Second report on the Japanese cylapine plant bugs (Heteroptera, Miridae, Cylapinae), with descriptions of five new species[1]

T. YASUNAGA & S. MIYAMOTO

Abstract: Additional records and descriptions of Japanese cylapines, or fungal-inhabiting plant bugs, are provided. The following five new species are described from southwestern subtropical islands of Japan: *Bothriomiris ernsti* nov.sp., *B. yakushima* nov.sp., *Euchilofulvius lepidopterus* nov.sp., *Fulvius nakatai* nov.sp., and *Yamatofulvius minutus* nov.sp. Clearly detected functions of two autapomorphies previously assumed for *Yamatofulvius* are documented and discussed. Keys are provided to distinguish every *Bothriomiris*, *Fulvius* and *Yamatofulvius* species occurring in Japan. A checklist of Japanese cylapines is given, with updated distributional records. Male and/or female genitalic structures are described for the first time for *Bothriomiris capillosus* and *Fulvius tagalicus*.

Key words: checklist, Cylapinae, Heteroptera, Japan, mating behavior, Miridae, new record, new species.

Introduction

Cylapinae, one of basal plant bug subfamilies, consists predominantly of fungal-inhabiting members, most of which live on fungous-covered rotten logs or decaying woods in dark, humid forests, particularly in the warm temperate zone, subtropics and tropics. Due to the specialized habitat and remarkable agility, hand collecting is the best method for capture. Cylapines usually do not take flight but quickly run away when disturbed. Only some members of *Fulvius* are known to be occasionally attracted to light at night.

In a revisional work by the first author (YASUNAGA 2000), 16 species in six genera were documented from Japan, with a key to all known Japanese genera and species, and a cladistic analysis for the newly established genus, *Yamatofulvius*. However, subsequent efforts by TY and several enthusiastic colleagues have revealed the presence of five hitherto unknown species. In addition, evidence for the function of two autapomorphies assumed for *Yamatofulvius* by YASUNAGA (2000) was demonstrated through field observations in subtropical broadleaved forest on Okinawa Island. The functions apparently are correlated with the specialized mating behavior within *Yamatofulvius* species, as mentioned in the generic Discussion.

The present paper documents five new species. Brief comments and/or revised keys to Japanese species are also provided for the four genera, *Bothriomiris*, *Euchilofulvius*, *Fulvius* and *Yamatofulvius*, containing these new species. The function of the autapomorphies for *Yamatofulvius* is discussed. The male of *B. capillosus* is reported for the first time. Descriptions of male and/or female genitalic structures are also for the first time provided for *Bothriomiris capillosus* and *Fulvius tagalicus*.

All measurements in the text are in millimeters (mm). Synonymic lists for known taxa are not always cited here as comprehensive catalogues are now available (SCHUH 1995; KERZHNER & JOSIFOV 1999). Terminol-

[1]This paper was written to celebrate the 70th birthday of Dr. Ernst Heiss, a father-like mentor of the first author as well as a long time friend of the second author.

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ogy of the female genitalia mainly follows KULLENBERG (1947) and YASUNAGA (2000), but some terms are tentatively used in this paper since cylapine female genital structures have not been sufficiently studied. Habitus and genitalic structure of each species are shown by digital photographic images.

Checklist of Japanese Cylapinae

[New distributional record indicated by an asterisk (*)]

Tribe Bothriomirini KIRKALDY 1906

Genus *Bothriomiris* KIRKALDY 1902

Bothriomiris capillosus YASUNAGA 2000 – Distribution: Japan (Ishigaki* & Iriomote Isls.).
Bothriomiris ernsti nov.sp. – Japan (Ishigaki Is.).
Bothriomiris gotohi YASUNAGA 2000 – Japan (Honshu (S. Kii Peninsula), Shikoku, Kyushu, Miyake & Okinawa Isls.).
Bothriomiris yakushima nov.sp. – Japan (Yakushima Is.).

Tribe Cylapini KIRKALDY 1906

Genus *Cylapomorpha* POPPIUS 1914

Cylapomorpha michikoae YASUNAGA 2000 – Japan (Honshu (S. Kii Peninsula), Kyushu, Okinawa & Ishigaki Isls.), Taiwan.

Tribe Fulviini UHLER 1886

Genus *Euchilofulvius* Poppius 1909

Euchilofulvius lepidopterus nov.sp. – Japan (Okinawa Is.).

Genus *Fulvius* STÅL 1862

Fulvius anthocoroides (REUTER 1875) – Japan (Ogasawara (Bonin) Isls., Ishigaki Is., Iriomote Is.); widely distributed in Old World subtropics and tropics, and Neotropical Region; a record (original description) from France was the result of accidental introduction with the shipment of logs from Senegal.
Fulvius dimidiatus POPPIUS 1914 – Japan (W. Honshu*, Tsushima Is.), Taiwan, Peninsular Malaysia.
Fulvius nakatai nov.sp. – Japan (Okinawa Is.).
Fulvius niveonotatus YASUNAGA 2000 – Japan (Ishigaki Is.).
Fulvius tagalicus POPPIUS 1914 – Japan (Ishigaki Is.), Taiwan.

Genus *Peritropis* UHLER 1891

Peritropis advena KERZHNER 1972 – Japan (Hokkaido, Honshu, Shikoku), Russian Far East (Primorskij Territory).
Peritropis hasegawai YASUNAGA 2000 – Japan (N. Honshu)
Peritropis insularis YASUNAGA 2000 – Japan (Amami-Oshima & Okinawa Isls.).
Peritropis iriomotensis YASUNAGA 2000 – Japan (*Ishigaki & Iriomote Isls.).
Peritropis takahasii YASUNAGA 2000 – Japan (Ishigaki Is.).

Genus *Punctifulvius* SCHMITZ 1978

Punctifulvius kerzhneri SCHMITZ 1978 – Japan (Hokkaido, Honshu, Shikoku, Kyushu), Korea, Russia (S. Primorskij Territory).

Genus *Yamatofulvius* YASUNAGA 2000

Yamatofulvius laevigatus YASUNAGA 2000 – Japan (Okinawa Is.).
Yamatofulvius minutus nov.sp. – Japan (Amami-Oshima Is.).
Yamatofulvius miyamotoi YASUNAGA 2000 – Japan (Honshu, Shikoku, Kyushu, *Yakushima Is.).
Yamatofulvius sinuicornis YASUNAGA 2000 – Japan (Kyushu, *Yakushima & *Amami-Oshima Isls.).

Genus *Bothriomiris* KIRKALDY

Bothriomiris KIRKALDY 1902: 270 (n.gen.), type species: *Bothriomiris marmoratus* KIRKALDY 1902 (= *Capsus dissimulans* WALKER 1873), original designation; SCHUH 1995: 20 (cat.); KERZHNER & JOSIFOV 1999: 10 (cat.); YASUNAGA 2000: 203 (diag.); 2001: 124 (diag.).

