

The Genus *Cyphonocerus* (Coleoptera, Lampyridae) from Taiwan and Japan, with Notes on the Subfamily Cyphonocerinae

Ming-Luen JENG, Ping-Shih YANG

Laboratory of Insect Conservation, Department of Entomology,
National Taiwan University, Taipei, Taiwan 106, Republic of China

and

Masataka SATÔ

Laboratory of Natural Conservation, Graduate School of
Nagoya Women's University, Nagoya, 467–8610 Japan

Abstract The genus *Cyphonocerus* KIESENWETTER from Taiwan and Japan is dealt with. Two and six species are previously recorded from Taiwan and Japan, respectively. A new species, *C. hwadongensis*, and a new subspecies, *C. okinawanus amamianus*, are described from Taiwan and Japan, respectively. A key to the Taiwanese and Japanese species of the genus is provided. Male genitalia do not provide useful characters for distinguishing congeneric species. This suggests that premating isolation is an important mechanism preventing hybridization in the genus. The name Cyphonocerinae CROWSON, based on *Cyphonocerus*, should be regarded as a subjective synonym of the Psilocladinae MCDERMOTT (stat. nov.) according to the principles of priority and coordination of the International Code of Zoological Nomenclature. The Psilocladinae is redefined, with discussion on the relationship between morphology and the phylogenetic affinity of the subfamily.

Introduction

The genus *Cyphonocerus*, along with its type species *C. ruficollis*, was established by KIESENWETTER (1879) under the Drilidae. This family arrangement was retained for many years and was adopted by many authors (*e.g.*, LEWIS, 1895; OLIVIER, 1910; PIC, 1911, 1955; WITTMER, 1944). It is important that *Psilocaldus variolosus* OLIVIER, a synonym of *C. ruficollis*, was regarded as a firefly species (OLIVIER, 1902, 1907, 1910; OKADA, 1931; MIWA, 1931; KANDA, 1935). NAKANE (1947) considered *Cyphonocerus* to be a synonym of the American lampyrid genus *Psilocladus* BLANCHARD, but later changed his opinion, regarded the former as a valid genus and transferred it to the Lampyridae (NAKANE, 1967). Most recent researchers have followed NAKANE's opinion (NAKANE, 1967, 1968, 1981, 1983, 1991; SATÔ, 1970, 1976, 1978, 1985, 1989, 1991; OHBA, 1976, 1978, 1988, 1997; LAWRENCE & NEWTON, 1995; LAI *et al.*, 1998).

Cyphonocerus is characterized by its bipectinate antennae, absence of tibial spurs, abdominal segmentation (male with 8 (visible) ventrites and female with 7) and distinctive male genitalia. Both the sexes of *C. ruficollis* were found to emit a continuous weak light (OHBA, 1981, 1983, 1997; OHBA *et al.*, 1995), and its larval stage was reported by KANDA (1935) and OHBA (1976). At the present time, *Cyphonocerus* is composed of ten known species. In this paper, we are going to review the species from Taiwan and Japan, and to describe a new species from Taiwan and a new subspecies from Japan. Validity of the subfamilial name Cyphonocerinae and the morphology of this subfamily are also discussed.

Material and Methods

Specimens were collected by the authors or borrowed from the museums and institutions listed below. Both pinned and alcoholic materials were used. Type specimens are specified if examined.

Descriptions are mainly based on pinned dried specimens. Measurements of body were made by outlining the shape under Nikon SMZ-10 stereomicroscope with the aid of a drawing tube. Body length (BL) was calculated as the sum of pronotal and elytral lengths (PL+EL); pronotal width (PW) and body width (BW=EW) refer to the broadest widths of the pronotum and elytra, respectively. The letter V refers to the abdominal visible sternum, and T to the abdominal tergite; aedeagal sheath is composed of S9 (true sternum 9 of abdomen=V8) and TS (tergite of aedeagal sheath=T9 (paraproct)+T10 (proctiger); see BALLANTYNE, 1987, 181). Antennae, labial palpi, abdominal tergite 8 and ventrite 7 as well as male genitalia were removed and drawn by using an Olympus BX50 light microscope with drawing tube. T8 and V7 were mounted on slides. The flight periods refer to the emergence periodicity of adults and were recorded based on materials examined and literal records.

Acronyms:

MNHN	Muséum national d'Histoire naturelle, Paris, France (J. MENIER)
NMB	Naturhistorisches Museum Basel, Switzerland (M. BRANCUCCI)
NMNS	National Museum of Natural Science, Taichung, Taiwan (M.-L. CHAN)
NTU	National Taiwan University, Taipei, Taiwan (T.-C. HSU)
NWU	Nagoya Women's University, Nagoya, Japan (M. SATÔ)
TARI	Taiwan Agricultural Research Institute, Taichung, Taiwan (L.-Y. CHOU)

Taxonomic Accounts

Key to the Species of *Cyphonocerus* KIESENWETTER from Taiwan and Japan

1. Pronotum reddish brown 2.

- Pronotum yellowish brown, dark brown or brownish black 3.
- 2. Elytra black; parameres of male genitalia bifurcate at apex
- *C. ruficollis* KIESENWETTER.
- Elytra reddish brown; parameres of male genitalia not forked at apex
- *C. sanguineus* PIC.
- 3. Antennal ramus branched from apex of its antennomere, and much shorter than its own antennomere in both sexes *C. inelegans* NAKANE.
- Antennal ramus branched from base of its antennomere, more or less longer than the antennomere in male 4.
- 4. Coloration of pronotum more or less darker or lighter than that of elytra 5.
- Coloration of pronotum and elytra almost the same 9.
- 5. Pronotum dark or blackish brown, elytra yellowish brown 7.
- Pronotum yellowish brown, elytra dark brown or brownish black
- *C. okinawanus* NAKANE [6].
- 6. Elytra and all tibiae dark brown *C. okinawanus okinawanus* NAKANE.
- Elytra and all tibiae brownish black *C. okinawanus amamianus* ssp. nov.
- 7. Pronotum blackish brown throughout; elytra about 3.6 times as long as pronotum
- *C. yayeyamensis* M. SATÔ.
- Pronotum dark brown at discal centre, with margins yellowish brown; elytra more than 4 times as long as pronotum 8.
- 8. Paramere of male genitalia sharply curved in basal 1/2 on inner side ventrally; antennomeres 3–10 and their appendages slender (Fig. 40 B) *C. taiwanus* NAKANE.
- Paramere of male genitalia smoothly curved on inner side ventrally; antennomeres 3–10 and their appendages somewhat short and stout (Fig. 40 C)
- *C. hwadongensis* sp. nov.
- 9. Coloration brownish black throughout dorsum *C. watarii* M. SATÔ.
- Coloration dark brown, with paler margins dorsally *C. marginatus* LEWIS.

***Cyphonocerus inelegans* NAKANE**

(Figs. 1, 13, 22, 31)

Cyphonocerus inelegans NAKANE, 1967, 7; 1968, 5 (in *Psilocladina*). — SATÔ, 1978, 47 (review). — OHBA *et al.*, 1995, 11 (morphology and ecology). — OHBA, 1997, 133 (checklist).

