 m, on *Kalopanax*, 24.vii.1996, T. Yasunaga and M. Takai; deposited in the Biological Laboratory, Hokkaido University of Education, Sapporo.

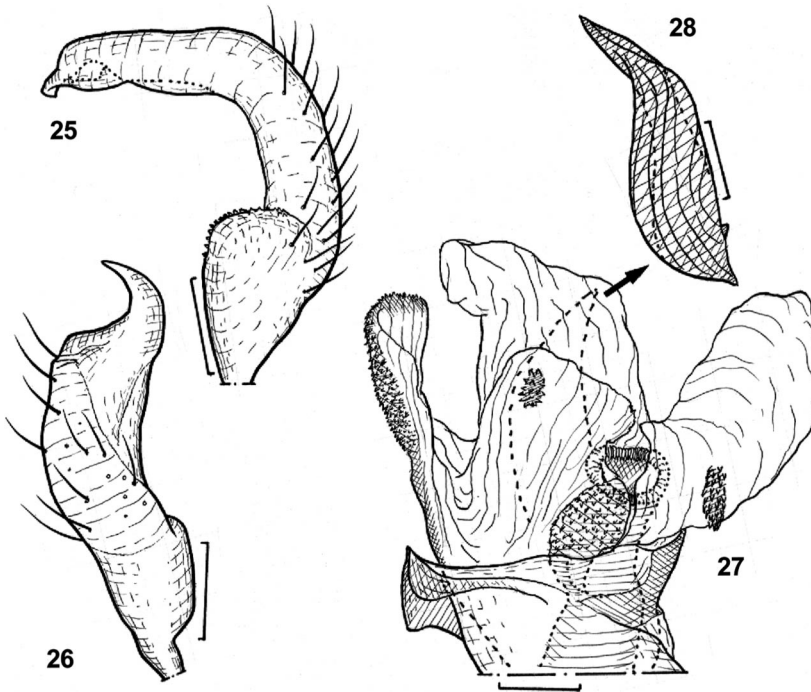
**DIAGNOSIS:** Recognized by the small body size (fig. 24), entirely fuscous scutellum, and male genitalia. Closely allied to *P. nigrescens* (Kerzhner, 1977) and *P. festivus* (Kerzhner, 1977) that are also *Kalopanax* inhabitants, the new species can be distinguished from the former by the much smaller body and from the latter by the almost concolorous fuscous corium, in addition to having an entirely dark scutellum, and unique male genitalia (figs. 25–28).

**DESCRIPTION:** Body generally fuscous, oval, rather tumid; dorsal vestiture composed of simple and silvery setae. Head chocolate-brown, shining, with silvery, upright setae; vertex slightly paler along inner margin of eye, 0.33–0.38 (♂)/0.39–0.42 (♀) times as wide as head across eyes, with a narrow, transverse basal carina; anteocular portion of head slightly produced (fig. 34). Antenna



Fig. 24. *Pachylygus anthrax*, habitus photograph of adult male.

fuscous; segment II partly brown, slightly incrassate, shorter than basal width of pronotum; segments III and IV filiform; lengths of segments I–IV (♂/♀): 0.52–0.57/0.54–0.56, 1.80–1.95/1.72–1.77, 0.88–0.95/0.78–0.98, 0.75–0.78/0.73–0.84. Labium dark brown, reaching apex of metacoxa; border of each segment slightly paler. Pronotum shining, sometimes slightly pale along midline, deeply and densely punctate, except for smooth calli, with uniformly distributed, silky, suberect simple setae; collar grayish brown, shagreened, broad, about as thick as antennal segment I; mesoscutum weakly pruinose; scutellum shiny, sometimes slightly pale medially, distinctly tumid, very finely punctate (fig. 33); pleura generally dark grayish brown, pruinose, posterior margin of ostiolar peritreme yellowish brown. Hemelytra almost unicolorously dark brown, somewhat shagreened, with uniformly distributed, reclining silvery setae; cuneus tinged with red; membrane somber grayish brown, with paler,



Figs. 25–28. *Pachylygus anthrax*, male genitalic structures. 25. Left paramere. 26. Right paramere. 27. Vesica. 28. Vesical spiculum. Scales: 0.1 mm.

narrow veins. Legs dark brown; lengths of metafemur, tibia, and tarsus ( $\delta/\eta$ ): 1.50–1.65/1.54–1.73, 2.25–2.40/2.25–2.36, 0.54–0.60/0.55–0.59. Abdomen dark brown. **Male genitalia:** Parameres rather broad; left paramere with sensory lobe protuberant, apically toothed basally (fig. 25); right paramere slightly broadened subapically, with tapered and hooked apex (fig. 26). Vesica with a spiculum (fig. 28) and spinulate hood in front of secondary gonopore; phallosome with distinct tubercle at apex (fig. 27). **Dimensions** ( $\delta/\eta$ ): Total length 4.5–5.0/4.6–5.1; head width across eyes 1.05–1.08/1.05–1.16; vertex width 0.36–0.39/0.43–0.45; rostral length 1.77–1.83/1.74–1.80; mesal length of pronotum including collar 0.91–0.93/0.93–1.05; basal pronotal width 1.59–1.68/1.65–1.85; width across hemelytra 1.95–2.00/1.98–2.25.

**ETYMOLOGY:** From the Greek *anthrax* (= coal, coal black), referring to the widely darkened coloration of the new species.

**PARATYPES:** JAPAN: **Shikoku:** *Ehime Pref.*: Odamiyama, 11.vi.1994, M. Takai 1 $\delta$  (HUES). *Kochi Pref.*: Kamegamori, Honga-

wa Vil., 10.vii.1993, T. Befu 1 $\delta$  (HUES); Motoyama T. Hongawa Vil., 23.vii.1996, K. Yoshizawa 1 $\delta$  (HUES); Mt. Shiraga, 1400 m, Monobe Vil., 25.vii.1996, Y. Nakatani 1 $\eta$  (HUES); same locality and date, light trap, T. Yasunaga et al. 2 $\delta$  (CNC, HUES); Shikoku, same data as for holotype (CNC, HUES) 4 $\delta$ , 7 $\eta$ ; Teragawa, Hongawa Vil. 1.vii.1995, I. Yamashita 1 $\delta$  (HUES).

