

Two polycentropodid caddisflies (Trichoptera, Insecta) collected from Yonaguni-jima, westernmost Japan

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Abstract

Two Taiwanese caddisflies, *Polycentropus nigrospinus* and *Polycentropus unicus* both described by Hsu and Chen (1996) were collected from Yonaguni-jima, Japan for the first time, and are transferred into the genera *Plectrocnemia* and *Polyplectropus*, respectively. Males and females of both species are redescribed, and their immature stages are described for the first time.

Key words: Trichoptera, Polycentropodidae, new combination, redescription, adult, immature stage, Taiwan

Introduction

Yonaguni-jima is the westernmost island in Japan and very close to Taiwan (Fig. 1). Shimura (2010) provided a fauna list of Ephemeroptera, Plecoptera and Trichoptera of this island for the first time, and recorded 16 caddisfly species including two unidentified polycentropodids (*Plectrocnemia* sp. and *Polyplectropus* sp.). After comparison of these unidentified specimens with Taiwanese material which was kindly provided by Dr. L. Hsu, Dayeh University, we recognized that they are the same species as *Polycentropus nigrospinus* Hsu and Chen, 1996 and *Polycentropus unicus* Hsu and Chen, 1996, respectively. Based on characters of their wing venation and male genitalia, they apparently belong to the genera *Plectrocnemia* Stephens and *Polyplectropus* Ulmer, respectively. In this paper, we redescribe males and females of these two species, and describe the immature stages of them for the first time.

Material and methods

Immature stages were associated with the adult by the metamorphotype method. Male and female

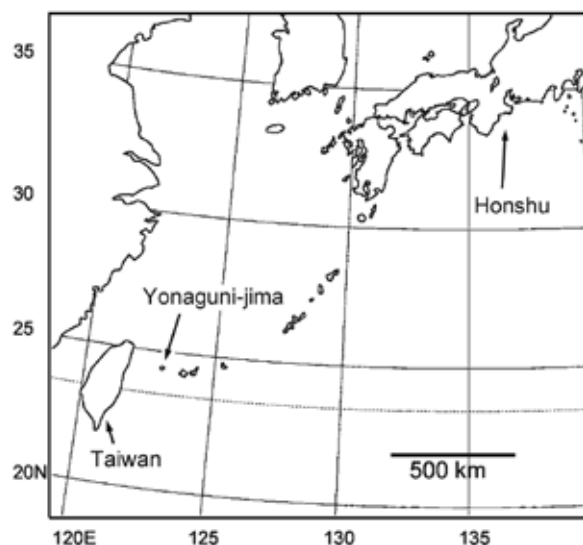


Fig. 1. Location of Yonaguni-jima.

genitalia were figured after being cleared in a 10% solution of KOH. Morphological terms mainly follow Arefina et al. (2003) and Morse et al. (2012) for the adult, and Wiggins (2004) for the larva and pupa. Depositories of the specimens are abbreviated as follows: Natural History Museum and Institute, Chiba (CBM); L. Hsu, Dayeh University, Dacun, Taiwan (LH); and authors (T. Nozaki (TN), N. Shimura (NS)).

Descriptions

Plectrocnemia nigrospina (Hsu and Chen, 1996)

Figs. 2, 4, 5

Polycentropus nigrospinus Hsu and Chen, 1996, 120–121, male, female. **New combination.**

Adult. Head and body dark brown, antennae light brown with dark bands. Forewings dark brown with many small pale yellow spots, 5–6 mm long in male (n=5), 5–7.5 mm long in female (n=10). Forewings with forks I, II, III, IV and V; hind wings with forks I, II and V; discoidal cell closed in both wings; median cell closed in forewing.