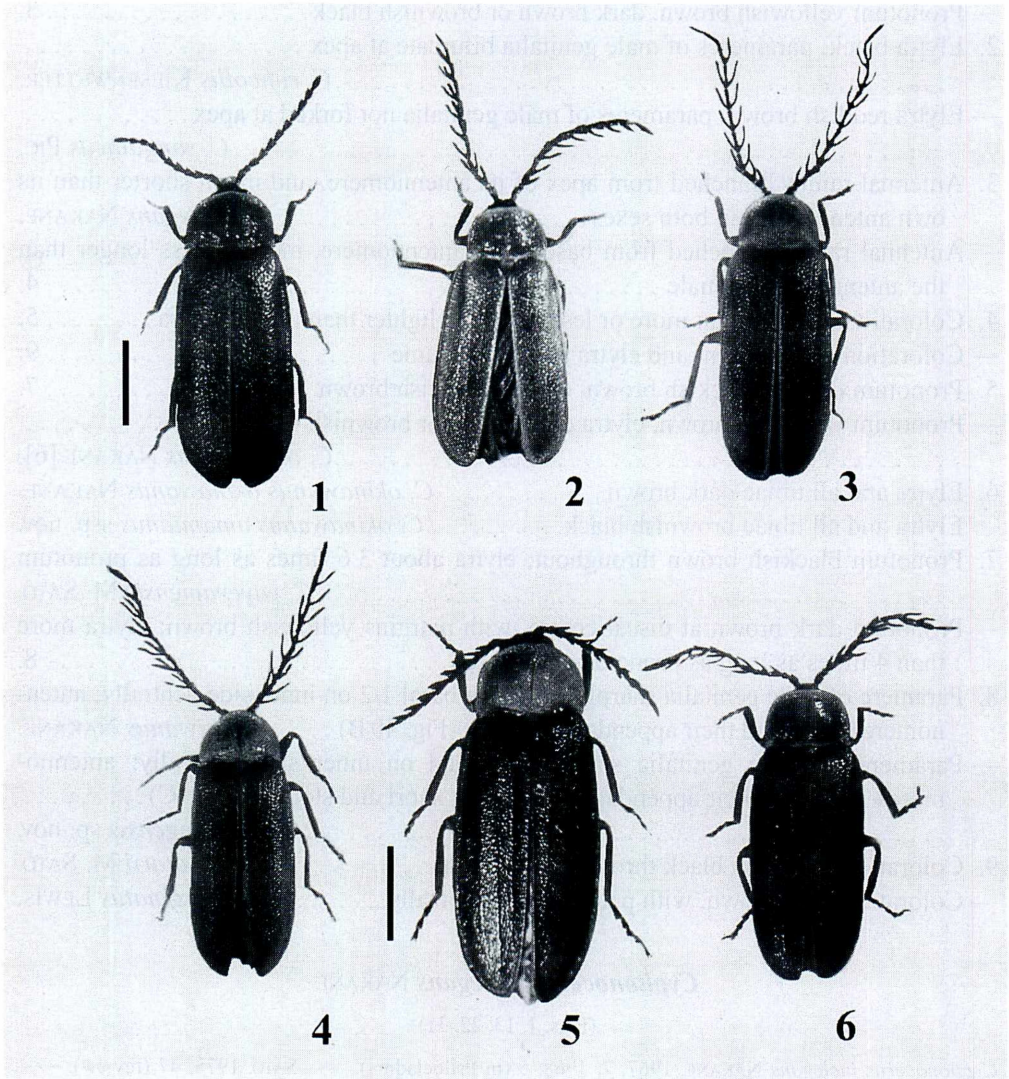
Type locality. Mimune, Mie Pref., Honshu, Japan.

This species was carefully redescribed by OHBA *et al.* (1995).

Brief description. EL/EW=2.1–2.2, EL/PL=4.2–4.3. T8 (Fig. 13) transverse, apex weakly arcuate and apical angles rounded.

Aedeagal sheath (Fig. 22) oblong, about 1.3 mm long, 0.7 mm wide. TS thumb-like, about a half as long as sheath, with lateral sides slightly sinuate; T10/T9 in length about 1.7.

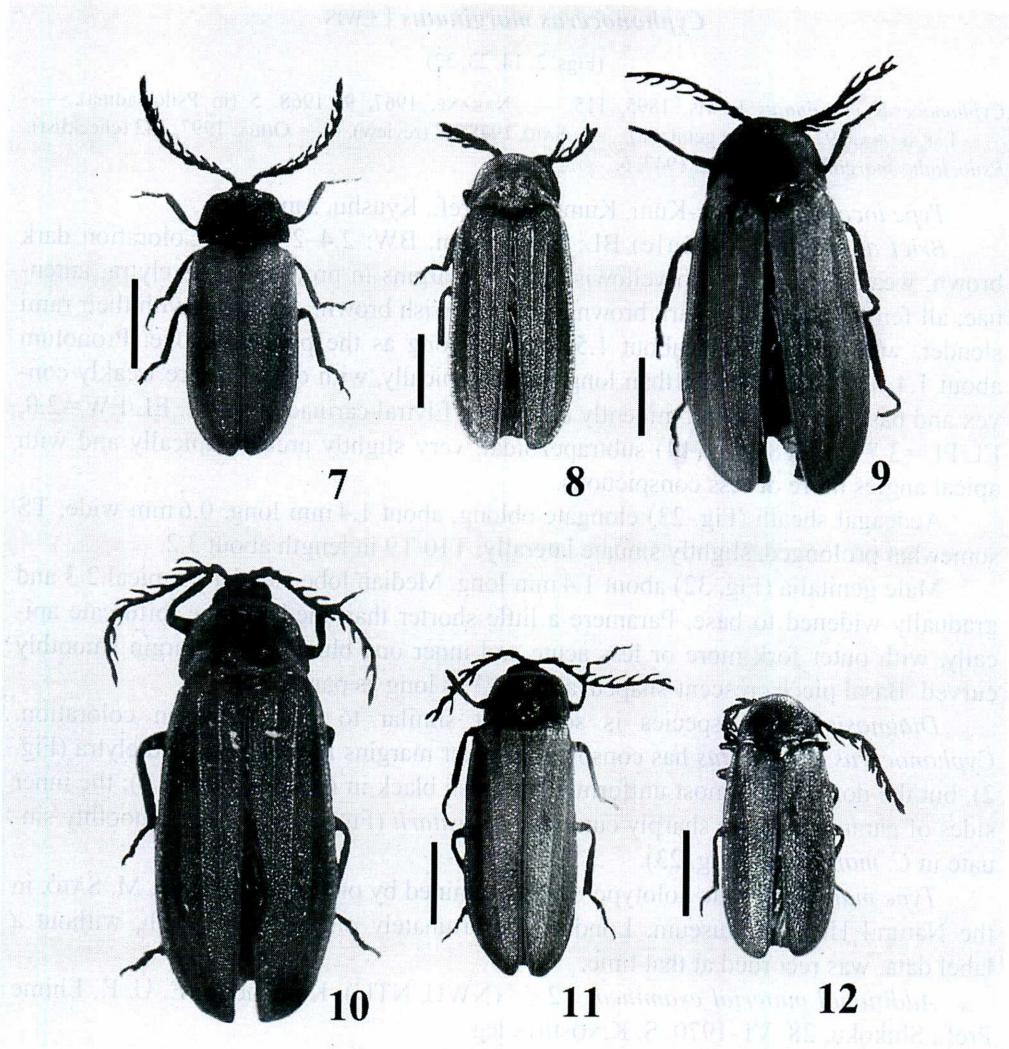
Male genitalia (Fig. 31) about 1.3 mm long. Median lobe slender in apical 1/2 and gradually widened to base. Paramere bifurcate apically, with apex of each fork blunt;



Figs. 1–6. Males of *Cyphonocerus* species. — 1, *C. inelegans* NAKANE, specimen from Honshu; 2, *C. marginatus* LEWIS, specimen from Shikoku; 3, *C. okinawanus okinawanus* NAKANE, specimen from Is. Okinawa-hontô; 4, *C. okinawanus amamianus* ssp. nov., paratype from Is. Amami-Ôshima; 5, *C. ruficollis* KIESENWETTER, specimen from Honshu; 6, *C. watarii* M. SATÔ, paratype from Kyushu. Scales=2 mm; all but Fig. 5 in the same scale.

inner side prominently but smoothly curved in apical 2/5. Basal piece crescent-shaped, about a half as long as paramere.

Diagnosis. This species is very distinctive for its antennae which have obsolete rami arising from the apices of antennomeres 3–10 in both sexes (see Fig. 1). No con-



Figs. 7–12. Males of *Cyphonocerus* species. — 7, *C. yayeyamensis* M. SATÔ, holotype, Is. Ishigakijima; 8, *C. sanguineus* OLIVIER, holotype (in MNHN) from S. Taiwan; 9, *C. sanguineus* OLIVIER, specimen from S. Taiwan; 10, *C. klapperichi* PIC (in NMB), specimen from S. China; 11, *C. taiwanus* NAKANE, specimen from C. Taiwan; 12, *C. hwadongensis* sp. nov., paratype from E. Taiwan. Scale = 2 mm; Figs. 9–10 in the same scale.

generic species possess similar character state.

Material examined. 1 ♂ (NWU), Hirakura, Misugi, Mie Pref., Honshu, 6–VI–1992, M. SAITO leg. / *Cyphonocerus inelegans* NAKANE, det. M. SATÔ, 1996.