**DISTRIBUTION:** Japan (montane areas of Shikoku).

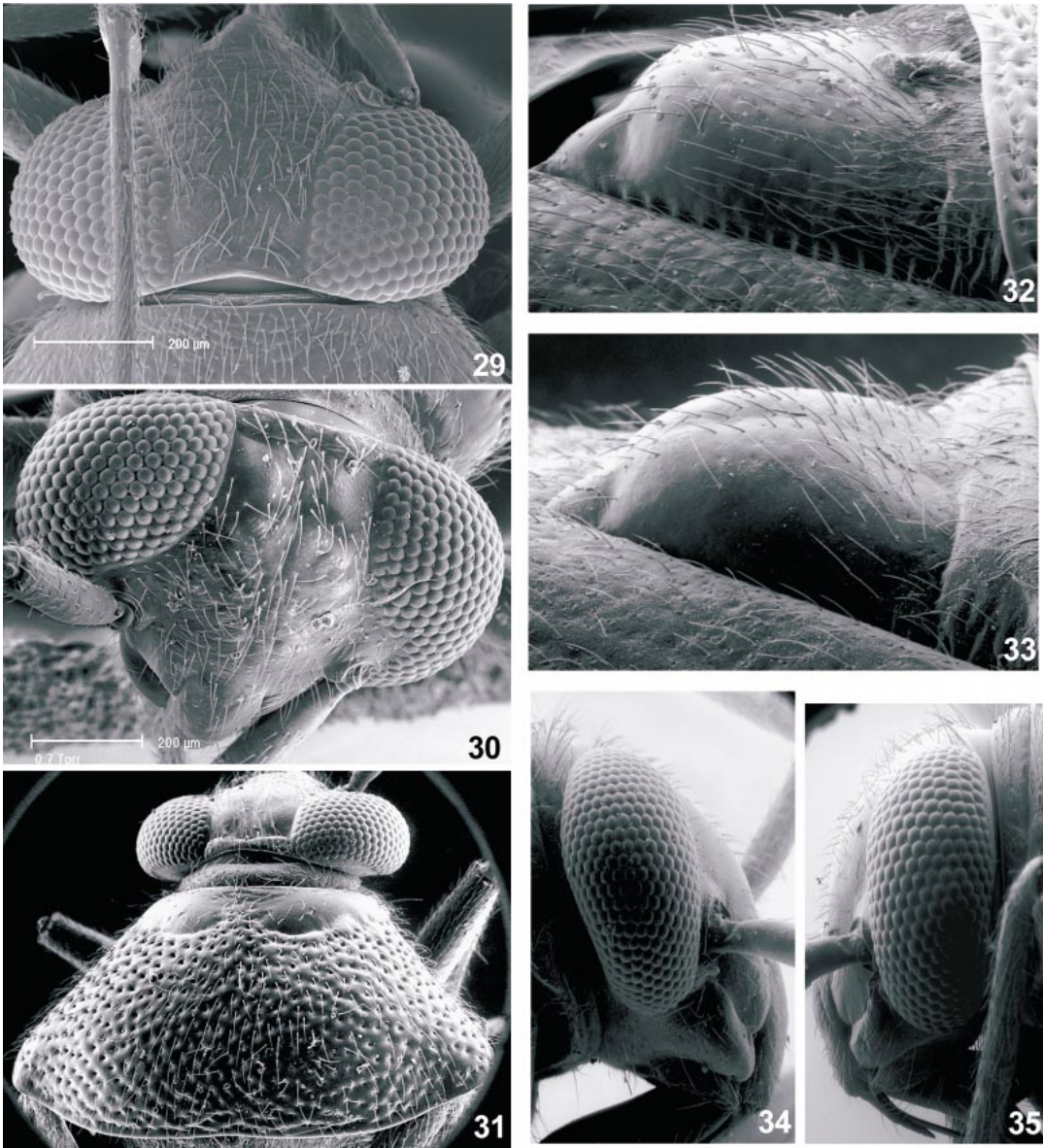
**BIOLOGY:** This species is strictly associated with *Kalopanax pictus* (Thunb.) Nakai (Araliaceae), and has a univoltine life cycle. Adults are occasionally attracted to light.

#### *PINALITOPSIS*, NEW GENUS

**TYPE SPECIES:** *Pinalitopsis rhodopotnia*, new species.

**DIAGNOSIS:** Recognized by the elongate body, moderate size, dense, sericeous dorsal vestiture, short labium, broad collar, long pronotum with dense, distinct punctures, and the unique genital structure. Sexually dimor-





Figs. 29–35. Scanning electron micrographs. **29.** *Nepiloygus arare*, dorsal view of adult male head. **30–32.** *Peltidolygus scutellatus*, adult male. **30.** Anterior view of head. **31.** Dorsal view of head and pronotum. **32.** Lateral view of scutellum. **33, 34.** *Pachylygus anthrax*. **33.** Lateral view of scutellum. **34.** Lateral view of head. **35.** *Pinalitopsis rhodopotnia*, lateral view of head.

phic female much paler, more reddish brown and larger than the male.

**DESCRIPTION:** Body elongate, nearly parallel-sided (figs. 36–37); dorsal surface with densely distributed, silky vestiture. Head rather oblique, not strongly pointed in front (fig. 35); vertex very weakly carinate basally.

Antenna shorter than body, densely covered with brown, stiff, suberect setae; segment I as long as, or shorter than, eye, about as thick as pronotal collar; segment II cylindrical, not incrassate apically; segments III and IV slender. Labium short, broad, exceeding procoxa, but not reaching apex of mesocoxa. Prono-



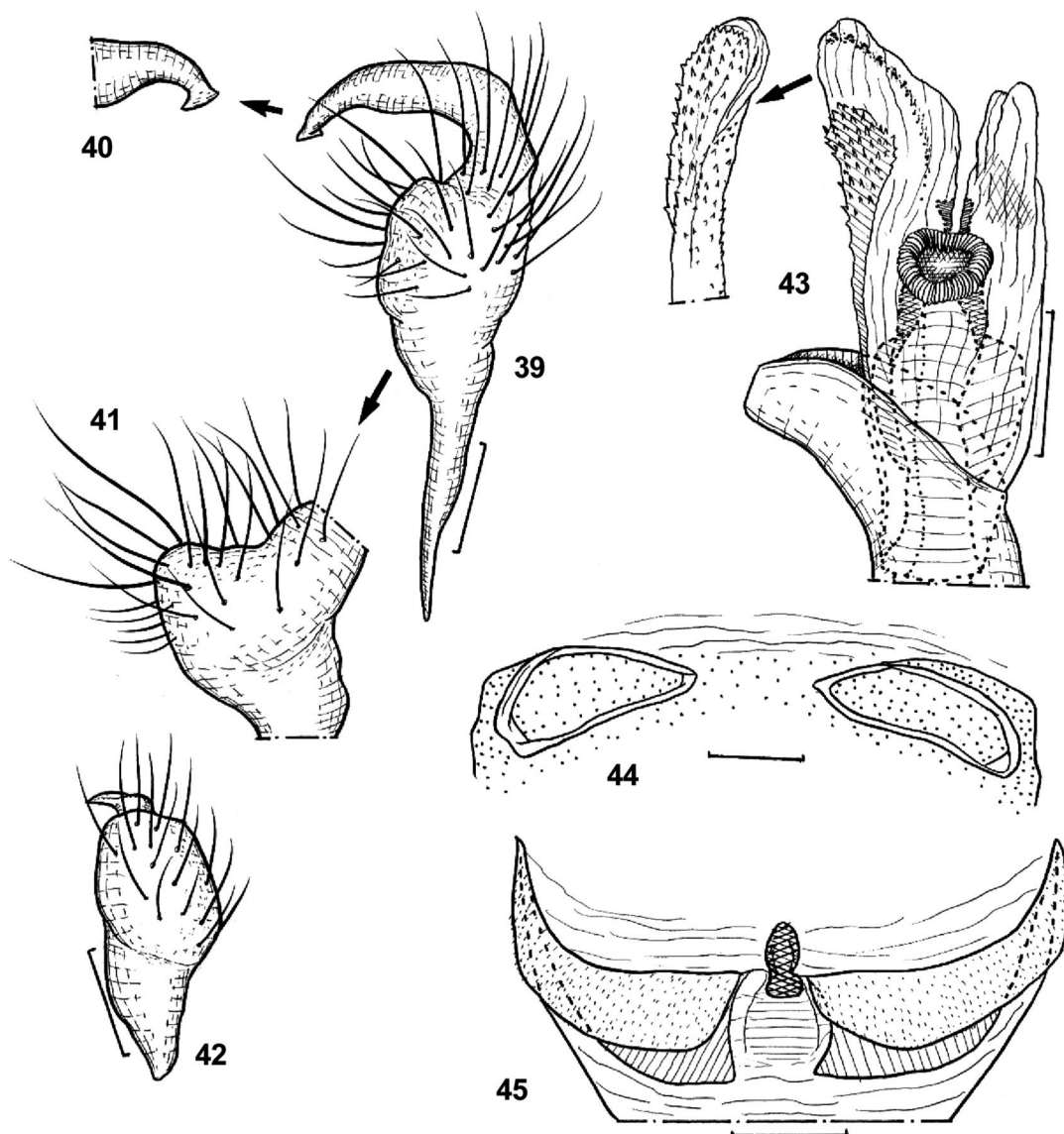
Figs. 36–38. *Pinalitopsis rhodopotnia*, habitus photographs. 36. Adult male. 37. Adult female. 38. Fifth instar nymph.