Male genitalia (Figs. 2A–H). Sternum IX trapezoidal in lateral aspect. Tergum IX semimembranous, fused with semimembranous segment X. Segment X tapering to round apex in lateral aspect. Preanal appendages broad club-like in lateral aspect. Mesoventral process of each preanal appendage strongly sclerotized, each divided into two acute branches, upper one longer, both rugose. Inferior appendages large, trapezoidal in lateral aspect, with mesal plate and ventromesal process; mesal plate with short dorsal process bearing two spine-like setae; ventromesal process slender, digitate, with short setose lobe midway, round apically and with many tiny teeth. Subphallic sclerite divided into two short lobes with short setae apically. Phallus with large phallobase, with pair of long paramere spines dorsally.

Female genitalia (Figs. 1I–J). Ventral lobes of sternum VIII leaf-like, tapering to blunt apices in ventral aspect. Tergum IX sclerotized laterally, membranous dorsally. Vulval scale protruding posteriorly, T-shaped in ventral aspect, with heart-shaped dark pigmentation in ventral aspect. Vaginal sclerite diamond-shaped in middle.

Larva (Figs. 4A–D, 5A–C). Length of larva up to 15 mm. Head yellowish brown, with dark muscle scars. Pronotum wider than length, yellowish brown, with dark muscle scars. In forelegs, tarsus about half as long as tibia, with one black stout seta ventrolaterally; tibia with three black setae apicoventrally. Abdominal segments without gills. Anal legs long; each anal claw slender, curved gently,

with obtuse angle of about 130°; basal half with two rows of very tiny spines ventrally; apical half with several dorsal hair-like spines at base, their number and arrangement variable.

Pupa (Figs. 4E–F). Mandibles slender, curved mesad, without teeth. Anterior hook plates present on abdominal segments III to VIII, posterior hook plates present on segment V. Abdominal gills present anterolaterally, arrangement variable: one male pupa bearing gills on segments II to V, all single and filamentous; another male pupa bearing gills on segments II to VII, those on segments III to V branched. Anal processes thick, their round apices with many long setae. Pupal cocoon covering rough dome-shaped shelter constructed of plant pieces and small rock fragments.

Specimens examined. JAPAN: Yonaguni-jima: 1 male, 1 female, Dunan-dagi, 13.iv.2011, N. Shimura (TN); 4 larvae, 1 male pupa, *ibid.*, 6–13.iv.2011, N. Shimura (TN); 4 males, 9 females, Urada, 8–11.iv.2011, N. Shimura (2 males, 2 female: CBM; others: TN); 1 larva, *ibid.*, 7.iv.2011, N. Shimura (NS); 1 male, Urabu, 27.iii.2009, N. Shimura (TN); 2 females, *ibid.*, 2–3.iv.2010, N. Shimura (1 female: NS; 1 female: TN); 3 larvae, Kubura, 5.iv.2011, N. Shimura (NS); 1 male pupa, Mantabaru, 8.iv.2011, N. Shimura (NS). TAIWAN: 1 male, 1 female, Wucheng Vill., Yuchi, Nantou Co., 8.ix.2003, L. P. Hsu (LH).

Distribution. Taiwan, Japan (Yonaguni-jima).

Japanese name. Taiwan-miyama-iwa-tobikera.

Remarks. This species has a closed discoidal cell on each fore- and hind wing and apical forks I, II and V on each hind wing, and these characters suggest that it belongs to the genus *Plectrocnemia* (Oláh and Johanson, 2010). Although Hsu and Chen (1996) originally assigned this species to the genus *Polycentropus*, probably in the broad sense (including *Plectrocnemia* species), the monophyly of the genus *Plectrocnemia* was recently supported by the morphological study (Chamorro and Holzenthal, 2011).