Distribution. Japan (Honshu).

Flight period. June.

Cyphonocerus marginatus LEWIS

(Figs. 2, 14, 23, 32)

Cyphonocerus marginatus LEWIS, 1895, 115. — NAKANE, 1967, 9; 1968, 5 (in *Psilocladina*). — TAKAKURA, 1977, 6 (male genitalia). — SATÔ, 1978, 47 (review). — OHBA, 1997, 132 (checklist).
Psilocladus marginatus: NAKANE, 1947, 6.

Type locality. Kuma-Kuni, Kumamoto Pref., Kyushu, Japan.

Brief description. (Male) BL: 6.0–6.8 mm, BW: 2.4–2.7 mm. Coloration dark brown, weakly shining, with yellowish brown margins in pronotum and elytra; antennae, all femora and tibiae dark brown, tarsi yellowish brown. Antennae with their rami slender, with last segment about 1.5 times as long as the preceding one. Pronotum about 1.4–1.5 times broader than long, arched apically, with discal centre weakly convex and basal angles not prominently expanded. Elytral carinae obsolete. EL/EW=2.0, EL/PL=3.7–3.9. T8 (Fig. 14) subtrapezoidal, very slightly arcuate apically and with apical angles more or less conspicuous.

Aedeagal sheath (Fig. 23) elongate oblong, about 1.4 mm long, 0.6 mm wide; TS somewhat prolonged, slightly sinuate laterally; T10/T9 in length about 3.2.

Male genitalia (Fig. 32) about 1.4 mm long. Median lobe slender in apical 2/3 and gradually widened to base. Paramere a little shorter than median lobe, bifurcate apically, with outer fork more or less acute and inner one blunt; inner margin smoothly curved. Basal piece crescent-shaped, about 1/3 as long as paramere.

Diagnosis. This species is somewhat similar to *C. watarii* in coloration. *Cyphonocerus marginatus* has conspicuous paler margins in pronotum and elytra (Fig. 2), but the dorsum is almost uniformly brownish black in *C. watarii* (Fig. 6); the inner sides of parameres more sharply curved in *C. watarii* (Fig. 27) but more smoothly sinuate in *C. marginatus* (Fig. 23).

Type material. The holotype ♂ was examined by one of the authors, M. SATÔ, in the Natural History Museum, London. Unfortunately only a photograph, without a label data, was recorded at that time.

Additional material examined. 2 ♂♂ (NWU, NTU), Komenono, E. U. F., Ehime Pref., Shikoku, 28–VI–1970, S. KINOSHITA leg.

Distribution. Japan (Shikoku, Kyushu).

Flight period. June.

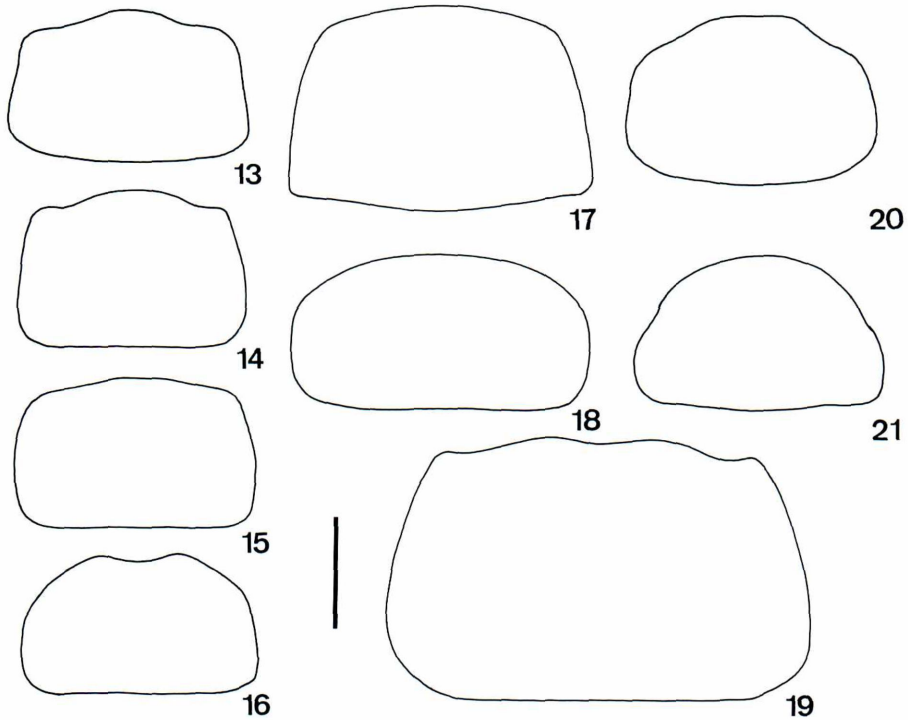
Cyphonocerus okinawanus okinawanus NAKANE

(Figs. 3, 15, 24, 33)

Cyphonocerus okinawanus NAKANE, 1983, 142. — OHBA, 1997, 132 (checklist).

Type locality. Yabu, Is. Okinawa-hontô, Okinawa Pref., Japan.

Brief description. (Male) BL: 6.1 mm, BW: 2.4 mm. Pronotum, elytral suture and all tarsi yellowish brown; scutellum, elytra, all femora and tibiae, and basal two antennomeres dark brown; antennae black; venter dark brown. Antennae and their rami



Figs. 13–21. Abdominal tergite 8 of males of *Cyphonocerus* species. — 13, *C. inelegans*; 14, *C. marginatus*; 15, *C. okinawanus okinawanus*; 16, *C. okinawanus amamianus*, paratype; 17, *C. ruficollis*; 18, *C. watarii*, paratype; 19, *C. sanguineus*; 20, *C. taiwanus*; 21, *C. hwadongensis*, paratype. Scale = 0.5 mm.

slender, with last antennomere about 1.5 times as long as the preceding one. Pronotum about 1.4 times broader than long, arched apically, with discal centre well convex and basal angles not prominently protruded. Elytra elongate, with carinae obsolete. $EL/EW = 2.1$, $EL/PL = 4.1$. T8 (Fig. 15) subrectangular, with apical angles rounded.

Aedeagal sheath (Fig. 24) oblong, about 1.3 mm long, 0.6 mm wide; TS with T10/T9 in length about 2.4.

Male genitalia (Fig. 33) about 1.5 mm long. Median lobe slender in apical 3/5 and thence widened toward base. Paramere almost as long as median lobe, bifurcate apically, with outer fork blunt and inner fork more acute; inner margin smoothly sinuate in basal half. Basal piece crescent-shaped, about a half as long as paramere.

Diagnosis. Among the known species, only *C. okinawanus* has yellowish brown pronotum and dark brown elytra. Male genitalia resemble those of *C. inelegans*, and they can be separated from each other by the inner sides of parameres which curve in apical 2/5 in *C. inelegans* (Fig. 31) but in apical half in *C. okinawanus* (Fig. 33). Male genitalia of *C. marginatus* are almost identical to those of *C. okinawanus*, but they are

different in body form of which *C. okinawanus* has very elongate elytra (EL/EW=4.1 vs. 3.7–3.9 in *C. marginatus*), in coloration as stated above, and in TS which is narrower and elongate in *C. marginatus* (Fig. 23) but shorter in *C. okinawanus* (Fig. 24).

Material examined. 1 ♂ (NWU), Yona, Forest of Ryukyu Univ., Is. Okinawa-hontô, 12–III–1996, T. TOYOGUCHI leg.

Distribution. Japan (Is. Okinawa-hontô).

Flight period. March to May.

Cyphonocerus okinawanus amamianus ssp. nov.

(Figs. 4, 16, 25, 34)

Type locality. Hatsuno, Is. Amami-Ôshima, Kagoshima Pref., Japan.

Diagnosis. This new subspecies can be distinguished from the nominotypical subspecies by its blackish brown elytra and legs, yellowish brown scutellum, and slightly emarginate apex of T8 (Fig. 16). Aedeagal sheath and male genitalia as shown in Figs. 25 and 34, respectively.