tum long, about 0.62–0.66 times as long as basal width, densely and deeply punctate, transversely rugose between calli, with uniformly distributed, silky, suberect simple setae; calli narrow, impunctate; collar broad (fig. 35), shagreened; scutellum arched, transversely wrinkled. Hemelytra finely punctate, somewhat shagreened, densely covered with simple, suberect vestiture. Legs moderate in length; tibial spines pale brown; length of tarsomere III about equal to combined lengths of I and II. Abdomen even with or shorter than apex of membrane. **Male genitalia:** Parameres with conspicuous, long setae; left paramere with rather roundly produced sensory lobe and apically narrowed hypophysis (figs. 39–41); right paramere shortened, with small, pointed hypophysis (fig. 42). Vesica mostly membranous, with spinose areas apically, lacking spiculi; secondary gonopore rather large, thick-rimmed; ejaculatory duct expanded subapically; phal-

lothea smooth (fig. 43). **Female genitalia:** Sclerotized ring ovoid, enlarged (fig. 44); posterior wall with median process, lacking dorsal structure and lateral lobe; interramal lobes and interramal sclerite divided mesially (fig. 45).

**ETYMOLOGY:** Derived from the mirine generic name *Pinalitus* Kelton, to which the new genus seems to be related; gender feminine.

**DISCUSSION:** This new genus appears to be related to the Holarctic genus *Pinalitus* Kelton, 1955, from which it is easily distinguished by the characters as diagnosed above, and the membranous vesica without any spiculi, enlarged, ovoid sclerotized ring, and posterior wall lacking the dorsal structure. The preceding genitalic characters, sexually dimorphic coloration, very short labium, and the conspicuously long setae on the parameres are considered to be autapomorphic for the new genus. *Pinalitopsis* also ex-



Figs. 39–45. *Pinalitopsis rhodopotnia*, male (39–43) and female (44–45) genitalic structures. 39. Left paramere. 40. Apex of hypophysis. 41. Sensory lobe. 42. Right paramere. 43. Vesica, posterior detail of dorsal spinulate area. 44. Sclerotized rings. 45. Posterior wall. Scales: 0.1 mm.

hibits affinity with *Metasequoiamiris* Schwartz, recently proposed to accommodate a single Chinese species, *M. carvalhoi* Schwartz (1995). *Pinalitopsis* is distinguished from the latter genus by the larger size, flat, not rounded frons, very short labium, pigmented collar, and different genital structure. The members of the present new genus, *Pinalitus* Kelton, and *Metasequoia-*

*miris* Schwartz are associated strictly with conifers, and the three genera appear, at least superficially, to be more closely related to each other than to other genera of the “*Lygus* complex”. In the key to the “*Lygus* complex” genera of Japan (below) *Pinalitopsis* runs with *Nepiolygus* but is distinguished by the shorter labium and the posterior margin of head removed from the pronotal collar.



*Pinalitopsis rhodopotnia*, new species

Figures 35–45

HOLOTYPE ♂: JAPAN, **Shikoku**, *Kochi Pref.*, Mt. Shiraga, 600–1400 m, Monobe Vil., on *Cephalotaxus harringtonia*, 25.vii.1996, M. Takai; deposited in the Biological Laboratory, Hokkaido University of Education, Sapporo.

DIAGNOSIS: Easily recognized by the characters mentioned in the generic diagnosis. The male of the new species is similar in general appearance to *Pinalitus nigriceps* Kerzhner, 1988 and the female is similar to *P. rubeolus* (Kulik, 1965). *Pinalitopsis rhodopotnia* is readily distinguished from these *Pinalitus* species by the shorter labium, large punctures on the longer pronotum, and the broader collar. The fifth instar-nymph of this new species is recognized by the entirely pale green, elongate-oval body (fig. 38).

DESCRIPTION: *Male*. Head dark chestnut brown, shining, with silky, erect vestiture; pale brown on inner margin of eye and partially on mandibular and maxillary plates; vertex 0.29–0.30 times as wide as head across eyes. Antenna dark brown, partly tinged with red; segment II reddish brown basally; lengths of segments I–IV: 0.51–0.53, 1.50–1.77, 0.85–0.93, 0.54–0.65. Labium pale brown, segment IV infusate apically. Pronotum shiny fuscous; collar reddish brown to dark brown, pruinose; mesoscutum and scutellum dark brown; apex of the latter slightly paler; pleura pale brown, widely pruinose; propleuron shiny black, punctate. Hemelytra unicolorously somber dark brown; membrane somber grayish brown, with veins slightly tinged with red. Coxae and legs yellowish brown; femora usually widely dark red apically; tibiae tinged with red, with pale brown spines; tarsomeres III apically darkened; lengths of hind femur, tibia and tarsus: 1.57–1.65, 2.10–2.37, 0.55–0.62. Abdomen dark brown, widely yellow ventromesially except for darker genital segment. Genitalia as described above. **Dimensions** (♂/♀): Total length 4.5–4.8/5.5–5.7; head width across eyes 0.96–1.01/1.05–1.06; vertex width 0.28–0.30/0.41–0.43; rostral length 1.17–1.22/1.24–1.34; mesal length of pronotum including collar 0.88–0.98/1.08–1.11; basal pronotal width 1.42–1.49/1.65–

1.74; width across hemelytra 1.62–1.65/1.95–2.03.

*Female*. Similar to male in structure, but significantly different in coloration and size. Body generally pale reddish brown. Vertex, frons, and tylus sometimes darkened; vertex 0.39–0.41 times as wide as head across eyes. Antenna dark brown, except segment I and more than basal 1/5 of segment II pale reddish brown; lengths of segments I–IV: 0.49–0.51, 1.45–1.50, 0.97–1.05, 0.63–0.73. Pronotum and scutellum sometimes brown; collar pale grayish brown. Tibiae and tarsi pale brown; tarsomeres III somewhat darker apically; lengths of metafemur, tibia, and tarsus: 1.80–1.83, 2.25–2.40, 0.60–0.63. Abdomen unicolorously pale reddish brown. Genitalia as described above.

ETYMOLOGY: From the Greek *rhodon* (= red) in combination with *potnia* (mistress, queen), referring to the mostly reddish brown females of the new species.

PARATYPES: JAPAN: **Honshu**: *Wakayama Pref.*, Tanabe-Fudono, 10.vii.1988, S. Gotoh 2♂ (HUES). **Shikoku**: *Kochi Pref.*, Befu, Monobe Vil., light trap, 19.vii.1992, I. Yamashita 2♂ (CNC, HUES); Monobe Valley, 12.ix.1993, Ali and Takai 1♀ (HUES); same data as for holotype, on *C. harringtonia* and *Abies firma* 4♂, 4♀ (CNC, HUES); same data as for holotype except collector, T. Yasunaga 4♀ (HUES).

DISTRIBUTION: Japan (Kii Peninsula of Honshu, montane areas of Shikoku).

BIOLOGY: The presence of nymphs (fig. 38) confirms the host association with *Cephalotaxus harringtonia* (Knight) K. Koch (Cephalotaxaceae). Some adults were also collected on *Abies firma* Siebold and Zucc. (Pinaceae).