The male of this species is very similar to that of *Plectrocnemia divisa* Ohkawa and Ito, 2007 described from central Honshu, Japan, but they are easily distinguishable from each other by the shape of the mesoventral process of each preanal appendage and the subphallic sclerite. Each branch of the mesoventral

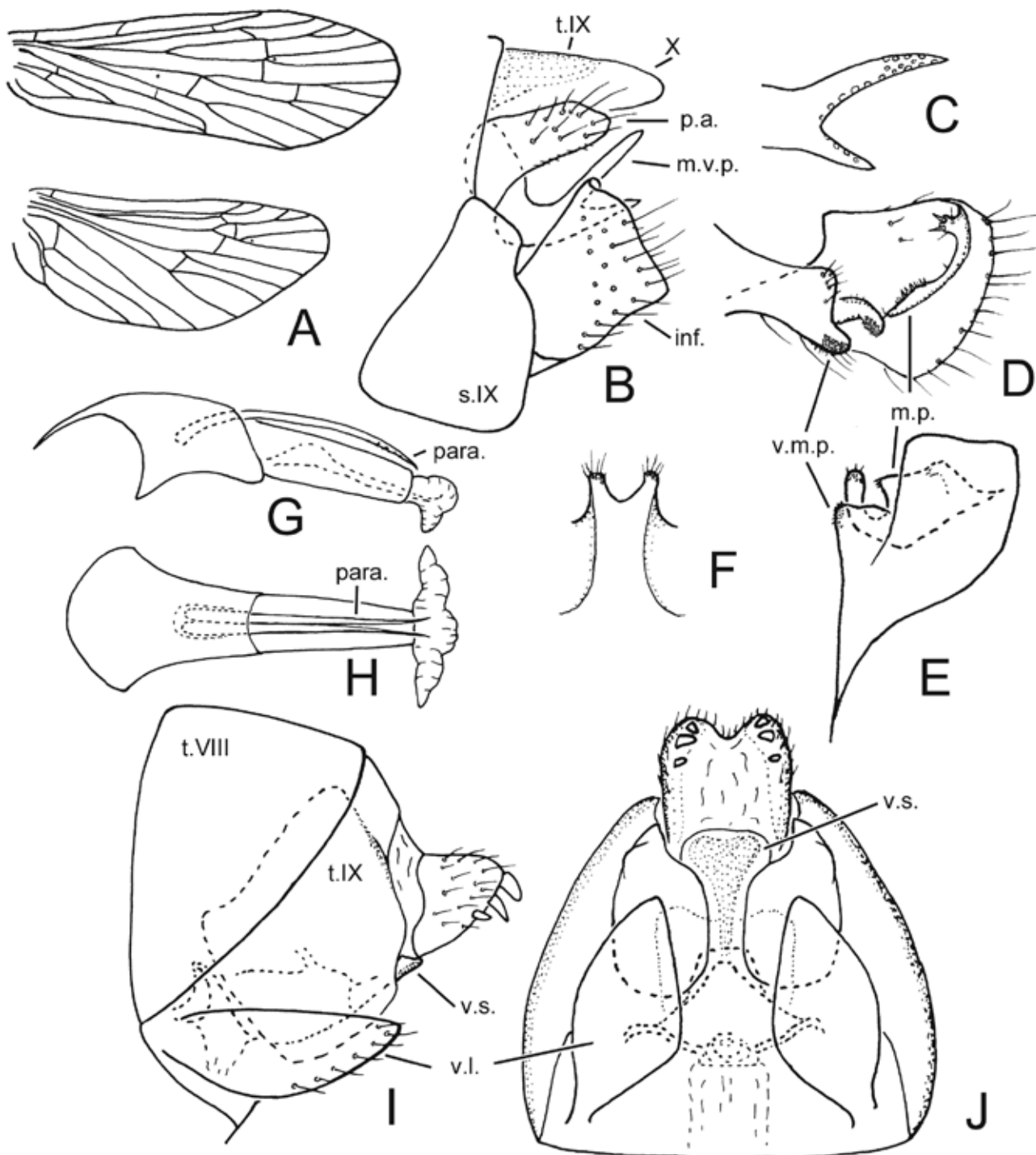


Fig. 2. Adults of *Plectrocnemia nigrospina*. A, male wings. Male genitalia (B–H): B, left lateral; C, left mesoventral process of left preanal appendage, left lateral; D, right inferior appendage, mesal; E, *ibid.*, ventral; F, subphallic sclerite, ventral; G, phallus, left lateral; H, *ibid.*, dorsal. Female genitalia (I–J): I, left lateral; J, ventral. Abbreviations: X = segment X; inf. = inferior appendage; m.p. = mesal plate of inferior appendage; m.v.p. = mesoventral process of preanal appendage; p.a. = preanal appendage; para. = paramere; s.IX = sternum IX; t.VIII = tergum VIII; t.IX = tergum IX; v.l. = ventral lobe; v.m.p. = ventromesal process of inferior appendage; v.s. = vulval scale.

process is spread in *P. nigrospina*, but parallel in *P. divisa*; and the lobes of the subphallic sclerite of *P. nigrospina* are longer than those of *P. divisa*. *Plectrocnemia qianshanensis* Morse, Zhong and Yang, 2012 recently described from eastern China (Jiang-xi, An-hui, Shaan-xi) is also very similar to this species. Although we did not examine any specimens of *P. qianshanensis*, these species can be distinguished from each other by the shape of the mesoventral process of each preanal appendage and the mesal plate of each inferior appendage.

***Polyplectropus unicus* (Hsu and Chen, 1996)**

Figs. 3, 4, 5

Polycentropus unicus Hsu and Chen, 1996, 118–120, male, female. **New combination.**

Adult. Head and body dark brown, antennae light brown with dark bands. Forewings dark brown with many small pale yellow spots, 4.2–5.0 mm long in male (n=4), 4.5–6.0 mm long in female (n=5). Forewings with forks I, II, III, IV and V; hind wings with forks II and V; discoidal cell closed in forewings, but open in hind wings; median cell closed in forewing.