Type series. Holotype ♂ (NWU), Hatsuno, Is. Amami-Ôshima, 5–IV–1965. K. UEDA leg. / Holotype / Holotype *Cyphonocerus okinawanus amamianus* JENG, YANG et M. SATÔ, sp. nov., Det. JENG, 1998. Paratypes: (NWU, NTU) 1 ♂, with identical collecting data as the holotype; 1 ♂, Hatsuno, Is. Amami-Ôshima, 28–III–1965, H. NOMURA leg.; 1 ♂, Akina, Is. Amami-Ôshima, 24–III–1968, E. ITO leg.; 2 ♂♂, Mt. Yuwan, Is. Amami-Ôshima, 1–V–1984, H. ARIMOTO leg.

Distribution. Japan (Is. Amami-Ôshima).

Flight period. March to May.

Etymology. The subspecific name refers to its occurrence in Amami-Ôshima.

Cyphonocerus ruficollis KIESENWETTER

(Figs. 5, 17, 26, 35)

Cyphonocerus ruficollis KIESENWETTER, 1879, 312. — LEWIS, 1895, 121 (review). — OLIVIER, 1910, 8 (in Drilidae). — NAKANE, 1967, 9 (returned from *Psilocladus*); 1968, 5 (in Psilocladina). — SATÔ, 1976, 47 (review). — OHBA, 1976, 35 (morphology & ecology); 1983, 40 (flash pattern); 1997, 132 (checklist). — TAKAKURA, 1977, 7 (male genitalia).

Psilocladus variolosus OLIVIER, 1902, 188; 1907, 12 (checklist). — OKADA, 1931, 142 (review). — KANDA, 1935, 133 (morphology & larva). — NAKANE, 1947, 4 (syn.).

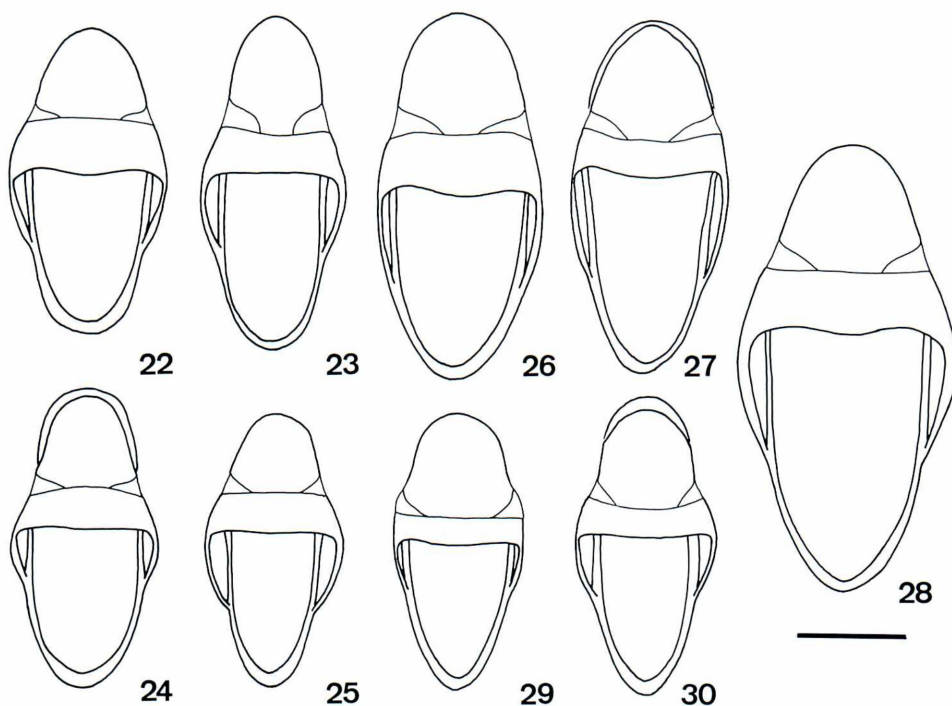
Psilocladus ruficollis: NAKANE, 1947, 5 (syn.).

Type locality. Japan.

This species was redescribed in detail by KANDA (1935) and OHBA (1976).

Brief description. (Both sexes) BL: 7.6–8.1 mm, BW: 2.8–2.9 mm. EL/EW=2.1–2.2, EL/PL=4.1–4.3. Male with T8 (Fig. 17) subtrapezoidal, with apex slightly arcuate.

Aedeagal sheath (Fig. 26) about 1.6 mm long, 0.7 mm wide; TS thumb-like, not



Figs. 22–30. Aedeagal sheath of *Cyphonocerus* species, dorsal aspect. — 22, *C. inelegans*; 23, *C. marginatus*; 24, *C. okinawanus okinawanus*; 25, *C. okinawanus amamianus*, paratype; 26, *C. ruficollis*; 27, *C. watarii*, paratype; 28, *C. sanguineus*; 29, *C. taiwanus*; 30, *C. hwadongensis*, paratype. Scale=0.5 mm.

sinuate laterally; T10/T9 in length about 2.3.

Male genitalia (Fig. 35) about 1.6 mm long. Apical half of median lobe very slender, gradually widening to base. Paramere bifurcate, with inner fork very long and slender, while the outer fork curves inwards and acute apically; inner margin sharply curved in apical 2/5. Basal piece narrowly crescent-shaped, slightly narrowed centrally.

Female with its antennal rami very short — seemingly serrate.

Diagnosis. This species is distinctive for its coloration, bearing a reddish brown pronotum and black elytra (Fig. 5). *Cyphonocerus okinawanus amamianus* has similar coloration but has a dark yellow pronotum, and the male genitalia are quite different from those of *C. ruficollis* (Fig. 34 vs. 35). The male genitalia of *C. ruficollis* closely resemble those of *C. sanguineus* (Fig. 37) from which they can be separated by the bifurcate apices of parameres in *C. ruficollis*, and the lack of forked parameres in *C. sanguineus*.

Material examined. 1 ♂ and 1 ♀ (NWU), Is. Mikura-jima, Izu-shotô, Tokyo, 29-V~4-VI-1990, H. NAKANO leg.; 1 ♀, near Yakeyama, Is. Kôzu-shima, Izu-shotô, Tokyo, 13-V-1983, T. NIISATO & M. NISHIMURA leg.; 1 ♂ (NTU), Daibosatsu, Kana-

gawa Pref., Honshu, 15–VII–1973, K. MASUMOTO leg.; 1 ♂ (NTU), Daisen, Tottori Pref., Honshu, 17–19–VII–1973, Y. NOTSU leg.

Distribution. Japan (Honshu, Kyushu, Is. Mikura-jima, Is. Kôzu-shima).

Flight period. May to July.

Cyphonocerus watarii M. SATÔ

(Figs. 6, 18, 27, 36)

Cyphonocerus watarii M. SATÔ, 1991, 191 — OHBA, 1997, 133 (checklist).

Type locality. Jooyama, Munakata-shi, Fukuoka Pref., Kyushu, Japan.

Brief description. (Male) BL: 6.8–7.2 mm, BW: 2.4–2.7 mm. Coloration brownish black, with margins of pronotum and elytra, elytral carinae, scutellum and V8 brown. Antennae and their rami slender, with last segment about 1.6 times longer than the preceding one. Pronotum 1.5 times broader than long, weakly broadly rounded apically, with discal centre well convex and basal angles blunt. Elytra with carinae distinct. EL/EW=2.1, EL/PL=4.0. T8 (Fig. 18) transverse, very broadly rounded apically, with apical angles smoothly rounded.

Aedeagal sheath (Fig. 27) elongate oblong, about 1.6 mm long and 0.7 mm wide. TS a little shorter than half the length of sheath.; T10/T9 in length about 3.0.

Male genitalia (Fig. 36) about 1.6 mm long. Median lobe slender in apical 3/5 and widening to base. Paramere bifurcate apically, both forks blunt apically; inner sides conspicuously curved in apical halves but not sharply pointed. Basal piece narrowly crescent-shaped, about 2/5 as long as paramere.

Female unknown.

Diagnosis. This species is similar to *C. marginatus* and *C. inelegans*. Externally, *C. watarii* can be separated from the two preceding taxa by its brownish black coloration (Fig. 6); dark brown, fringed with yellowish brown margins in *C. marginatus*, and brown throughout dorsum in *C. inelegans*. Further, T8 of *C. watarii* is much broader than long (in the ratio 1.9), while those of the other two species are in the ratio 1.5–1.6.