# DISCUSSION OF *PELTIDOLYGUS* AND *WARRISIA*, WITH NEW SYNONYMIES AND NEW COMBINATIONS

## *PELTIDOLYGUS* POPPIUS

*Peltidolygus* Poppius, 1915: 64 (n. gen.); Schuh, 1995: 862. Type species: *Peltidolygus puncti-collis* Poppius, 1915, original designation (holotype by monotypy).

*Zhengiella* Yasunaga and Lu, 1994: 41–45 (n. gen.); Kerzhner and Josifov, 1999: 182. Type



Fig. 46. *Peltidolygus scutellatus*, habitus photograph of adult female.

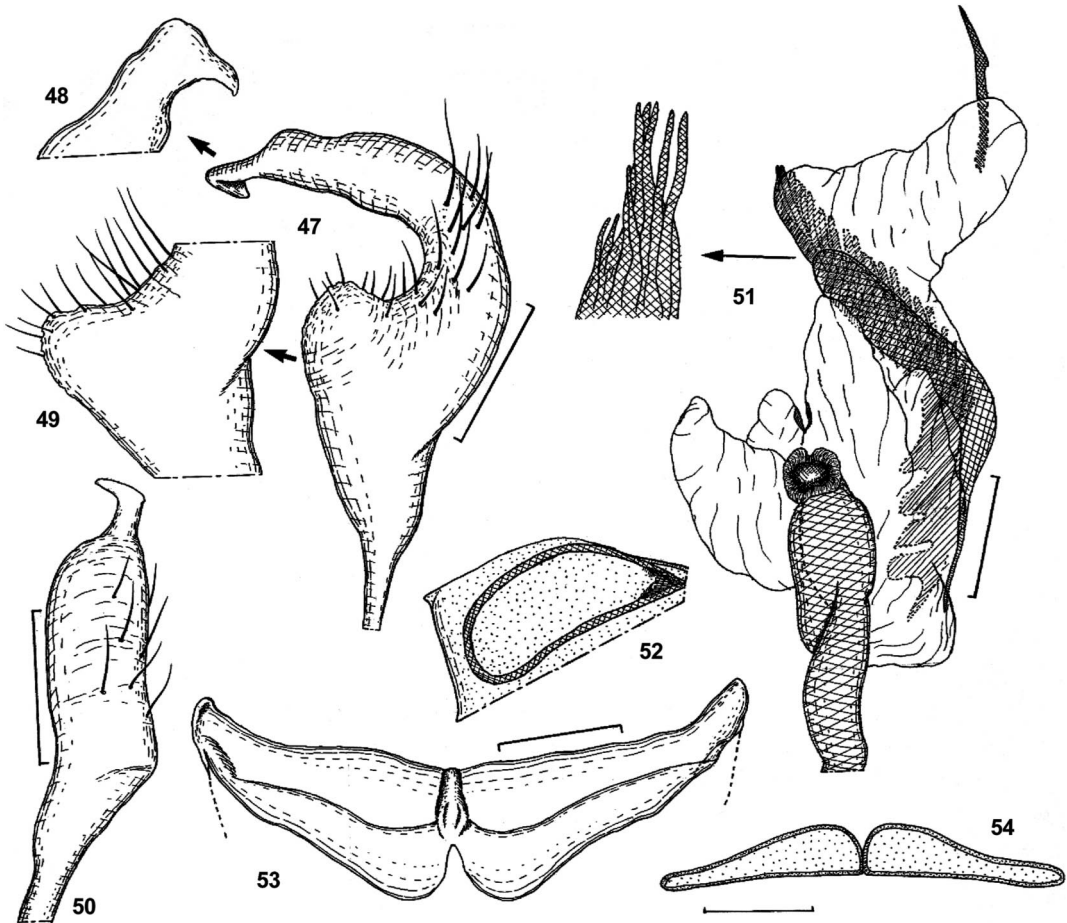
species: *Zhengiella scutellata* Yasunaga and Lu, 1994. NEW SYNONYMY.

**DESCRIPTION:** A good diagnosis and description of the genus were provided by Yasunaga and Lu (1994) and are not repeated here.

**DISCUSSION:** Based on examination of the holotypes, we consider the type species of *Peltidolygus* and *Zhengiella* synonyms. Their habitus (fig. 46), transversely striate frons (fig. 30), pronotal and hemelytral punctation (fig. 31), dorsal vestiture, and tumid scutelli (fig. 32) are nearly identical. The conspicuous pattern of the scutellum, yellow with a pair of dark posterolateral patches separated by a large clear medial stripe, the red lateromedial spot and darker apex of the cuneus, and the female genital structures are also similar in both taxa. Consequently, we declare both species to be congeneric and suggest the new synonymy.

According to Schwartz and Footitt (1998:

328), *Peltidolygus* “bears a remarkable external similarity to *Henrylygus*” recently described from North America. The body shape and length, color pattern (except for the venter), and pilosity are very similar. These taxa share dorsal pilosity composed of “long, dense, black, simple setae and white sericeous setae” (Schwartz and Footitt, 1998: 327), intermixed with white simple setae, the uncommon presence of black setae on the posterior margin of the vertex, and the pattern on the scutellum. Upon detailed examination, however, we found a preponderance of other characters which indicate that any similarity between the two taxa is strictly superficial. The phylogenetic relationships between *Peltidolygus* and *Henrylygus* are beyond the scope of this study. The following characters distinguish the two genera: (1) pronotal calli fused anteriorly in *Peltidolygus*, totally separated in *Henrylygus*; (2) posterior margin of the pronotum practically straight medially in *Peltidolygus*, but obviously concave medially in *Henrylygus*; (3) scutellum ampullate posteriorly in *Peltidolygus*, slightly tumid in *Henrylygus*; (4) punctuation of scutellum sparse and superficial in *Peltidolygus*, denser and deep in *Henrylygus*; (5) venter yellow in *Peltidolygus*, dark brown with two pale lateral stripes in *Henrylygus*; (6) sensory lobe of left paramere lacking large teeth in *Peltidolygus*, these teeth obvious in *Henrylygus*; (7) pilosity of left paramere stiffer in *Peltidolygus* than in *Henrylygus*; (8) vesica bearing an apical lobal sclerite, but lacking a ACH in *Peltidolygus*, lacking a lobal sclerite and with a ACH in *Henrylygus*; (9) PMS more complex in *Peltidolygus* (i.e., including some small “supplementary” lobes) than in *Henrylygus*; (10) main lobe of PMS bearing a ctenoidal process in *Peltidolygus* that is not present in *Henrylygus*; (11) main lobe of PMS membranous in *Peltidolygus*, the “large lobe of vesica” (probably homologous to main lobe of *Peltidolygus*) of *Henrylygus* strongly sclerotized and partially covered by a spinose field, not membranous; (12) posterior wall lacking median process in *Peltidolygus*, this structure present in *Henrylygus*; (13) interramal sclerites narrower in *Peltidolygus* than in *Henrylygus*; (14) dorsal structure absent in *Peltidolygus*, present in *Henrylygus*.



Figs. 47–54. Genitalic structures of *Peltidolygus* species, *P. scutellatus*, male (47–51) and female (52, 53) and *P. puncticollis* (54). 47. Left paramere. 48. Apex of hypophysis. 49. Sensory lobe. 50. Right paramere. 51. Vesica. 52. Sclerotized ring. 53. Posterior wall. 54. Vaginal sclerite. Scales: 0.1 mm.