Male genitalia (Figs. 3G–E). Sternum IX subtriangular in lateral aspect. Tergum IX narrow, protruding posterodorsally. Segment X sclerotized laterally, membranous mesally. Preanal appendages thumb-like in lateral aspect, with long stout spine-like seta and long fine setae apicomesally. Dorsobasal process of each preanal appendage slender, strongly sclerotized; basal 2/5 directed anteriorly; distal 3/5 curved backward, with acute apex. Inferior appendages long, curved caudoventrad in middle in lateral aspect, apices sharp, concaved dorsally, with small ventral lobe basally. Subphallic sclerite subrectangular in ventral aspect, with notch apicomesally; with 4 pairs of long spine-like setae on posterior margin, all slightly curved, outermost ones longest. Phallus simple, sinuate ventrally in lateral aspect, apex curved ventrad.

Female genitalia (Figs. 3H–I). Ventral lobes of sternum VIII leaf-like, tapering to blunt apices in ventral aspect. Vulval scale large in ventral aspect,

unpigmented posteriorly. Tergum X rectangular in lateral aspect, strongly sclerotized but dorsal part semimembranous. Vaginal sclerite slender, curved outward anteriorly in ventral aspect.

Larva (Figs. 4G–H, 5D–F). Length of larva up to 8 mm. Indistinguishable from *Polyplectropus malickyi* Nozaki, Katsuma and Hattori, 2010, described by Nozaki et al. (2010, fig. 5). Head and pronotum pale yellow, muscle scars weakly pigmented, often indistinct. In forelegs, tarsus nearly same length as tibia, with one brown stout seta ventrolaterally; tibia with two black setae apicoventrally. Abdominal segments without gills. Anal legs long; each anal claw slender, concave margin doglegged, with obtuse angle of about 130°; apical half with several dorsal hair-like spines at base, their number and arrangement variable. Despite statement by Nozaki et al (2010, indicating lack of ventral teeth on anal claws of *P. malickyi*), anal claws of both *P. unicus* and *P. malickyi* each bearing two rows of very tinny spines ventrally on basal half.