Type material. 1 paratype ♂ (NTU), Jooyama, Munakata-shi, Fukuoka Pref., Kyushu, 1–VI–1991, H. WATARI leg. / paratype / *Cyphonocerus watarii* M. SATÔ, Det. M. SATÔ, 1991.

Distribution. Japan (Kyushu).

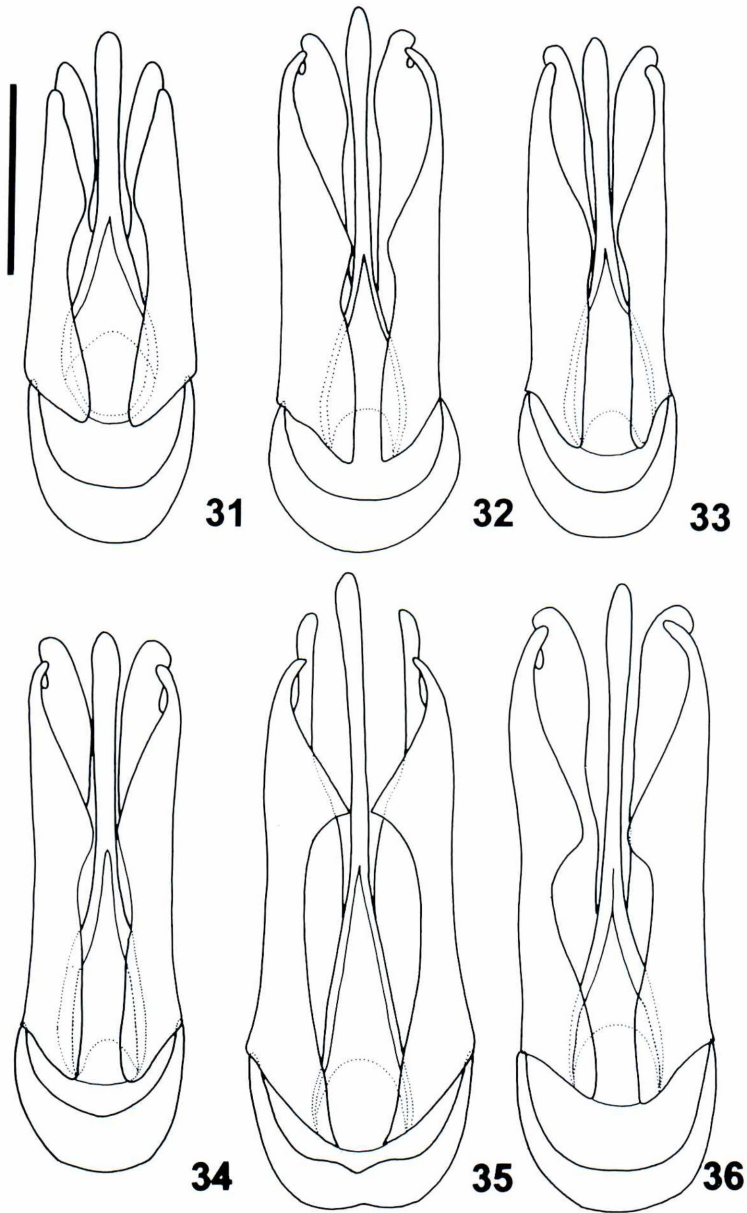
Flight period. June.

Cyphonocerus yayeyamensis M. SATÔ

(Fig. 7)

Cyphonocerus yayeyamensis M. SATÔ, 1976, 59; 1978, 16 (review). — OHBA, 1997, 133 (checklist).

Type locality. Mt. Omoto-yama, Is. Ishigaki-jima, Okinawa Pref., Japan.



Figs. 31–36. Male genitalia of *Cyphonocerus* species, ventral aspect. — 31, *C. inelegans*; 32, *C. marginatus*; 33, *C. okinawanus okinawanus*; 34, *C. okinawanus amamianus*, paratype; 35, *C. ruficollis*; 36, *C. watarii*, paratype. Scale=0.5 mm.

Brief description. BL: 5.8 mm, BW: 2.3 mm. Pronotum, scutellum and antennomeres 3–11 with their rami brownish black; elytra yellowish brown; venter, all legs and basal two antennomeres dark brown. Antennomeres and their rami stout, with last segment about 1.2 times as long as the preceding one. Pronotum transverse, about 1.6 times broader than long; apical margin very weakly rounded, broad; basal angles not prominently expanded. Elytra comparatively short, with carinae obsolete. EL/EW = 2.0, EL/PL = 3.6.

Since the holotype is the only known specimen, we refrain from dissecting its aedeagal sheath and T8.

Male genitalia: see fig. 15 of SATÔ (1976).

Female unknown.

Diagnosis. This species is very distinctive in its robust body form (Fig. 7) in which the EL/PL value is about 3.6, a value lower than in the other species. Externally, the species is somewhat similar to *C. taiwanus* in coloration, but the latter has very elongate elytra (EL/PL = 4.3–4.5) and more slender antennae.

Type material. Holotype ♂ (NWU), Mt. Omoto-yama, Is. Ishigaki-jima, 19–III–1965, T. ITO leg. / *Cyphonocerus yayeyamensis* M. SATÔ, sp. nov., Det. M. SATÔ, 1967 / *Cyphonocerus yayeyamensis* M. SATÔ, Det. M. SATÔ, 1982.

Distribution. Japan (Is. Ishigaki-jima).

Flight period. March.

Cyphonocerus sanguineus PIC

(Figs. 8, 9, 19, 28, 37)

Cyphonocerus sanguineus PIC, 1911, 143. — NAKANE, 1967, 9 (name list). — LAI *et al.*, 1998 (check-list, in press).

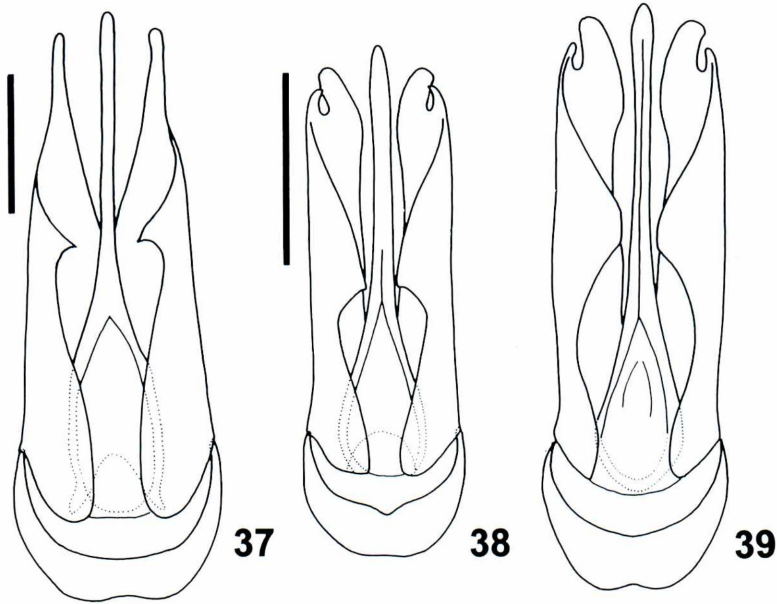
Cyphonocerus formosanus M. SATÔ, 1970, 22. — NAKANE, 1981, 125 (syn.).

Type locality. Tainan, southwestern Taiwan.

Brief description. BL: 7.8–11.2 mm (male), 8.7–10.3 mm (female); BW: 3.5–4.8 mm (male), 3.8–4.2 mm (female). Coloration of dorsum reddish brown except for head, antennae and legs dark brown to black; venter brown to black and slightly lustrous. Antennal rami longer than their own antennomeres in male but subequal in female; last segment 1.2 times longer than the preceding one. Pronotum transverse, 1.6 times broader than long, with apex roundly arcuate and basal angles conspicuous; discal centre moderately convex. Elytral carinae distinct. EL/EW = 1.8–2.1, EL/PL = 4.0–4.3. T8 weakly rounded and broad apically. T8 (Fig. 19) subtrapezoidal, with apex very weakly arcuate and slightly notched centrally, and with apical angles more or less conspicuous.

Aedeagal sheath (Fig. 28) about 2.0 mm long, 0.9 mm wide. TS with T10/T9 in length about 2.0.