Diagnosis. Recognized by the generally fuscous, oval, tumid body, distinct pubescence and punctures on the shiny dorsum, wide vertex with a narrow, basal transverse carina, shortened rostrum not exceeding apex of the mesocoxa, more or less arched scutellum, mesial knob-like projection of the ostiolar peritreme, and hook of the left paramere base.

Discussion. On the basis of the antennal structure and male genitalia, four Japanese *Bothriomiris* species can be divided into two subgroups. One group contains *B. capillosus* and *B. yakushima* nov.sp., characterized by the shortened, broadened antennal segment I and II, arched scutellum, highly polished epimeron and episternum, developed thumb-like process on the male genital segment, and highly sclerotized vesical appendages and female bursa copulatrix, whereas in the other two species, the antennal segments I and II are longer and slenderer, the scutellum is rather flat, the epimeron and episternum are distinctly punctate, the male genital segment lacks such process, the vesica is not heavily sclerotized, only with a slender, tubular exten-

sion, and the female bursa copulatrix is widely membranous. Further subdivision may be required for the classification of the members currently placed in *Bothriomiris*. However, there are several related genera (e.g., *Bakeriola* BERGROTH, *Dasymenia* POPPIUS, *Dasymeniella* POPPIUS), the genitalic structures of which have been poorly examined or reported. A comprehensive revision, including critical examination of the genitalia, is desirable to correctly redefine all related genera.

Key to Japanese species

[Revised couplet 3 of a key provided by YASUNAGA (2000: 206)]

1 Antennal segment I long, more than half length of segment II; epimeron and episternum distinctly punctate as in dorsum 2

– Antennal segment I short, equal to or less than 1/3 length of segment II; epimeron and episternum highly polished, only with weak minute punctures 3

2 Body broader, with maximum width more than 3.5 mm (♂)/ 4 mm (♀); rostrum shorter, not reaching apex of mesocoxa; apical pale spot on corium orange yellow, clear; Ishigaki Island . . . *B. ernsti* nov.sp.

– Body narrower than 2.5 mm (♂)/ 3 mm (♀); rostrum longer, reaching apex of mesocoxa; apical pale spot on corium obscure whitish brown; north of Okinawa Island . . . . . *B. gotohi*

3 Rostrum reaching but not exceeding apex of procoxa; subtropical inhabitant of Ishigaki and Iriomote Island . . . *B. capillosus*

– Rostrum exceeding apex of procoxa, reaching middle of mesocoxa; warm temperate zone inhabitant of Yakushima Island . . . . . *B. yakushima* nov.sp.

Bothriomiris capillosus YASUNAGA (Figs 1A, B, 2A, F, 3A-C, 4A, B)

Bothriomiris capillosus YASUNAGA 2000: 203 (n.sp.); 2001: 124 (diag.).

Diagnosis. Recognized by the heavily pubescent dorsum, short antennal segment I, rather thickened antennal segment II, entirely fuscous scutellum, polished, impunctate epimeron and episternum, a clear, white, rounded mark at the posterior apex of the corium, developed thumb-like processes on the male genital segment, and highly sclerotized appendages of the vesica. YASUNAGA (2000) provided further diagnosis and description of the adult female.

Description. Male: Similar in overall appearance to female, but body narrower and an apical, white semicircular spot at apex of corium smaller. Lengths of antennal segments I-IV: 0.51, 1.85, 0.68, 0.80. Lengths of metafemur, tibia and tarsus: 2.23, 2.67, 0.82. Male genitalia (Fig. 3A-C): Genital segment (A) with a pair of developed thumb-like processes, the right lateral one smaller. Left paramere (B) semicircularly curved, with weak basal hook. Vesica (C) with highly sclerotized appendages, and ventrally with a flattened, claw-like sclerite.

Female genitalia (Fig. 4A, B): Bursa copulatrix (A, B) with asymmetrical sclerotized structure; posterior wall of bursae almost membranous, without distinct sclerotized area.

Measurements. ♂: Body length 6.6; head width including eyes 1.66; vertex width 0.81; basal pronotal width 2.81; and width across hemelytron 3.28.

Biology. See the following species.

Discussion. This species is characterized by having a pair of developed thumb-like processes on the male genital segment and highly sclerotized appendages on the vesica. Based on similarity of the male genitalia, the closest relative of *B. capillosus* appears to be *B. yakushima* nov.sp.

Bothriomiris ernsti nov.sp. (Figs 1C, 2B, G, 3D-F; 4C, D)

Diagnosis. Recognized by the broad, rounded body, rough, distinct punctures on the dorsum, clear orange yellow spot on the apex of corium, and broad exocorial area, in addition to being currently known only from Ishigaki Island.

Description. Body generally shiny black, ovoid, broad; dorsal surface punctate, with uniformly distributed, silvery, semierect setae. Head rather brownish, shining, almost impunctate; vertex wide; frons shallowly and transversely wrinkled. Antenna dark brown, generally short and slender; segment

Fig. 1: Japanese *Bothriomiris* species. (**A**) *B. capillosus*, male; (**B**) ditto, female; (**C**) *B. ernsti* nov.sp., female; (**D**) *B. gotohi*, male; (**E**) fungal rotten log, on which *B. ernsti* nov.sp. (**F**) and *B. capillosus* (**G**) co-occurred, found in subtropical forest on Ishigaki Island of the Ryukyus, Japan (late September, 2002).

I and basal part of II slightly paler; lengths of segments I-IV (♂/♀): 1.03/ 1.03, 1.78/ 1.74, 1.01/ 0.94, 1.19/ 1.23. Rostrum dark reddish brown, short, exceeding apex of procoxa but not reaching apex of mesocoxa. Pronotum heavily punctured, roundly carinate or keeled laterally; calli swollen, finely punctate, somewhat convex medially; scutellum flat, punctate, with an orange yellow apex; thoracic pleura shiny fuscous, punctate as in pronotum; ostiolar peritreme dark grayish brown, pruinosed, with medial knob pruinosed, relatively flattened. Hemelytron wide; a subtriangular spot at apex of corium clear orange yellow; exocorial area broadened and flattened; membrane somber grayish brown, semitransparent, with whitish veins. Coxa and leg shiny chocolate brown;