Pupa (Fig. 4I). Indistinguishable from pupa of *P. malickyi* described by Nozaki et al. (2010). Mandibles slender, curved mesad, without teeth. Anterior hook plates present on abdominal segments III to VIII, posterior hook plates present on segment V. Abdominal gills filamentous, present on segments II to IV (often also on V) anterolaterally, those on segment III (often also on IV) branched. Anal processes short and lobate, with many long setae apically. Pupal cocoon covered with rough dome-shaped shelter constructed mainly of small rock fragments.

Specimens examined. JAPAN: Yonaguni-jima: 1 female, Dunan-dagi, 24.iii.2009, N. Shimura (TN); 2 males, 2 females, *ibid.*, 27.iii.2009, N. Shimura (TN); 3males, 1female, *ibid.*, 31.iii.2010 (NS); 1 pupa, *ibid.*, 1.iv.2010, N. Shimura (NS); 4 larvae, 1 male & 1 female pupae, *ibid.*, 6–13.iv.2011 N. Shimura (2 larvae, 2 pupae: TN, 2 larvae: NS); 2 males, Tabaru-suien, 23–27.iii.2009, N. Shimura (NS); 1 male, *ibid.*, 3.IV.2010, N. Shimura (NS); 1 male pupa, Urada, 4.iv.2010 (NS); 1 larva, *ibid.*, 7.iv.2011, N. Shimura (NS); 1 female, *ibid.*, 9.iv.2011, N. Shimura (TN); 1 female, Urabu, 3.iv.2010, N. Shimura (CBM); 1 male, *ibid.*, 6.iv.2011, N. Shimura (CBM). **TAIWAN:** 1 male, Sheishan Farm, Hoping, Taichung Co., 17.xii.2003, L. P. Hsu (LH).