Male genitalia (Fig. 37) about 2.0 mm long. Median lobe with apical 3/5 slender and wider toward base dorsally, but slightly curved laterally. Paramere with apical 1/5



Figs. 37–39. Male genitalia of *Cyphonocerus* species, ventral aspect. — 37, *C. sanguineus*; 38, *C. taiwanus*; 39, *C. hwadongensis*, paratype. Scale=0.5 mm; Figs. 38–39 in the same scale.

slender and blunt at apex, also bearing a setal tuft at apex; inner sides sharply curved in apical 2/5. Basal piece narrowly crescent-shaped, broadly rounded and slightly emarginate at middle of apex.

Variation. A male from southern Taiwan has black maculations on pronotum, and is much larger than the other male specimens from northern and middle Taiwan (Fig. 9). The only female specimen examined from Vietnam (BL: 13.5 mm) is larger than the Taiwanese specimens.

Diagnosis. Among the known species of *Cyphonocerus*, only *C. sanguineus* and *C. klapperichi* PIC from China have reddish brown coloration dorsally. According to PIC (1955), the latter has four elytral carinae and dark markings on the pronotum. We examined a specimen of *C. klapperichi* from its type locality (Fujian) from NMB (Fig. 10) and were not able to find any significant characters which separated the species from *C. sanguineus*, with the exception of the pronotal marking. The same pronotal marking is, however, also seen in populations of *C. sanguineus* from southern Taiwan. It is possible that *C. klapperichi* is a synonym of *C. sanguineus*. Unfortunately, we were unable to find the type specimen(s) of *C. klapperichi* at MNHN.

Type material. Holotype ♂ (by monotypy?, MNHN), Tainan, Formosa, IV (Fig. 8).

Additional material examined. Taiwan (NTU, NMNS, NWU, TARI): 1 ♂, Yangmingshan, Taipei Co., 6–IV–1979, K. MASUMOTO leg.; 1 ♂, Jingshan, Taipei City, 30–IV–1997, M. F. CHEN leg.; 1 ♂, Wulai, Taipei Co., 3–IV–1981, T. OCHI leg.; 1 ♂, 1 ♀,

Wulai, Taipei Co., 1-V-1997, M. L. JENG leg.; 1 ♀, Wulai, Taipei Co., 27-V-1982, C. F. YANG leg.; 1 ♀, Shiding, Taipei Co., 20-V-1992, C. F. LEE leg.; 1 ♀, Jongher, Taipei, Co., 10-IV-1992, Y. C. YU leg.; 1 ♂, Juolan, Miaoli Co., 13-IV-1981, Y. P. LUO leg.; 1 ♂, Tungpu, Nantou Co., 16~20-IV-1984, K. C. CHOU & C. H. YUNG leg.; 1 ♀, Puli, Nanshanshi, Nantou Co., 2-V-1975, S. IMASAKA leg.; 1 ♂, Aowanta, Nantou Co., 30-IV-1992, W. T. YANG leg.; 1 ♂, Liogwei, Shiker Shan (alt. 1,700 m), Kaohsiung Co., 4-V-1986, K. BABA leg.

China: 1 ♂ (NMB), NW. China.

Vietnam: 1 ♀ (NWU), Tam Dao, Vinh Phu Prov., N. Vietnam, 22-IV-1995, M. SATÔ leg.

Distribution. This species is now known from Taiwan, China and Vietnam. In Taiwan, this species seems widely distributed in western areas. The altitudinal distribution ranges from 0 to 1,700 m. Whether or not is the species distributed in eastern Taiwan remains unknown.

Flight period. April to May.

Cyphonocerus taiwanus NAKANE

(Figs. 11, 20, 29, 38, 40)

Cyphonocerus taiwanus NAKANE, 1967, 8. — SATÔ, 1970, 23-24 (key and male genitalia). — LAI *et al.*, 1998 (checklist, in press).

Type locality. Song-Gang (alt. 2,000 m), Nantou County, central Taiwan.

Brief description. (Male) BL: 6.5–7.5 mm, BW: 2.3–3.0 mm. Coloration brown to dark brown except for elytra yellowish brown; venter weakly shining. Antennae with their rami slender, apical segment about 1.4–1.5 times as long as the preceding one. Pronotum transverse, 1.5–1.6 times broader than long, with apical margin weakly rounded and broad; basal angles prominently protruded posteriad; discal centre well convex. Elytra very elongate, with carinae obsolete. EL/EW=2.1, EL/PL= 4.3–4.5. T8 (Fig. 20) arcuate apically and slightly sinuate apico-laterally.

Aedeagal sheath (Fig. 29) about 1.3 mm long, 0.6 mm wide, oblong; TS slightly sinuate laterally; T10/T9 in length about 3.3.

Male genitalia (Fig. 38) about 1.3 mm long. Median lobe slender in apical 2/3 and gradually broader toward base. Paramere bifurcate apically, with outer fork acute and inner fork blunt; inner sides of parameres sharply curved in apical halves. Basal piece crescent-shaped, about 1/3 as long as paramere, slightly narrowed centrally and broadly rounded at apex.

Female unknown.

Diagnosis. This species resembles *C. yayeyamensis* M. SATÔ in coloration. Their differences were shown above.

Material examined. 7 ♂♂, Chingjing Farm (1,900 m), Nantou Co., 9-V-1997, C.-J. CHANG leg.; 6 ♂♂, Meifeng (2,100 m), Nantou Co., 12~22-V-1974, K. MATSUDA leg.; 1 ♂, Song-Gang~Meifeng (2,044–2,127 m), Nantou Co., 19-V-1969, S. HISA-



40



41

Figs. 40–41. Male antennae of *Cyphonocerus* species. — 40, *C. taiwanus*; 41, *C. hwadongensis*, paratype. Scale=1 mm.

MATSU leg.; 1 ♂, Alishan (2,400 m), Chiayi Co., 10–VI–1977, J. a. S. KLAPPERICH leg.; 1 ♂, Chuyun, Kaohsiung Co., 16–V–1935, Y. MIWA leg.

The holotype of this species is deposited in T. NAKANE's private collection and we were unable to examine it.

Distribution. This species is known only from central montane areas of Taiwan at 1,500–2,500 m in elevation.

Flight period. March to June.

Cyphonocerus hwadongensis sp. nov.

(Figs. 12, 21, 30, 39, 41)

Type locality. Chihpen, Taitung County, southeastern Taiwan.

Description. (Male) BL: 5.4–6.2; BW: 2.0–2.3. Coloration yellowish brown on dorsum, with pronotal disc and scutellum dark brown; venter brown to dark brown, with slight lustre; epicranium, antennae and legs dark brown. Epicranium densely and coarsely punctate. Antennal segments 3–10 each possessing a pair of rami which are longer than its antennomere; antennomere stout; last segment longer than the preceding one by about 1.5 times (Fig. 41). Pronotum 1.5–1.7 times broader than long, with anterior margin weakly rounded and broad, with hind angles not prominently expanded; surface coarsely and densely punctate and covered with dense pubescence; discal centre weakly convex. Scutellum sparsely punctate in basal 1/4 but coarsely in the remaining part. Elytra coarsely and densely punctate, clothed with suberect pubescence; margins reflexed, elytral carinae distinct. EL/EW=2.1, EL/PL=4.2. T8 (Fig. 21) arcuate at apex.

Aedeagal sheath (Fig. 30) about 1.4 mm long, 0.7 mm wide, oblong. TS a little shorter than half the length of sheath, with T10/T9 about 3.0 in length.

Male genitalia (Fig. 39) about 1.5 mm long. Median lobe slender in apical 3/5,

hence broader towards base. Paramere about as long as median lobe, bifurcate apically; outer fork acute, inner fork blunt; inner sides of parameres smoothly but conspicuously sinuate in apical halves. Basal piece crescent-shaped, about 1/4 as long as paramere, slightly emarginate at apex.

Female unknown.

Type series. Holotype ♂ (NMNS), Chihpen, Taitung Hsien, SE. Taiwan, 17~18-II-1982, L. Y. CHOU & K. C. CHOU leg. Paratypes: (NMNS, TARI and NTU) 2 ♂♂ with the same data as the holotype; 2 ♂♂, Antung, Hualien Hsien, E. Taiwan, 14~17-II-1982, K. C. CHOU & C. C. PAN leg.