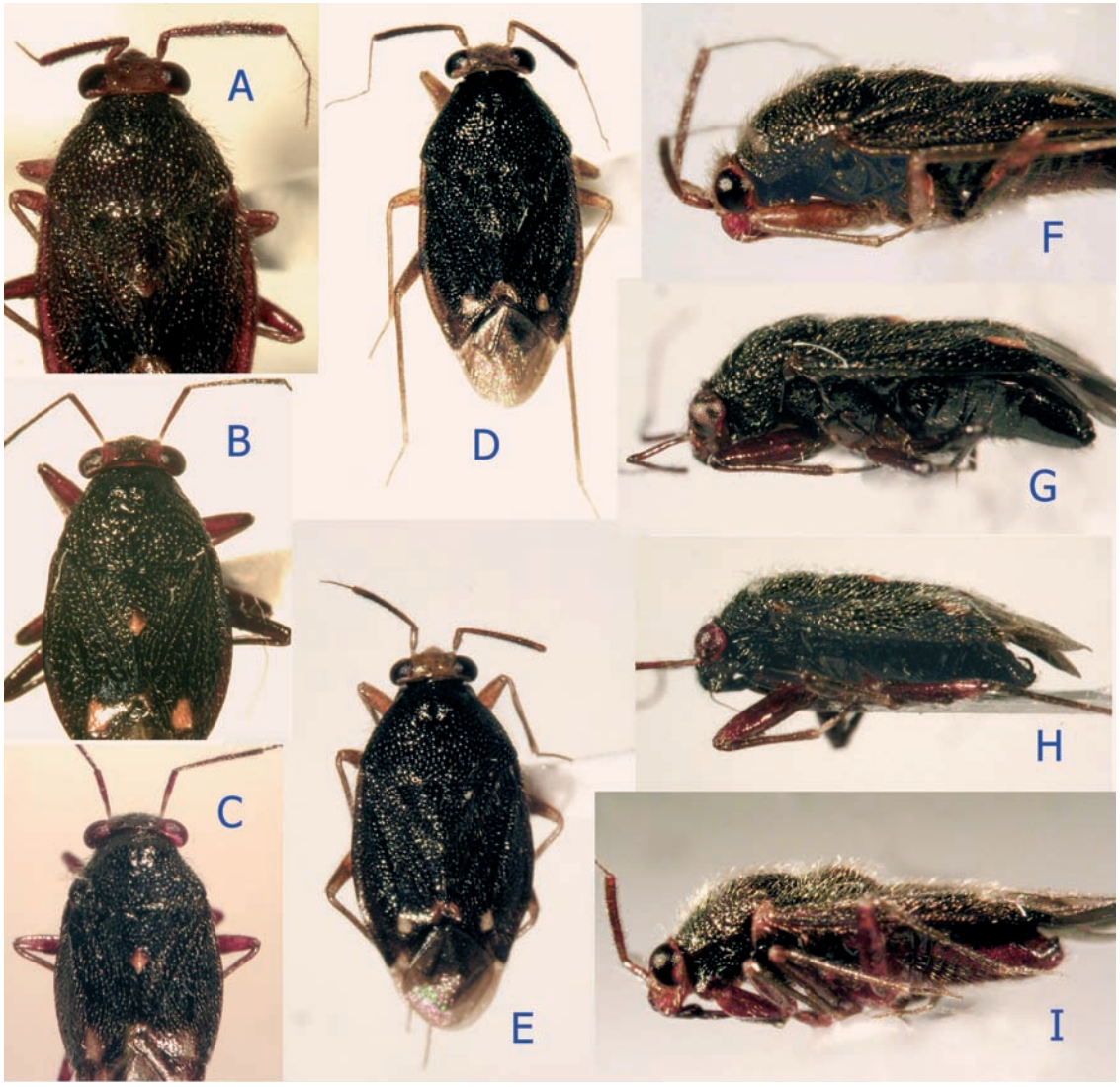


Fig. 2: Japanese *Bothriomiris* species. (**A**, **F**) *B. capillosus*; (**B**, **G**) *B. ernsti* nov.sp.; (**C**, **H**) *B. gotohi*; (**D**, **H**, **I**) *B. yakushima* nov.sp.; (**A-E**) dorsal habitus; (**F-I**) left lateral view; (**A-D**, **F-I**) male; (**E**) female.

tarsus paler basally; lengths of metafemur, tibia and tarsus (♂/♀): 2.34/ 2.67, 2.81/ 3.28, 0.96/ 1.07. Abdomen shiny dark brown. Male genitalia (Fig. 3D-F): Genital segment (D) smooth, without thumb-like process. Left paramere (E) rather strongly curved, with a blunt hooked process basally and a distinct, pointed process at apex; right paramere tiny (D). Vesical tubular process short, almost straight (F). Female genitalia (Fig. 4C, D): Bursa copulatrix (D) and posterior wall of bursae (C) mostly membranous, lacking sclerotized structures.

Measurements. ♂/♀: Body length 7.0/ 8.0; head width including eyes 1.98/ 2.13; vertex width 1.01/ 1.07; basal pronotal width 2.83/ 3.28; and width across hemelytron 3.49/ 4.18.

Holotype ♂, JAPAN: Ryukyus, Ishigaki Is., Mt. Nosokodake, 29.ix.2002, T. Yasunaga. Paratypes: 5♂♂ 15♀♀, same locality as for holotype, 22.vii.2002, T. Nakata; 3♂♂, same data as for holotype.

Etymology. Named in honor of Dr. Ernst Heiss; a noun in genitive case.

Biology. This new species co-occurred with *B. capillosus* on Ishigaki Island. TY observed both adults and immatures of these two species on heavily fungous-covered rotten logs in dark, humid subtropical rain forest in September, 2002 (Fig. 1E-G). Habitat preferences of the two species are similar to those of *B. gotohi*. Although collection records suggest that *B. capillosus* has at least a bivoltine life cycle, additional data are needed to determine the actual number of generations.

Discussion. The new species is morphologically most similar to *B. gotohi*, as both species have a similar, tubular sclerotized ex-