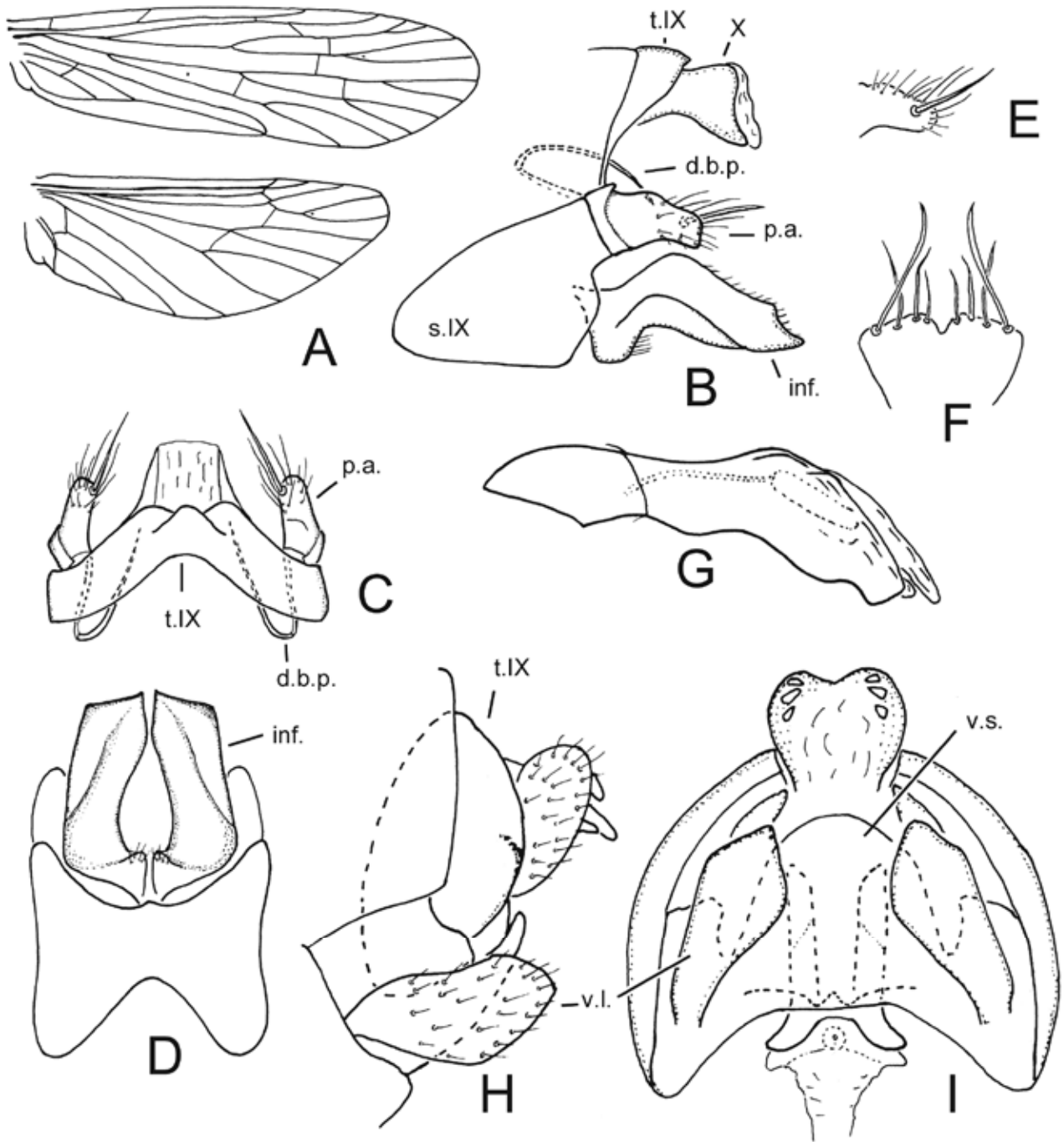


Fig. 3. Adults of *Polyplectropus unicus*. A, male wings. Male genitalia (B–G): B, left lateral; C, dorsal; D, ventral; E, right preanal appendage, mesal; F, subphallic sclerite, ventral; G, phallus, left lateral. Female genitalia (H–I): H, left lateral; I, ventral. Abbreviations: X = segment X; d.b.p. = dorsobasal process of preanal appendage; inf. = inferior appendage; p.a. = preanal appendage; s.IX = sternum IX; t.VIII = tergum VIII; t.IX = tergum IX; v.l. = ventral lobe; v.s. = vulval scale.

Distribution. Taiwan, Japan (Yonaguni-jima).

Japanese name. Nagatoge-iwa-tobikera.

Remarks. A male specimen determined as this species by Dr. Hsu is identical to the males collected

from Yonaguni-jima in wing venation and genitalic characters. The illustration of the lateral view of male genitalia provided by Hsu and Chen (1996, fig. 6) was mistakenly printed upside down. The wing venation