Diagnosis. This species resembles *C. taiwanus* NAKANE from Taiwan and *C. marginatus* LEWIS from Japan. *Cyphonocerus taiwanus* is larger in size than this new species and more slender in antennomere 10 and its appendages. Besides, the parameres of these two species are also different in shape; *C. marginatus* can be separated from this new species by its dark brown coloration edged with yellowish brown margins dorsally and more elongate oblong TS.

Etymology. The specific name refers to its distribution in Hualien and Taitung in eastern Taiwan.

Distribution. Eastern Taiwan.

Flight period. February.

Discussion

From the illustrations of the male genitalia shown above, it is obvious that this organ does not provide useful characters in comparison of congeneric species. This suggests that premating isolation is an important mechanism preventing hybridization between sympatric species of the genus.

The systematic position of *Cyphonocerus* has changed frequently. It was originally placed in the Drilidae when established (including citation) and remained unchanged for nearly 90 years until its transfer to the Lampyridae. However, *Psilocladus variolosus*, a synonym of *C. ruficollis*, the type species of *Cyphonocerus*, was placed by OLIVIER (1907, 1910) in the Lamprocerini of the Lampyridae based on its bipectinate antennae. GREEN (1959) redefined the Lamprocerini and excluded *Psilocladus* BLANCHARD from the group. MCDERMOTT (1964) erected the subtribe Psilocladina based on *Psilocladus* under the Amydetini of the Lampyrinae (later raised to the subfamily Amydetinae by MCDERMOTT (1966)), but he did not list *Cyphonocerus* in his catalogue of the Lampyridae. It was NAKANE (1967) that first transferred *Cyphonocerus* to the Lampyridae, and later he placed it under the Psilocladina of the Amydetinae in the modified "MCDERMOTT System" (NAKANE, 1968). This was adopted by OHBA (1978, 1988). CROWSON (1972) established the subfamily Cyphonocerinae which was composed of Asian *Cyphonocerus* and North American *Pollaclasis* NEWMAN.

The status of the Psilocladina and the Cyphonocerinae should be noticed. The former is based on American *Psilocladus* and the latter on Asian *Cyphonocerus*. MCDER-

MOTT (1964, 1966) grouped *Psilocladus*, *Pollaclasis* and some other genera in the Psilocladina, while CROWSON (1972) united *Cyphonocerus* and *Pollaclasis* into the Cyphonocerinae. NAKANE (1991) added *Psilocladus* to the Cyphonocerinae. We examined a *Psilocladus* species from Peru, possibly *P. apicalis* KIRSCH, and compared it with *Cyphonocerus* species. Only minor differences were detected between these two genera, e.g., the width of antennal rami, shape of male genitalia, and so on. We fully agree with NAKANE in considering that *Psilocladus* and *Cyphonocerus* are closely related and most likely belong to the same subfamily. From the viewpoint of nomenclature, the priority of Psilocladina over Cyphonocerinae should be noticed, since the former was established earlier. The name Psilocladina was established 34 years ago, while Cyphonocerinae has been used in no more than 10 publications (CROWSON, 1972; OHBA, 1983, 1991, 1997; SATÔ, 1985, 1991; NAKANE, 1991; LAWRENCE & NEWTON, 1995). Therefore, Psilocladinae MCDERMOTT (stat. nov.) should be regarded as the valid name of the subfamily, and Cyphonocerinae should be a subjective synonym of the former according to ICZN (Arts. 23, 36, 79c).

The subfamily Psilocladinae was not satisfactorily defined. MCDERMOTT (1964) included such heterogeneous genera as *Ethra* in the subtribe Psilocladina. According to CROWSON's key (1972), the genus *Lamprocerus* falls in the Psilocladinae due to its bipectinate antennae. We redefine the subfamily Psilocladinae with the following combination of characters: 1) antennae bipectinate in segments 3–10; 2) mandibles normal; 3) clypeus transverse, not concealing mandibles; 4) both sexes similar in shape and alate; 5) abdominal spiracles located dorsally; 6) abdomen with 8 ventrites (the last ventrite is the true abdominal sternite 9) in the male and 7 in the female; 7) abdominal tergites and sternites without prominent latero-apical angles and tergite 8 subrectangular or broadly rounded apicad; 8) luminous organ spot-like if present; 9) no tibial spurs. Only *Cyphonocerus*, *Psilocladus* and *Pollaclasis* are recognized as the members of the Psilocladinae at the present.

The phylogenetic affinity of *Cyphonocerus* was recently discussed by SUZUKI (1998). He took out exemplary species from 9 genera of the Lampyridae from Japan and analyzed their phylogeny based on 16s-rRNA sequence. The tree revealed that the genus *Cyphonocerus* is closely related to the genera of the Lampyrinae; in short, Psilocladinae and Lampyrinae form a clade based on 16s-rRNA from selected Japanese fireflies. The result may make the following inference possible: 1) the bipectinate antennae is an autapomorphy of the Psilocladinae; the other characters listed above are either symplesiomorphies or synapomorphies shared with the Lampyrinae; 2) the abdominal segmentation, in which males have 8 visible sternites and females have 7, is a synapomorphy for the Psilocladinae and Lampyrinae, while the condition that males have 7 visible sternites and females have 8 is an autapomorphy of a part of the Lampyrinae; 3) the alate female condition is symplesiomorphic to the two subfamilies, while the apterous and brachypterous conditions are autapomorphic to a part of the Lampyrinae; 4) the spotted, small luminous organs and weak luminescence pattern in both sexes are synapomorphies for both the subfamilies, while the plate-like luminous

organs and strong luminescence in a part of the Lampyrinae are autapomorphic.

It is certain that the above inference is still tentative. The issue of character polarity will be much more accurate if all subfamilies of fireflies can be included in a phylogenetic analysis in the future.

Acknowledgments

We thank Dr. L.-Y. CHOU (TARI), Dr. T.-C. HSU (NTU), Dr. M.-L. CHAN (NMNS), Dr. J. MENIER (MNHN), Dr. M. BRANCUCCI (NMB), Mr. M. SAITO (Fukui) and Mr. T. TOYOGUCHI (Okinawa) for loaning us material, and Dr. N. OHBA (Yokosuka City Museum, Japan) for offering us a number of references and information. Special thanks are due to Dr. M. BRANHAM (Ohio State Univ., U.S.A.) and Dr. S.-I. UENO (Natn. Sci. Mus., Tokyo) for reading the manuscript and to Miss J. LAI for line drawings. We are also grateful to Mr. J.-C. CHANG and Mr. M.-F. CHEN who helped us in field collections. The study is financially supported by the National Science Council of the Republic of China, grant no. NSC87-2313-B002-054.

要 約

鄭 明倫・楊 平世・佐藤正孝：台湾および日本のクシヒゲボタル属のまとめとクシヒゲボタル亜科の名称に関する考察。——台湾および日本のクシヒゲボタル属 *Cyphonocerus* をまとめて、9種1亜種とした。台湾には3種が分布し、そのうちの1種を新種としてここに記載した。また、*C. sanguineus* の分布に中国とヴェトナムを新記録として加えた。日本には琉球列島を含めて6種が分布し、奄美大島のものを沖縄に分布する *C. okinawanus* とは別の新亜種と認めてここに記載した。

あわせてクシヒゲボタル属の所属を検討し、その亜科名について命名法上、Psilocladinae (クシヒゲボタル亜科) が有効名であることを述べた。

References

- BALLANTYNE, L. A., 1987. Lucioline morphology, taxonomy and behavior: a reappraisal (Coleoptera, Lampyridae). *Trans. Am. ent. Soc.*, **113**: 171–188.
- CROWSON, R. A., 1972. A review of the classification of Cantharoidea (Coleoptera), with the definition of two new families, Cneoglossidae and Omethidae. *Rev. Univ. Madrid*, **21**: 35–77.
- GREEN, J. W., 1959. Revision of the species of *Microphotus*, with an emendation of the Lampyrini (Lampyridae). *Coleopt. Bull.*, **13**: 80–96.
- KANDA, S., 1935. The Fireflies. 1 pl., vi+496 pp. Association of Lighting Organisms of Japan, Tokyo. (In Japanese.)
- KIESENWETTER, J., 1879. Coleoptera Japoniae collecta a Domino LEWIS et aliis. *Dt. ent. Z.*, **23**: 305–320.
- LAI, J., M. SATÔ & P. S. YANG, 1998. The checklist of Lampyridae of Taiwan. *J. Chin. Ent.* (In press.)
- LAWRENCE, J. F., & A. F. NEWTON, JR., 1995. Families and subfamilies of Coleoptera (with selected genera, notes, references and data on family-group names). In PAKALUK, J., & S. A. ŚLIPPIŃSKI (eds.), *Biology, Phylogeny, and Classification of Coleoptera: Papers Celebrating the 80th Birthday of Roy A. Crowson*, 779–1006. Muzeum i Instytut Zoologii PAN, Warszawa.