The issue of whether the type species for *Peltidolygus* and *Zhengiella* are distinct is not clear. The dorsal coloration pattern is the same for both species, but *P. scutellatus* appears to be smaller, narrower, and darker than *P. puncticollis*. (*P. puncticollis*: length 5.0 mm; width 2.2 mm; head, including vertex, first and second antennal segments, except apices, and pronotal disc yellow *P. scutellatus*: length, 3.5–4.0 mm; width 1.78–1.88 mm; head, depression of vertex medially, and first and second antennal segment brown or dark brown). The female genital structures are also practically identical. The sclerotized rings of *P. scutellatus* (fig. 52), as those of the holotype of *P. puncticollis*, are narrow,

lacking PmAp, and reinforcement of DLP, VLP, or PDL. In both taxa, the interrampal sclerites of posterior wall are fused and winglike (fig. 53); the median process is reduced to its dorsal portion (= sigmoid process sensu Davis, 1955); the lateral lobes are very large and fused to the median structures; the interrampal lobes are present, but not obvious. The dorsal wall of the holotype of *P. puncticollis* bears a small sclerite parallel to the posterior wall and having the same shape as the interrampal sclerites (fig. 54). The male of *P. puncticollis* is unknown; the male genital structures of *P. scutellatus* are as indicated in figures 47–51.

In light of this discussion and considering



that infraspecific variability is almost completely unknown (primarily due to the absence of additional specimens from India), we suggest maintaining two nominal species of *Peltidolygus*.

#### KEY TO *PELTIDOLYGUS* Species

1. Total length greater than 4.5 mm, maximum width greater than 2 mm; head uniformly yellow; pilosity of pronotal collar scattered; silky hemelytral pilosity, dense but not clumped; N. India ..... *P. puncticollis* Poppius
- Total length less than 4.5 mm, maximum width less than 2 mm; head brown, darker medially; pilosity of pronotal collar dense, erect; silky hemelytral pilosity, dense, obviously clumped; Guangxi Autonomous Region (China), Ryukyu Islands (Japan) ..... *P. scutellatus* Yasunaga and Lu

#### *Peltidolygus puncticollis* Poppius

Figure 54

*Peltidolygus puncticollis* Poppius, 1915: 64–65 (n. sp.).

SPECIMEN EXAMINED: INDIA: “Sikkim. Regenzeit. H. Fruhstorfer” (also with the following labels: “Mus. Zool. H:fors. Spec. typ. no. 10196”; “Mus. Zool. Hels. Loan nr HE 96–38”; “*Peltidolygus puncticollis* Popp./*Peltidolygus puncticollis* n. gen. et n. sp.” [handwritten]) 1 ♀ (holotype, MZHF).

*Peltidolygus scutellatus* (Yasunaga and Lu), new combination

Figures 30–32, 46–53

*Zhengiella scutellata* Yasunaga and Lu, 1994: 43–44 (n. sp.).

SPECIMENS EXAMINED: JAPAN: **Ryukyus:** *Okinawa Is.*: Mt. Terukubi, Kunigami Vil., 19. iv. 1986, light trap, T. Yasunaga 2♂, 1♀ (paratypes, CNC, HUES); Okunirindo, 23. iv. 1986, light trap, T. Yasunaga 1♀ (paratype, HUES); Okunirindo, Kunigami Vil., 14. v. 1998, light trap, Y. Nakatani 1♂ (HUES); Okunirindo, Kunigami Vil., vi. 1999, T. Yasunaga and M. Takai 3♂, 2♀ (HUES); Yona, Kunigami Vil., 20–25. v. 1993, light trap, T. Yasunaga 2♂ (paratypes, HUES).

#### WARRISIA CARVALHO

*Warrisia* Carvalho, 1986: 493–494 (n. gen.); Schuh, 1995: 971. Type species: *Lygus huonensis* Poppius, 1914b, original designation.

*Gotocapsus* Yasunaga and Nakatani, 1998: 29–30 (n. gen.). Type species: *Gotocapsus deraecoroides* Yasunaga and Nakatani, 1998, original designation. NEW SYNONYMY.

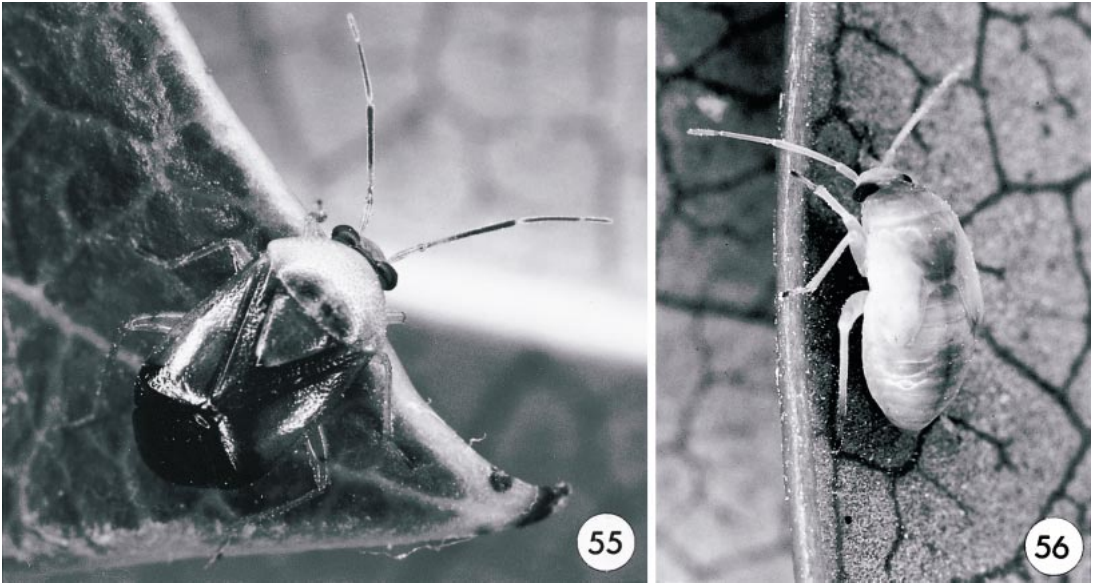
DESCRIPTION: Adequate descriptions were provided by Carvalho (1986) and Yasunaga and Nakatani (1998) for their new genera, neither of which will be repeated here. *Warrisia* is distinguished from the three Oriental mirine genera, *Gianellia* Poppius, 1914a, *Krausmiris* Carvalho, 1986, and *Liistonotus* Reuter, 1906 (cf., Carvalho, 1986: 494), by its shining, wide, and deeply punctate, practically glabrous, dorsal surface (fig. 59).

DISCUSSION: The holotypes of *Warrisia huonensis* and *Gotocapsus deraecoroides*, conform perfectly to both of the generic diagnoses provided by Carvalho (1986) and Yasunaga and Nakatani (1998). The habitus of the type species are practically the same, particularly the identical head structure (figs. 57–58), pale color, wide and deep punctation (fig. 59), callus partially reaching the marked lateral margin of the pronotum, as well as the pronotal and exocorial shape. Accordingly, we propose that both species are congeneric and suggest the new synonymy.

The differences between the two *Warrisia* species are slight. The vertex, tylus, and posterior part of the pronotum lack dark patches in *W. huonensis* (present in *W. deraecoroides*). The antennae and hemelytra are paler in *W. huonensis* than in *W. deraecoroides*. Carvalho (1986: 494) wrote: “The color shows some variation on scutellum where the dark spot may be continuous, as well as, in the apex of corium where it may be less extensive and uniformly black.” The spot on the scutellum is always absent in *W. deraecoroides*. The male genital structures are very similar, but we interpret the differences in the structure of the main sclerotized vesical spiculum as diagnostic for each species (compare Figs. 63–64, 67–68).