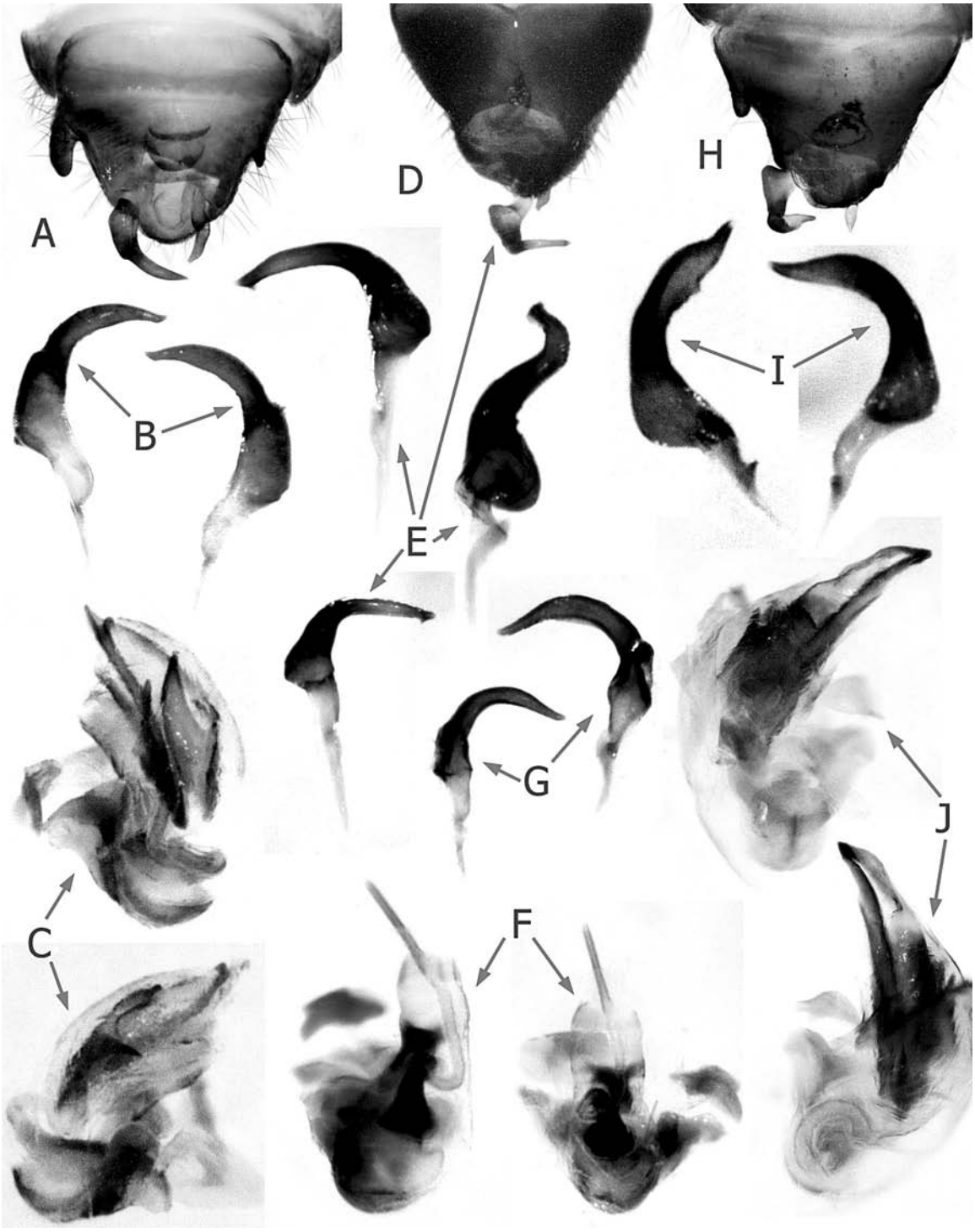


Fig. 3: Male genitalia of *Bothriomiris* species. (**A-C**) *B. capillosus*; (**D-F**) *B. ernsti* nov.sp.; (**G**) *B. gotohi*; (**H-J**) *B. yakushima* nov.sp.; (**A**, **D**, **H**) genital segment with parameres in dorsal view; (**B**, **E**, **G**, **I**) left paramere; (**C**, **F**, **J**) vesica.

tension on the vesica. *Bothriomiris ernsti* nov.sp. can be distinguished from *B. gotohi* by the characters mentioned in the above key and Diagnosis. These two species are now shown to be allopatric.

Bothriomiris yakushima nov.sp. (Figs 2D, E, I, 3H-J)

Diagnosis. Recognized by the generally pale brown head, antennal segment I and legs, relatively long rostrum exceeding apex of the procoxa, polished epimeron and episternum, a single thumb-like process on left side of the male genital segment, and weakly curved left paramere with a subapical process, in addition to being currently known only from Yakushima Island, south of Kyushu.

Description. Body blackish brown, oval; dorsal surface shining, distinctly punctate,

Fig. 4: Female genitalia of *Bothriomiris* species. (**A**-**B**) *B. capillosus*; (**C**-**D**) *B. ernsti* nov.sp.; (**A**) Bursa copulatrix in right lateral view; (**B**) ditto, in left lateral view; (**C**) posterior wall of bursae in frontal view; (**D**) vaginal vestibule in frontal view.

with uniformly distributed, silky, suberect pubescence. Head pale brown, shining, almost impunctate, with sparsely distributed, silky, erect setae; vertex narrowly margined basally; buccula chocolate brown. Antenna fuscous, except for segment I pale brown; segment II cylindrical; segments III and IV filiform; lengths of segments I-IV (♂/♀): 0.60/ 0.62, 2.07/ 1.91, 1.03/ 0.94, 1.01/ ?. Rostrum brown, reaching middle of mesocoxa; apical part of segment IV darker. Pronotum continuously margined laterally; scutellum relatively arched; pleura polished, only with sparsely distributed, minute punctures, except for propleuron punctate as in pronotum; ostiolar peritreme grayish brown, shagreened, with shiny, chocolate brown medial knob. Hemelytron with a white spot at apex of corium; ♂ embolium pale brown; membrane smoky brown. Coxa and leg pale brown; tarsus darkened; lengths of metafemur, tibia and tarsus (♂/♀): 2.67/ 2.67, 2.97/ 3.28, 0.92/ 0.98. Abdomen dark chocolate brown. Male genitalia (Fig. 3H-J): Genital segment (H) with a single thumb-like process on its left side; left paramere (I) not strongly curved, with a subapical, small, pointed process. Vesica (J) with distinct sclerites; ventral triangular sclerite short.

Measurements. ♂/♀: Body length 7.2/ 7.7; head width including eyes 1.80/ 1.76; vertex width 0.82/ 0.82; basal pronotal width 3.04/ 3.12; and width across hemelytron 3.28/ 3.63.

Holotype ♂, JAPAN: Kagoshima Pref., Yakushima Is., Ohkawa Timber Road, 8.viii.2002, T. Nakata. Paratype: 1 ♀, same data as for holotype.

Etymology. Named after Yakushima Island, type locality of this new species, a well-known World Natural Heritage site; a noun in apposition.

Discussion. This new species apparently is a close relative of *B. capillosus*, from which it can be distinguished by the characters diagnosed above. Both species are allopatrically distributed on these islands. Between Yakushima and Ishigaki islands are several other islands that have a rich fauna (e.g., Amami-Oshima, Tokunoshima, Tokara), and additional congeners may occur there.