- LEWIS, G., 1895. On the Dascillidae and malacoderm Coleoptera of Japan. *Ann. Mag. nat. Hist.*, (6), **16**: 98–122.
- MIWA, Y., 1931. A systematic catalogue of Formosan Coleoptera. *Dept. Agric. Gov. Res. Inst. Formosa, Taipei*, (55): i–xiii+1–359.
- MCDERMOTT, F. A., 1964. The taxonomy of the Lampyridae (Coleoptera). *Trans. Am. ent. Soc.*, **90**: 1–72.
- 1966. Lampyridae. In STEEL, W. O. (ed.), *Coleopterorum Catalogus Supplementa*, pars 9 (ed. secunda). iii+149 pp. W. Junk, s'-Gravenhage.
- NAKANE, T., 1947. On the Japanese *Psilocladus* (Col. Lampyridae). *Trans. Kinki coleopt. Soc.*, **2**: 4–7. (In Japanese.)
- 1967. On the genus *Cyphonocerus* KIESENWETTER in Japan and Formosa (Insecta, Coleoptera, Lampyridae). *Bull. natn. Sci. Mus., Tokyo*, **10**: 7–9.
- 1968. The classification of Lampyridae. *Nat. & Ins., Tokyo*, **3** (6): 3–6. (In Japanese.)
- 1981. New or little known Coleoptera from Japan and its adjacent regions. XXXIII. *Fragm. coleopt., Kagoshima*, (29/32): 125–130.
- 1983. *Ditto*. XXXVI. *Ibid.*, (35/37): 139–150.
- 1991. Lampyrid insects of the world. In Association of Nature Restoration of Japan (ed.), *The Reconstruction of Firefly Environments*, 3–11. Reconquista SP, No. 1. Scitec, Tokyo. (In Japanese.)
- OHBA, N., 1976. Notes on the form and activity of the firefly, *Cyphonocerus ruficollis*. *Sci. Rept. Yokosuka City Mus.*, (23): 35–43, pls. 3–5. (In Japanese.)
- 1978. Morphology and behavior of the Lampyridae (Coleoptera, Insecta). *Ibid.*, (25): 15–28, pls. 2–3. (In Japanese.)
- 1983. Studies on the communication system of Japanese fireflies. *Ibid.*, (30): 1–62, pls. 1–6.
- 1991. Japanese fireflies. In Association of Nature Restoration of Japan (ed.), *The Reconstruction of Firefly Environments*, 13–22. Reconquista SP, No. 1. Scitec, Tokyo. (In Japanese.)
- 1997. Twenty years with fireflies — an outline of research in Japan. *Insectarium, Tokyo*, **34**: 132–146. (In Japanese.)
- & M. SATÔ, 1988. The shape of facet in the fireflies. *Sci. Rept. Yokosuka City Mus.* (36): 1–10. (In Japanese.)
- , T. KAMIGAKI & I. KAWASHIMA, 1995. External morphology of the adult stage of *Cyphonocerus inelegans* NAKANE (Coleoptera: Lampyridae) and its habitat. *Ibid.*, (43): 11–16. (In Japanese.)
- OKADA, Y. K., 1931. Notes on the scientific names of Japanese fireflies. *Zool. Mag., Tokyo*, **43**: 130–149. (In Japanese.)
- OLIVIER, M. E., 1902. Coléoptères Lampyrides recueillis aux environs de Tokio (Japon). *Bull. Mus. Hist. Nat., Paris*, **8**: 188–190.
- 1903. Coléoptères Lampyrides capturés à Dardjilling par M. le Dr. HARMAND. *Ibid.*, **9**: 19–20.
- 1907. Coleoptera. Fam. Lampyridae. In WYTSMAN P. (ed.), *Genera Insectorum*, fasc. 53. i+74 pp., 3 pls. M. P. Wytzman, Bruxelles.
- 1910. Rhagophthalmidae, Drilidae. In SCHENKLING S. (ed.), *Coleopterorum Catalogus*, pars 10. 10 pp. W. Junk, Berlin.
- PIC, M., 1911. Coléoptères exotiques nouveaux ou peu connus. *Échange*, **27**: 142–144.
- 1955. Coléoptères nouveaux de Chine. *Bull. Soc. ent. Mulhouse*, **1955**: 25–26.
- SAITO, M., 1994. *Cyphonocerus inelegans* collected in Mie Pref. *Gekkan-Mushi, Tokyo*, (286): 22. (In Japanese.)
- SATÔ, M., 1970. Notes on the genus *Cyphonocerus* KIESENWETTER from Formosa (Col.: Lampyridae). *Bull. Jpn. ent. Acad.*, **5** (1): 22–24.
- 1976. New Cantharoidea from Japan (Coleoptera). *Trans. Shikoku ent. Soc.*, **13**: 51–60.
- 1978. The lampyrid-beetles of Japan. *Insectarium, Tokyo*, **15**: 168–173. (In Japanese.)
- 1985. Family Lampyridae. In KUROSAWA, Y., S. HISAMATSU & H. SASAJI (eds.), *The Coleoptera*

- of Japan in Color*, **3**: 121–124 [incl. pl. 20]. Hoikusha, Osaka. (In Japanese.)
- SATÔ, M., 1989. Lampyridae. In HIRASHIMA, Y. *et al.* (eds.), *A Check List of Japanese Insects*, [1]: 351–353. Kyushu University, Fukuoka. (In Japanese.)
- 1991. A new *Cyphonocerus* (Coleoptera, Lampyridae) from Japan. *Elytra, Tokyo*, **19**: 191–193.
- SUZUKI, H., 1998. Phylogeny of Japanese fireflies inferred from DNA sequences. *Nat. & Ins., Tokyo*, **33** (7): 11–15. (In Japanese.)
- TAKAKURA, Y., 1977. Cantharoidea of Fukuoka Prefecture (Coleoptera). *Biologia Fukuokana*, (17): 6–13. (In Japanese.)
- WITTMER, W., 1944. Catalogue des Drilidae E. OLIV. (Coleoptera, Malacodermata). *Rev. Soc. ent. Argentina*, **12**: 203–221.

Elytra, Tokyo, **26** (2): 398, November 15, 1998

Some Records of *Hydrochara affinis* (SHARP) (Coleoptera, Hydrophilidae) in the Ryukyu Islands

Masataka Satô

Laboratory of Natural Conservation, Graduate School of
Nagoya Women's University, Nagoya, 467–8610 Japan

Hydrochara affinis (SHARP) has been widely known from Japan, Korea, the Russian Far East, China and Mongolia. Until now, records of the species in the Ryukyu Islands are limited to Tokuno-shima and Iriomote-jima (SATÔ, 1998). I have been able to examine additional specimens of the species newly recorded from the following islands of the Ryukyus and from Quelpart Island off South Korea.

Specimens examined. 1 ♂, Nama, Is. Yoron-tô, 11–VIII–1958, S.-I. UÊNO leg.; 2 ♀♀, Hira-ra, Is. Miyako-jima, 2–VIII–1996, K. SASAKI leg.; 1 ♂, Is. Iribu-jima, 9–VI–1998, K. KINJO leg.; 1 ♀, Is. Hateruma-jima, 13–16–VIII–1968, H. ÔHIRA leg.; 2 ♀♀, Kinneikutsu, Quelpart Is., 24–VII–1968, T. DOI, S. HIDAKA, M. NAKAHARA, S. HAYAKAWA, Y. NISHIDA & S. OMATSU leg.

Reference

- SATÔ, M., 1998. Aquatic Coleoptera of the Ryukyu Archipelago, III. *Coleopt. News, Tokyo*, (121): 7–13. (In Japanese.)