#### KEY TO *WARRISIA* SPECIES

1. Vesica with two sclerotized spiculi surrounding a toothed, nonsclerotized, median fin-



Figs. 55–56. *Warrisia deraeocoroides*, habitus photographs. 55. Adult male. 56. Fifth instar nymph.

gerlike lobe; spiculi and median lobe with subequal length, median lobe slightly exceeding length of spiculi (fig. 67–68); Oriental Region . . . . *W. huonensis* (Poppius)

- Vesica with two sclerotized spiculi (not surrounding a fingerlike lobe), a sclerotized flap, and a sclerotized medial spiculelike lobe. This latter lobe is strongly curved apically, lacks teeth, and obviously exceeds the length of the spiculi (fig. 63–64); Japan . . . . .  
.. *W. deraeocoroides* (Yasunaga and Nakatani)

*Warrisia deraeocoroides* (Yasunaga and Nakatani), new combination

Figures 55–56, 60–64

*Gotocapsus deraeocoroides* Yasunaga and Nakatani, 1998: 30–32 (n. sp.).

**SPECIMENS EXAMINED:** JAPAN: **Shikoku**, Kochi Pref., Imanoyama, Tosashimizu C., 29.viii.1998, T. Befe 20♂, 20♀ (HUES). **Honshu:** Wakayama Pref.: Ichie, Hikigawa T., 2.vi.1997, T. Yasunaga 1♀ (paratype, HUES); same locality, light trap, 5.vi.1997, T. Yasunaga 1♀ (paratype, HUES); same locality, iv.1998, S. Gotoh 2♂, 2♀ (HUES); Mt. Ando, Mts. Hatenashi, 21. vii. 1996, S. Gotoh 1♂ (paratype, HUES); Tsubaki, Shirahama T., 5.vi.1997, Y. Nakatani 1♂ (holo-

type, HUES); same locality as for holotype, 2. vi. 1997, T. Yasunaga 1♀ (HUES).

**REMARKS:** This species is reported from Shikoku for the first time. The host plant *Daphniphyllum teijsmanni* Zoll. ex Kurz (Euphorbiaceae) is confirmed by the presence of nymphs. The fifth instar-nymph is easily recognized by the oval, tumid body, yellowish general coloration, and glabrous dorsal surface (fig. 56).

*Warrisia huonensis* (Poppius)

Figures 57–59, 65–68

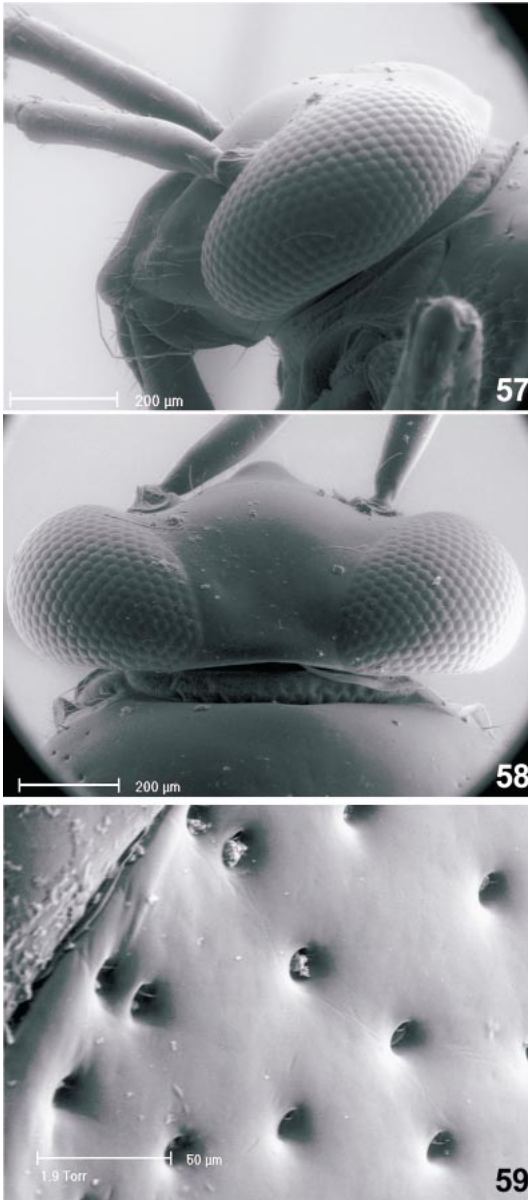
*Lygus huonensis* Poppius, 1914b: 356 (n. sp.).

*Warrisia huonensis*: Carvalho, 1986: 493–495 (n. comb., redesc.); Schuh, 1995: 971.

*Lygus tonkinensis* Poppius, 1914b: 355 (n. syn.); Schuh, 1995: 827 (as incertae sedis). **NEW SYNONYMY.**

**DESCRIPTION:** A redescription of this species was provided by Carvalho (1986) and so is not repeated here. We provide herein measurements for the holotype of the nominal species *Lygus tonkinensis*.

**MEASUREMENTS:** *Lygus tonkinensis* (holotype male): body length 3.98; body width 1.90; vertex width 0.28; head width across eyes 0.98; anteocular length 0.24; eye height 0.53; eye width 0.34; antennal segments



Figs. 57–59. *Warrisia huonensis* [holotype of *Lygus tonkinensis*], scanning electron micrographs. **57.** Lateral view of head. **58.** Dorsal view of head. **59.** Detail of pronotal punctation.

length 1, 0.53; 2, missing; 3, missing 4, missing; pronotum length 1.04; pronotum basal width 1.65; corium length 2.00; cuneus length 0.59; claval commissure length 0.56; labium approx. 1.22, apex of mesocoxae.

DISCUSSION: Examination of the holotype

of *Lygus tonkinensis* revealed that it is practically identical to *Warrisia huonensis*. This observation was previously stressed by Poppius (1914b: 338, key, and 356, description). In our opinion the slight differences of coloration and punctuation quoted by Poppius (loc. cit.) are insufficient to maintain species status for *W. tonkinensis*. The coloration of *W. huonensis* was known to be variable (Carvalho, 1986) and based on our observations, the male genitalic structure of the two nominal taxa is identical. Consequently, we suggest the new synonymy, *L. huonensis* Poppius (valid name) = *L. tonkinensis* Poppius (new junior subjective synonym by first reviser principle).

SPECIMENS EXAMINED: INDONESIA: **Irian Jaya**, Warris, S. of Hollandia, 450–500 m, 1–7.viii.1959, T. C. Maa, sweeping 1 ♀ (MNRJ). **Sumatra**: Brastagi, North Sumatra, 1400 m, 7.xii.1989, light trap, T. Yasunaga 1 ♂ (HUES); Dairi, 1600 m, NW end of Lake Toba, E.W. Diehl 3 ♂, 1 ♀ (AMNH); Dolok Merangir, E.W. Diehl 1 ♂, 1 ♀ (AMNH); same locality, i–ii.1972, E.W. Diehl 1 ♀ (AMNH). MALAYSIA: Bukit Larut, Taiping, Perak, 7.i.1990, light trap, T. Yasunaga 1 ♂ (HUES); Penang, 12–14.i.1959, L.W. Quate 1 ♀ (BPBM). PAPUA NEW GUINEA: *Morobe Prov.*: near Wau, Mt. Kaindi, 2360 m, 27–28.vii.1983, UV light, S.E. and P.M. Miller 1 ♀ (USNM); Mt. Kaindi, 2200–2350m, 25–26.iii.1965, malaise trap, J.Sedlacek 1 ♂ (USNM). Agamoia and Ailuluai, Mts. between, Fergusson Isl., 900 m, No. 4, 5–17.VI.1956, Fifth Archbold Exped. to, L.J. Brass 1 ♂ (AMNH); Finisterre Range Saidor, Matoko, 29.VIII–5.IX.1958, W.W. Brandt, Bishop Museum 1 ♂ (USNM); Kandep, Western Highlands, 8000–8500 ft, 23.12.1961–14.2.1962, W.W. Brandt 3 ♀ (AM); Kepilam, 2400 m, 20–22.vi.1963, J. Sedlacek, light trap 1 ♀ (MNRJ); Kimi Creek Camp, Eastern Highlands, NE Slopes Mt. Michael, 1980 m, Camp #9, 3–4.IX.1959 1 ♀ (AMNH). **New Ireland**, Kandan, 1.i.1960, W.W. Brandt 1 ♀ (MNRJ). VIETNAM: “Tonkin, Montes Mauson [Mt. Mau-Son], April Mai, 2–3000’, Fruhstorfer” (also with the following labels: “*Lygus tonkinensis* n. sp.” [handwritten]; “Mus. Zool. H:fors. Spec. typ. no. 10258 *Lygus tonkinensis* Popp.”; “Holotype *Lygus tonkinensis* Pop-