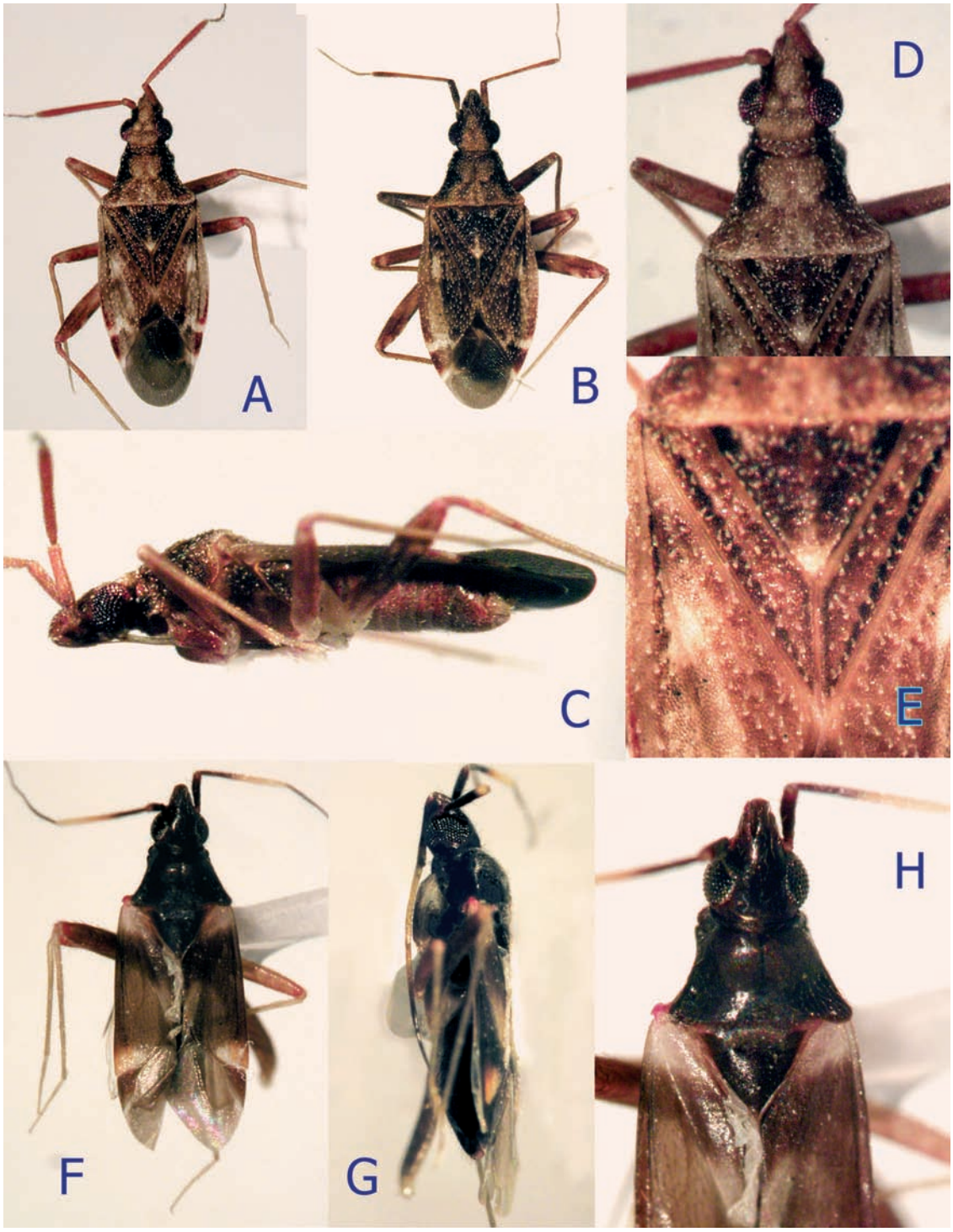


Fig. 5: Japanese *Euchilofulvius* and *Fulvius* species. (**A-E**) *E. lepidopterus* nov.sp.; (**F-H**) *F. nakatai* nov.sp.; (**A**, **C-E**) male; (**B**, **F-H**) female; (**A-B**, **D**, **F**, **H**) dorsal habitus; (**C**, **G**) left lateral view; (**E**) scutellum and hemelytron.

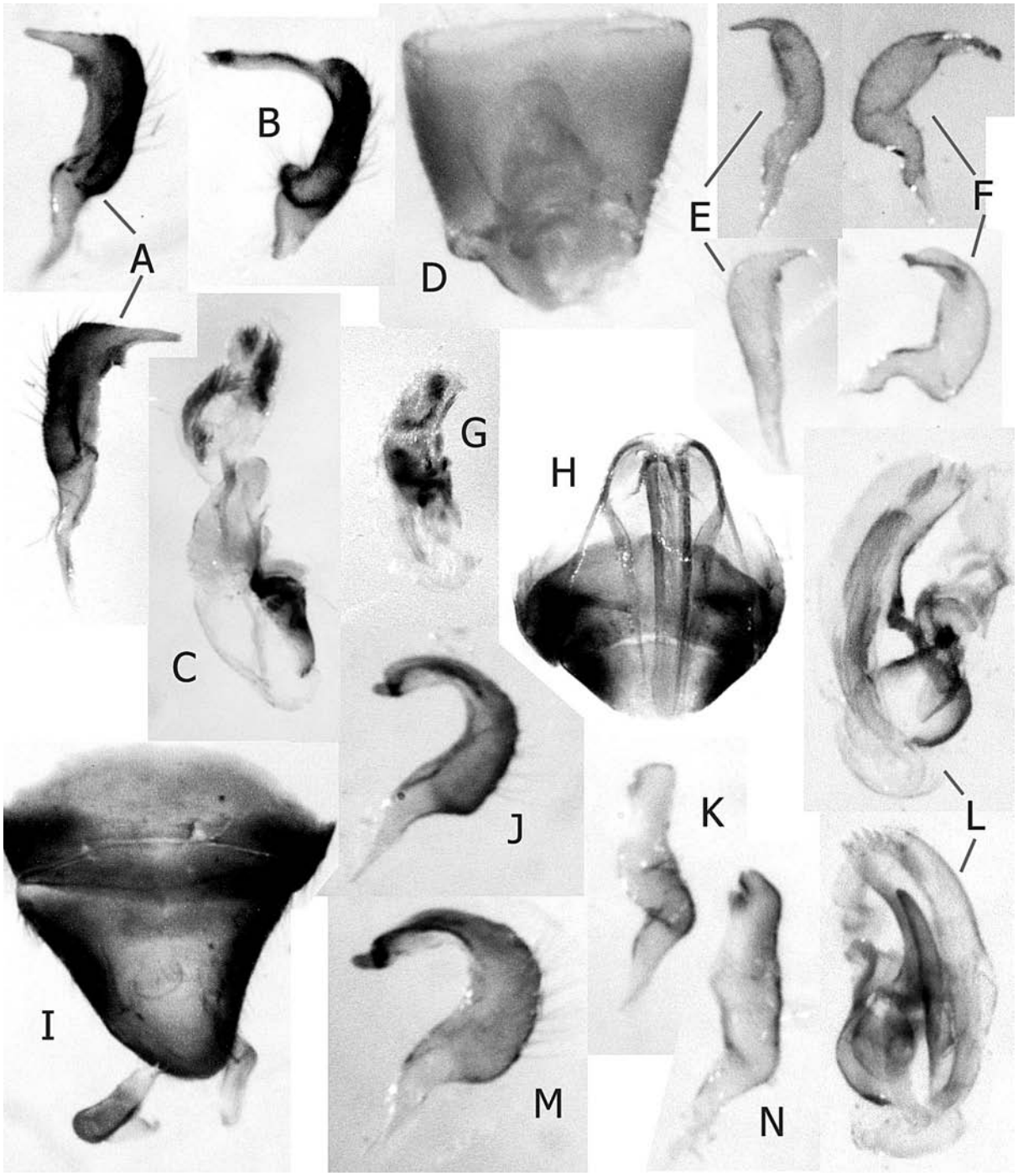
Further investigations on these islands are required to clarify distribution patterns of Japanese *Bothriomiris*.

Genus *Euchilofulvius* Poppius

Euchilofulvius Poppius 1909: 28, type species: *Euchilofulvius tibialis* Poppius 1909: 28, monotypic; Gorczyca 1999: 3 [as *Eucholofulvius*].

Diagnosis. Recognized by the scale-like setae covering the rather flattened body, shagreened dorsum, shortened antennal segments III and IV, subapically toothed claws, and the short hypophysis and rather tumid sensory lobe of the left paramere. Further diagnostic characters and redescription were provided by Gorczyca (1999).

Discussion. This Indo-Pacific genus previously included five tropical species and is divided into two subgenera, *Euchilofulvius* s.str. and *Lepidofulvius*. Our discovery of a



species belonging to the nominotypical subgenus from Okinawa Island of Japan represents the northernmost distributional record for the genus.

Euchilofulvius lepidopterus nov.sp. (Figs 5A-E, 6D-H)

Diagnosis. Recognized by the somber pale brown general coloration, shagreened dorsum with uniformly distributed, silvery, scale-like setae, and short rostrum not exceeding apex of the metacoxa.

Description. Body generally somber pale brown, elongate oval; dorsal surface shagreened or pruinosed, with uniformly or in part densely distributed, silvery, scale-like setae. Head shagreened, longer than wide, with densely distributed, silvery, scale-like setae; eye small; vertex somewhat swollen, with a shallow, mesal depression. Antenna somber brown; segments I and II tinged with red; segments III and IV short, filiform; lengths of segments I-IV (♂/♀): 0.50/ 0.58, 1.15/ 1.05, 0.38/ 0.35, 0.50/ 0.45. Rostrum

Fig. 6: Male (**A-G**, **I-N**) and female (**H**) genitalia of *Euchilofulvius* (**D-H**), *Fulvius* (**A-C**) and *Yamatofulvius* (**I-N**) species. (**A-C**) *F. dimidiatus*; (**D-H**) *E. lepidopterus* nov.sp.; (**I-L**) *Y. minutus* nov.sp.; (M-N) *Y. miyamotoi*; (**A**, **E**, **K**, **N**) right paramere; (**B**, **F**, **J**, **M**) left paramere; (**C**, **G**, **L**) vesica; (**D**, **I**) male genital segment in dorsal view.

pale brown, reaching but not exceeding apex of metacoxa. Pronotum trapezoidal, carinate laterally, with densely distributed, silvery, scale-like setae; calli swollen, with a longitudinal, mesal sulcation; collar about as broad as antennal segment II; mesoscutum dark brown, tumid; scutellum dark brown, flat, shallowly and transversely rugose, with yellowish apex; pleura generally chocolate brown, shagreened, with sparsely distributed, silvery, scale-like setae. Hemelytron somber brown, shagreened, with uniformly distributed, silvery, scale-like setae; median part of corium and basal margin of cuneus pale brown; membrane somber grayish brown, with a pale, semitransparent spot contiguous to apex of cuneus. Coxa and leg brown, partly tinged with red; trochanter, apical part of tibia and tarsus yellowish brown; lengths of metafemur, tibia and tarsus (♂/♀): 1.35/ 1.38, 1.83/ 1.94, 0.35/ 0.36. Abdomen reddish brown, relatively shining. Male genitalia (Fig. 6, D-G): Genital segment (D) trapezoidal. Left paramere (F) C-shaped, with tumid sensory lobe and short, flattened hypophysis. Right paramere (E) with an inner apical tooth at base of short hypophysis. Vesica (G) weakly sclerotized but lacking noticeable bundles of sclerites. Female genitalia (Fig. 6H): Posterior wall of bursae with weakly sclerotized interramal sclerites.

Measurements. ♂/♀: Body length 3.65/ 3.96; head width including eyes 0.69/ 0.71; vertex width 0.30/ 0.35; mesal pronotal length including collar 0.69/ 0.88; basal pronotal width 1.14/ 1.35; and width across hemelytron 1.31/ 1.64.

Holotype ♂, JAPAN: Ryukyus, Okinawa Is., Nago City, Katsuyama, 17.vii.2002, T. Nakata. Paratypes: 46 specimens same data as for holotype, and 9 specimens, Okinawa Is., Ohgimi Vil., Shanashiro, 18.vii.2002, T. Nakata.

Etymology. From Greek, lepidopterus (= scaled wing), referring to the scale-like setae of this new species; an adjective.

Discussion. No other congener has been found in neighboring regions of Japan. In the key provided by GORCZYCA (1999), the present species may key to *E. antennatus* GORCZYCA from South Sulawesi, Indonesia, but *E. lepidopterus* nov.sp. can be distinguished from it by the larger body, shorter antennal segment II that is less than the basal pronotal width, and the hemelytron that lacks any red portion.

Biology. Unknown.

Genus *Fulvius* REUTER

Fulvius STÅL 1862: 322 (n.gen.), type species: *Fulvius anthocoroides* STÅL 1862: 322, monotypic; SCHUH 1995: 25 (cat.); KERZHNER & JOSIFOV 1999: 8 (cat.); YASUNAGA 2000: 189 (diag.); 2001: 125 (diag.).

Diagnosis. Recognized by the small, rather slender, anthocorid-like body with the principally dark coloration, usually shagreened or pruinosed, almost impunctate dorsum, long head, short antenna, long rostrum sometimes reaching the genital segment, narrow, slender pronotum, 2-segmented tarsi, and flattened, apically hooked sensory lobe of the left paramere.

Discussion. The included species and interspecific variation suggest that *Fulvius* requires subdivisions. Although some workers have proposed several species groups for *Fulvius*, we refrain from using any of them until the genus is revised on a worldwide basis. Definitive treatments are beyond the scope of this study.

The habitus of most members of *Fulvius* is suggestive of certain anthocorid species. Such anthocorid-like body shape may imply a convergence in food habits of *Fulvius* species: predaceous rather than mycophagous. Recently, our colleague Dr. K. Takahashi reported immatures of *Fulvius anthocoroides* from a henhouse in Ogasawara (Bonin) Islands; they developed into adults when provided with larvae of *Tribolium confusum* JAQUELIN DU VAL (Coleoptera) as prey (TAKAHASHI et al. 2001). Further, most cylapines are presumably nocturnal but do not migrate far from their typical habitats. In Japan, only *Fulvius* species were collected by light traps, and no other cylapines have been attracted to light. It seems to us that the biology of *Fulvius* differs from that of other cylapines, as suggested by WHEELER (2001).