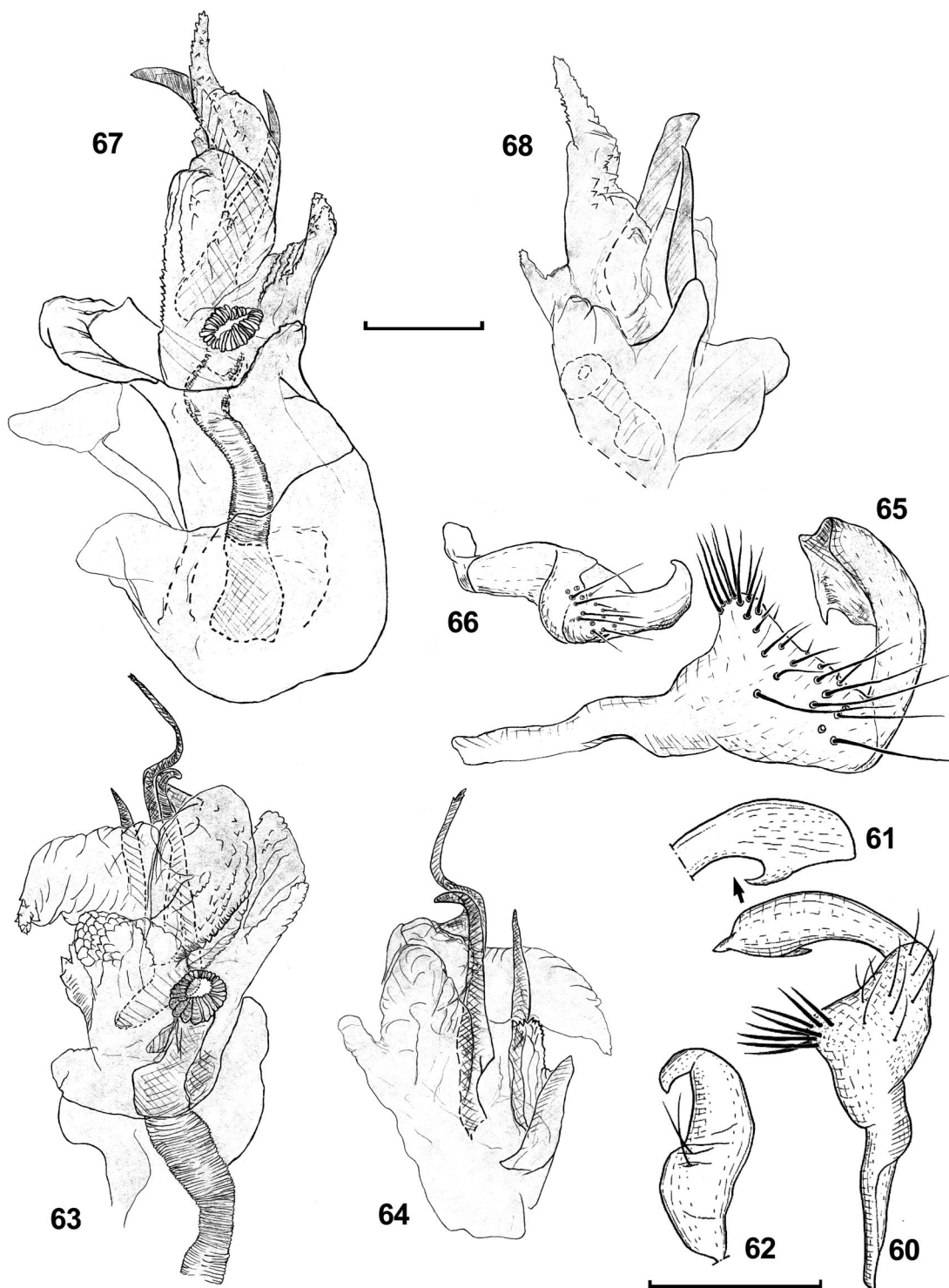
pius, labelled by M.D. Schwartz 1996" [red label]; "Mus. Zool. Hels. Loan nr HE 96-126") 1♂ (holotype MZHF).

#### KEY TO THE JAPANESE GENERA OF THE "LYGUS COMPLEX"

The "*Lygus* complex," as we conceive it, is probably a group of convenience founded to include mirine plant bugs with a *Lygus* like habitus. Without a cladistic phylogeny for the Mirini it is impossible to determine whether the following characters define a natural group or an assemblage of taxa grouped by symplesiomorphies. The Japanese taxa of this complex share the following features, many of which are also found in other mirine genera: (1) pronotum, sometimes also hemelytra, more or less distinctly punctate (if pronotal punctation indistinct, then vertex with distinct transverse basal carina); (2) body length usually not more than 7 mm; (3) vestiture consisting of either a mixture of patchy or generally restricted silky, silvery setae and uniformly distributed, reclining simple setae of various length and color or just vestiture of reclining setae only; (4) posterior margin of pronotum 1.6–2.3 times as wide as head across eyes; (5) antenna fossa usually situated somewhat dorsal to ventral margin of eye; (6) inner margin of eye strongly concave; (7) calli of pronotum usually only weakly raised; (8) sensory lobe of left paramere raised beyond arm, variously produced, usually bearing spinules or large processes. The following key allows identification of the Japanese genera.

1. Length of antennal segment II less than or equal to width of head across eyes ..... *Agnocoris* Reuter
- Length of antennal segment II greater than width of head across eyes ..... 2
2. Antennal segment II spindle-shaped, in the widest place 2.3–3 times as thick as antennal segment III; dorsum bright red or yellowish red with a bold black pattern ..... *Eolygus* Poppius
- Antennal segment II slender, at most twice as thick as antennal segment III; coloration of dorsum otherwise, usually dull, concolorous, or with mostly indistinct color pattern ..... 3
3. Frons almost dull, with shallow longitudinal groove and oblique transverse grooves di-