Key to Japanese species

[Revised couplets 6-8 of a key provided by YASUNAGA (2000: 207)]

1 Head white; pronotum fuscous, with a widely white mesial region .... *F. niveonotatus*

– Head and pronotum entirely dark brown 2

2 Clavus unicolorously somber brown .... *F. tagalicus*

– Clavus brown or fuscous, with paler or whitish basal region 3

3 Head and pronotum polished, shining; apical 3/5 of antennal segment II pale .. .. *F. nakatai* nov.sp.

– Head and pronotum more or less shagreened or pruinosed, not distinctly shining; less than apical 1/3 of antennal segment II pale 4

4 Head as long as, or shorter than width including eyes; apical 1/3 of antennal segment II pale ..... *F. anthocoroides*

– Head longer than width including eyes; apical 1/6 of antennal segment II pale .. .. *F. dimidiatus*

Fulvius dimidiatus POPPIUS (Fig 6 A-C)

Fulvius dimidiatus POPPIUS 1909: 33 (n.sp.); SCHUH 1995: 27 (cat.); KERZHNER & JOSIFOV 1999: 8 (cat.); YASUNAGA 2000: 189 (diag.); 2001: 126 (diag.).

Diagnosis. Recognized by the rather elongate body, pale apical 1/6 of antennal segment II, whitish anterior half of the corium, and a creamy yellow spot occupying the lateral apex of the corium and apex of the embolium. A detailed description of the external structure was given by POPPIUS (1909).

Description. Male genitalia (Fig. 6A-C): Parameres distinctly pubescent; right paramere sensory lobe with a small process at base of slender, apically tapered hypophysis (A); left paramere curved at right angle, with a protuberance near base of sensory lobe (B). Vesica with bundled slender sclerites subapically (C).

Discussion. An examination of male genital structure suggests this species is a nominotypical member of *Fulvius*. The similar general shape of the parameres and bundles of sclerites on the vesica are also found in two other Japanese species, *F. anthocoroides* REUTER and *F. tagalicus* POPPIUS (see YASUNAGA 2000).

Fulvius nakatai nov.sp. (Fig. 5F-H)

Diagnosis. Recognized by the shiny fuscous head and pronotum, light apical 3/5 of the antennal segments II, long, filiform antennal segments III and IV, and four pale spots on the hemelytron.

Description. Female: Body elongate, parallel-sided; dorsal surface shining, dark brown, with uniformly distributed, simple, silky, semierect pubescence. Head shiny fuscous, a little longer than width including eyes. Antenna dark brown; apical 3/5 of segment II brownish white; segments III and IV long, filiform; lengths of segments I-IV: 0.56, 1.13, 0.78, 1.13. Rostrum shiny dark brown, elongate, reaching genital segment; segments II and III paler. Pronotum shiny fuscous, with a longitudinal, mesal sulcus between roundly swollen calli; collar about as thick as base of antennal segment III; scutellum shiny fuscous, slightly arched; pleura chocolate brown; ostiolar peritreme dark grayish brown. Hemelytra dark brown; apices of corium and embolium, and base and apex of clavus creamy brown, partly tinged with red. Coxa, and trochanter pale brown; femur chocolate brown; tibia and tarsus yellowish brown; lengths of metafemur, tibia and tarsus: 2.00, 2.25, 0.81. Abdomen uniformly dark brown. Male: Unknown.

Measurements. ♀: Body length 4.3; head width including eyes 0.75; vertex width 0.34; mesal pronotal length including collar 0.65; basal pronotal width 1.25; and width across hemelytron 1.69.

Holotype ♀, Japan, Ryukyus, Okinawa Is., Nago City, Katsuyama, 17.vii.2002, T. Nakata.

Etymology. Named after Mr. Tadafumi Nakata, who collected and offered us many cylapine specimens including the holotype of this new species; a noun in genitive case.

Discussion. We consider this new species most closely allied to *Fulvius sauteri*, described from Taiwan by POPPIUS (1915). Based on comparison with the holotype of *F. sauteri*, deposited in the Zoological Museum,

Fig. 7: *Yamatofulvius* species. (**A**) *Y. minutus* nov.sp., female; (**B**) *Y. sinuicornis*, female; (**C-K**) *Y. laevigatus*; (**C-D**) male adult; (**E**) female adult; (**F**) male final instar nymph; (**G-I**) male adult riding female final instar nymph; (**J**) male adult continuing to ride female just after emerging; (K) male copulating with still teneral female.

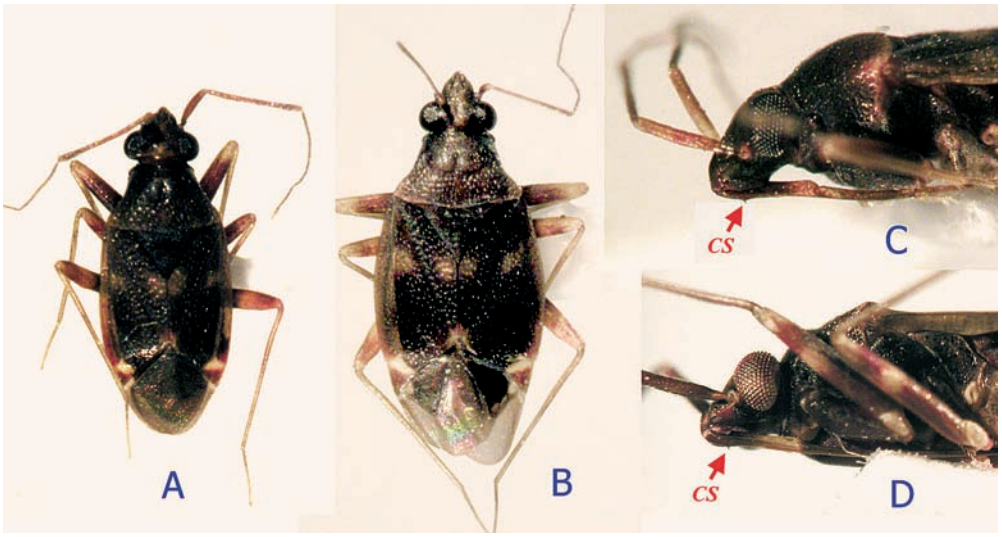


Fig. 8: Dorsal habitus (**A-B**) and left lateral view (**C-D**) of *Yamatofulvius minutus* nov.sp. (**A-C**) and *Y. miyamotoi* (**D**); (**A**, **C-D**) male; (**B**) female. Abbreviation: CS, clypeal spine.

University of Helsinki, Finland, *F. nakatai* nov.sp. can be distinguished by the highly polished head and pronotum, the uniformly dark antennal segment I, the darker antennal segment II that is darkened at nearly basal half, and the triangular, much narrower apical pale spot on the exocorium.

Biology. Unknown.

Genus *Yamatofulvius* YASUNAGA

Yamatofulvius YASUNAGA 2000: 198 (n.gen.); 2001: 128 (diag.).

Diagnosis. Characterized by synapomorphies such as the brown general coloration, more or less flattened and curved male antennal segment II, male clypeal spines, impunctate pronotal calli, and lateral sclerotized region of the vesica. Adult males are significantly smaller than females.