- verging from it; hemelytra with more or less spotty, short, curved, silvery setae and erect black setae; body somewhat dorso-ventrally compressed ..... *Salignus* Kelton
- Frons usually strongly shining, smooth; if frons faintly roughened, dorsum with simple setae only ..... 4
  - 4. Tibia with a dark spot at knee and another dark spot more distal to knee ..... 5
  - Tibia without dark spots or only diffusely darkened at knee ..... 6
  - 5. Tibial spines pale; hind tibia on outer margin with large brown spots at bases of spines or with brown longitudinal stripe; scutellum strongly convex, black, with a pale longitudinal stripe widened posteriorly, and often with 2–4 pale spots at base; hemelytra with fine, uniform punctation and densely distributed, rather long vestiture ..... *Cyphodemidea* Reuter
  - Tibial spines black; outer margin of tibiae without spots at bases of spines; scutellum weakly convex, without a dark pattern or with a pattern different than above; hemelytra with densely distributed, somewhat coalesced punctures and at most moderately densely distributed, moderately long vestiture ..... *Lygus* Hahn
  - 6. Dorsum with densely distributed, long, erect simple setae; tibia without spines; tibiae with pale, erect pilosity; anterolateral margins of pronotum conspicuously narrowed ..... *Pseudolygocoris* Yasunaga
  - Dorsum with either a mixture of silky silvery setae and reclining simple setae of various lengths, or with reclining simple setae of various length only; tibia with spines; tibiae with reclining setae only; anterolateral margins of pronotum not narrowed ..... 7
  - 7. Large, body length greater than 8 mm; hemelytra bright green with greenish yellow lateral margins; dorsal vestiture of rather densely and uniformly distributed, short, reclining, pale simple setae; length of antennal segment II subequal to equal to basal width of pronotum; vesical membrane very small, simple, without spiculum ..... *Macrolygus* Yasunaga
  - Usually much smaller, usually less than 7 mm; hemelytra variously colored and with various types of vestiture; length of antennal segment I usually greater than basal width of pronotum; vesical membrane always large, usually complex and with one or more spiculi; if body length 8 mm or slightly more, dorsum glabrous, shining dark brown or black and length of antennal



Figs. 60–68. *Warrisia* species, male genitalic structures. *W. deraeocoroides* (60–64). **60.** Left paramere. **61.** Hypophysis. **62.** Right paramere. **63.** Vesica, anterior view. **64.** Vesica posterior view. *W.*

- segment II shorter than basal width of pronotum ..... 8
8. Dorsum very shiny, practically glabrous; pronotal and scutellar discs widely and deeply punctate; vertex without transverse basal carina ..... *Warrisia* Carvalho
- Dorsum subshining or dull; with various types of vestiture, but never practically glabrous; pronotal and scutellar discs finely punctate; transverse basal carina either present or absent ..... 9
9. Pronotal collar rounded with thin diameter, pale, sometimes white, contrasting with dark callar region ..... 10
- Pronotal collar with slightly flattened, wider diameter, concolorous with pronotal disc ..... 11
10. Clavus with simple setae only; length of antennal segment II only  $\frac{2}{3}$  to  $\frac{3}{4}$  of width of pronotum at base; tibial spines black or dark brown ..... *Orthops* Fieber
- Clavus with mixture of silvery, silky setae and simple setae; length of antennal segment II greater than, equal to, or slightly (by  $\frac{1}{10}$ ) less than width of pronotum; tibial spines yellow or light brown ..... *Pinalitus* Kelton
11. Transverse basal carina of vertex obsolete mesially, or completely absent ..... 12
- Transverse basal carina of vertex distinct, spanning entire width of vertex ..... 14
12. Transverse basal carina of vertex absent; antennal segment II incrassate; left paramere widened basally, triangular in lateral view; interramal lobe of posterior wall very long; lateral lobe apparently absent; dorsal structure not bilobed ..... *Lygocorides* Yasunaga
- Transverse basal carina of vertex diminished mesially only; antennal segment II almost linear; left paramere elongate; inter-ramal lobe of posterior wall moderately developed; lateral lobe present; dorsal structure sometimes bilobed ..... 13
13. Vertex with mesial sulcus; body robust, coloration dark brown to black, sometimes with pale mottling; left paramere with elongate arm; vesica with two spiculi; posterior wall with bilobed dorsal structure ..... *Arbolygus* Kerzhner
- Vertex without mesial sulcus; body narrow, coloration uniformly pale yellow to green; left paramere with moderately long arm; vesica with one spiculum; dorsal structure of posterior wall with one membranous sac ..... *Lygocoris* Reuter
14. Scutellum tumid ..... 15
- Scutellum flattened or at most slightly convex ..... 16
15. Silky, silvery setae on hemelytra uniformly distributed ..... *Pachylygus* Yasunaga
- Silky, silvery setae on hemelytra arranged in patches ..... *Peltdolygus* Poppius
16. Tibial spines on hind tibia black ..... 17
- Tibial spines on hind tibia yellow or pale brown to brown ..... 19
17. Body longer than 6.3 mm; pronotum with posterior margin narrowly pale; right paramere inwardly flattened, apex short and stout; lateral lobes not fused medially or curved ventrally, completely separated; median sclerite lacking; dorsal structure obvious, median process reduced; inter-ramal lobes elongated, not bulbous or fingerlike, contiguous medially, joining median process, if present ..... *Castanopsides* Yasunaga
- Body not longer than 6.3 mm; pronotum with posterior margin concolorous; right paramere not inwardly flattened; lateral lobes fused medially, curved ventrally, with a protruding median sclerite independent of median process, if present; dorsal structure very reduced; interramal lobes fingerlike or bulbous, completely separated from median process ..... 18
18. Vesica with two long, slender spiculi sheathed within a trough-shaped sclerite; without rasp; median sclerite of lateral lobe spinulose ..... *Apolygopsis* Yasunaga, Schwartz, and Chérot
- Vesica with only one long slender spiculum which is not sheathed within a trough-shaped sclerite, two spiculelike lobes, and a rasp; median sclerite of lateral lobe not spinulose ..... *Apolygus* China
19. Hind tibia with dark spots at base of spines ..... 20
- Hind tibia without dark spots at base of spines ..... 22
20. Labium reaching abdomen; lamellate pro-

←

*huonensis* [holotype of *Lygus tonkinensis*] (65–68). **65.** Left paramere. **66.** Right paramere. **67.** Vesica, anterior view. **68.** Vesica, posterior view. Scale: 0.1 mm.



- cess attached to sensory lobe of left paramere; body elongate, dorsoventrally compressed; usually scutellum with bilateral symmetrical marks of variable length; corium sometimes with diffuse, faint brown areas . . . . . *Taylorilygus* Leston
- Labium reaching at most hind coxa; sensory lobe of left paramere without lamellate process; body not dorsoventrally compressed; scutellum unicolorous; corium without diffuse, faint brown areas . . . 21
  - 21. Labium stout, not reaching middle coxa; posterior margins of eyes straight, removed from wide collar . . . *Pinalitopsis* Yasunaga, Schwartz, and Chérot
  - Labium reaching hind coxa; posterior margin of eyes bent posteriorly, contiguous with narrow collar . . . . . *Nepiolygus* Yasunaga, Schwartz, and Chérot
  - 22. Hemelytra with combination of silky, silvery setae and reclining simple setae . . . . . 23
  - Hemelytra with reclining simple setae only, usually vestiture at claval suture with some or many shining, recurved simple setae . . . . . 24
  - 23. Pronotum with distinct, discrete punctures; left paramere without apical protuberance on sensory lobe; right paramere straight . . . . . *Yamatolygus* Yasunaga
  - Pronotum with indistinct, somewhat coalesced punctures; left and right parameres with apical protuberances on the sensory lobe . . . . . *Lygocorias* Yasunaga
  - 24. Body length more than 4.5 mm; left paramere with apical portion of sensory lobe strongly protuberant and shaft without subapical process; vesica including a loop sensu Clayton, a wide spiculum, and a lobal sclerite . . . . . *Neolygus* Knight
  - Body length usually less than 4 mm; left paramere without apical protuberance on sensory lobe . . . . . 25
  - 25. Left paramere with one or two subapical processes on shaft . . . *Dagbertus* Distant
  - Left paramere lacking subapical processes on shaft . . . . . *Prolygus* Carvalho

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