Discussion. YASUNAGA (2000) assumed the four above-mentioned synapomorphies for *Yamatofulvius*. During subsequent fieldwork carried out by Dr. K. Takahashi and TY in Okinawa Island of the Ryukyus, a peculiar mating behavior was observed for *Y. laevigatus* (Fig. 7C-K), which implies actual functions of two of the synapomorphies.

Both mature and immature forms of this species sometimes aggregate on rotten logs or decaying wood covered with polyporaceous fungi in dark, humid subtropical forests. In such aggregations adult males were frequently observed to ride final instar females (Fig. 7G-I). These males apparently occupy their mates so as not to be robbed by other males. The riding males hold young females tightly, using the clypeal spines (Fig. 8C, D) and the curved second antennal segments (Fig. 7D, 8A), until the females emerge. Soon after a female would emerge, the male began to copulate with the still whitish, teneral female (Fig. 7J, K). Therefore, the clypeal spines, and curved or bent antennal segments II, found only in adult males of *Yamatofulvius*, can be regarded as specialized modifications for the peculiar mating behavior.

No male adults were observed to ride female final instars when the population density was low. The adult males presumably need to reserve immature females only when populations are larger. Unfortunately, we have not seen aggregations of other *Yamatofulvius* species because they are not so commonly found and their habitats are usually restricted. Further observations are required to determine whether all *Yamatofulvius* members exhibit similar mating behavior. Only one other species of Orthotylinae, *Falconia intermedia* (DISTANT), in the diverse family Miridae appears to exhibit similar mating behavior (WHEELER 2001).

Key to Japanese species

[Revised couplets 14-15 of a key provided by YASUNAGA (2000: 207)]

1 Pronotum and thoracic pleura polished, almost impunctate . . . . . *Y. laevigatus*

– Posterior part of pronotum and thoracic pleura punctate 2

2 Body oval or suboval; head shorter than width including eyes; pronotum not carinate laterally; mesoscutum with punctures 3

– Body elongate; head about as long as, or slightly longer than wide; pronotum with distinctly carinate posterolateral margin; mesoscutum impunctate . . . *Y. sinuicornis*

3 Antennal segment II dark, with a pale ring medially . . . . . *Y. miyamotoi*

– Antennal segment II almost uniformly brownish, without distinct pale parts . . . . . *Y. minutus* nov.sp.

Yamatofulvius minutus nov.sp. (Figs 5I-L, 7A, 8A-C)

Diagnosis. Recognized by the small size, dark castaneous brown general coloration, unicolorously dark brown, short, and slightly bent antennal segment II that lacks a noticeable mesial pale ring, and unique vesica with the apically toothed sclerotized appendage.

Description. Body generally dark castaneous brown, oval but a little elongate; dorsal surface shining, punctate, with uniformly distributed, simple, short setae. Head slightly shagreened, with sparsely distributed, simple setae; vertex with a pale spot mesally; frons sparsely punctate; ♂ clypeus with a small spine at middle. Antenna dark brown; segment I reddish brown; segment II weakly curved or bent in ♂, slightly longer than basal width of pronotum; segments III and IV filiform; lengths of segments I-IV (♂/♀): 0.65/ 0.56, 1.13/ 1.06, 0.73/ 0.75, 0.88/ 1.00. Rostrum shiny chocolate brown, reaching base of genital segment. Pronotum slightly pale at basal angles, uniformly punctate, not carinate laterally, with a longitudinal, mesal sulcus between calli; collar a little broader than antennal segment III; mesoscutum and scutellum punctate; pleura dark reddish brown, densely punctate; ostiolar peritreme creamy yellow. Hemelytron dark chestnut brown, with paler spots at basal 1/3 of corium and inner corner of clavus (near apex of scutellum); cuneus reddish brown, basally with a creamy yellow, semi-circular mark; membrane smoky brown, with a semitransparent spot contiguous to apex of cuneus. Coxa and leg dark brown, partly tinged with red; apex of coxa and trochanter yellowish; apex of each femur, subapical ring of metafemur and each tarsus pale brown; lengths of metafemur, tibia and tarsus (♂/♀): 1.50/ 1.66, 1.76/ 2.06, 0.63/ 0.73. Abdomen dark castaneous brown. Male genitalia (Fig. 5I-L): Genital segment (I) somewhat bent right. Left paramere (J) C-shaped; right paramere (K) not strongly excavated apically. Vesica (L) with a horn-like sclerite and a flat, apically toothed sclerite.

Measurements. ♂/♀: Body length 3.6/ 4.3; head width including eyes 0.85/ 0.94; vertex width 0.40/ 0.44; mesal pronotal length including collar 0.73/ 0.88; basal pronotal width 1.28/ 1.50; and width across hemelytron 1.56/ 2.03.

Holotype ♂, JAPAN: Ryukyus, Amami-Oshima Is., Kinsakubaru, 11.ix.2002, T. Nakata. Paratypes: 3♂♂ 1 ♀, same data as for holotype.

Etymology. From Latin, minutus (= small, tiny), referring to comparatively small size of this new species; an adjective.

Discussion. This new species appears to be sister to *Y. miyamotoi* YASUNAGA, from which it is easily distinguished by the smaller size, uniformly dark antennal segment II, and possession of the characteristic vesical sclerites. These species are currently considered allopatric.

Biology. Unknown.

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Zusammenfassung

Neue Funde und Beschreibungen japanischer Cylapinae (an Pilzen lebende Weichwanzen) werden mitgeteilt. Die folgenden fünf neuen Arten werden von den südwestlichen subtropischen Inseln Japans beschrieben: *Bothriomiris ernsti* nov.sp., *B. yakushima* nov.sp., *Euchilofulvius lepidopterus* nov.sp., *Fulvius nakatai* nov.sp. und *Yamatofulvius minutus* nov.sp. Die Funktion zweier – bereits früher vermuteter – autapomorpher Merkmale wird für *Yamatofulvius* dokumentiert und diskutiert. Bestimmungsschlüssel werden für alle japanischen Arten der Gattungen *Bothriomiris*, *Fulvius* und *Yamatofulvius* zur Verfügung gestellt. Eine Checkliste der japanischen Cylapinae mit aktualisierten Verbreitungsangaben wird präsentiert. Männliche und/oder weibliche Genitalmerkmale werden erstmals für *Bothriomiris capillosus* und *Fulvius tagalicus* beschrieben.

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Address of the Authors:

Dr. Tomohide Yasunaga
Natural History Museum
Institute of Science & Technology
Tribhuvan University (TU)
Swayambhu, Kathmandu, Nepal
c/o JICA (Japan International Cooperation Agency) Nepal Office
P. O. Box 450, Kathmandu, Nepal
E-Mail: kasumi@wlink.com.np

Dr. Syôiti Miyamoto
Sawaraku, Iikura 3-34-4
Fukuoka 814-0161, Japan