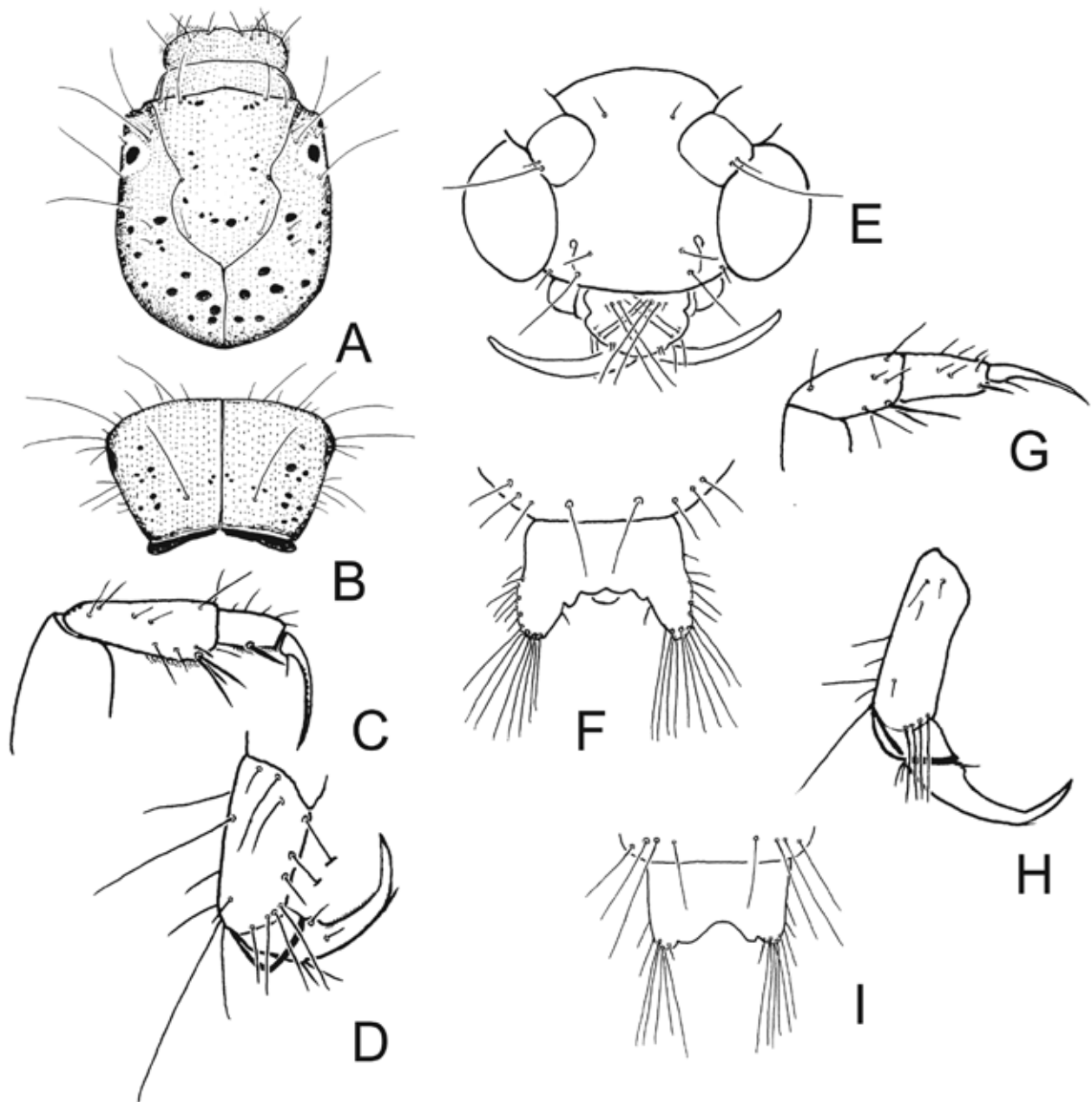


Fig. 4. Larvae and pupae. *Plectrocnemia nigrospina* (A–F). A, larva, head, dorsal; B, larva, pronotum, dorsal, C, larva, right foreleg, right, lateral; D, larva, right anal claw, right lateral; E, pupa, head, frontal; F, pupa, abdominal segment IX, dorsal. *Polyplectropus unicus* (Hsu and Chen, 1996) (G–I). G, larva, right foreleg, right lateral; H, larva, right anal claw, right lateral; I, pupa, abdominal segment IX, dorsal.

and male genitalia redescribed here suggest that this species does not belong to the genus *Polycentropus sensu lato*, but to the genus *Polyplectropus sensu lato* (Oláh and Johanson, 2010; Chamorro and Holzenthal, 2011).

This species is very similar to *Polyplectropus malickyi* described from central Honshu, Japan, but

the species are easily distinguishable from each other by the male genitalia. The preanal appendage of *P. unicus* is thumb-like in lateral aspect and bears a long stout spine-like seta with long fine setae apicomesally, but that of *P. malickyi* is triangular in lateral aspect and bears only long fine setae there.

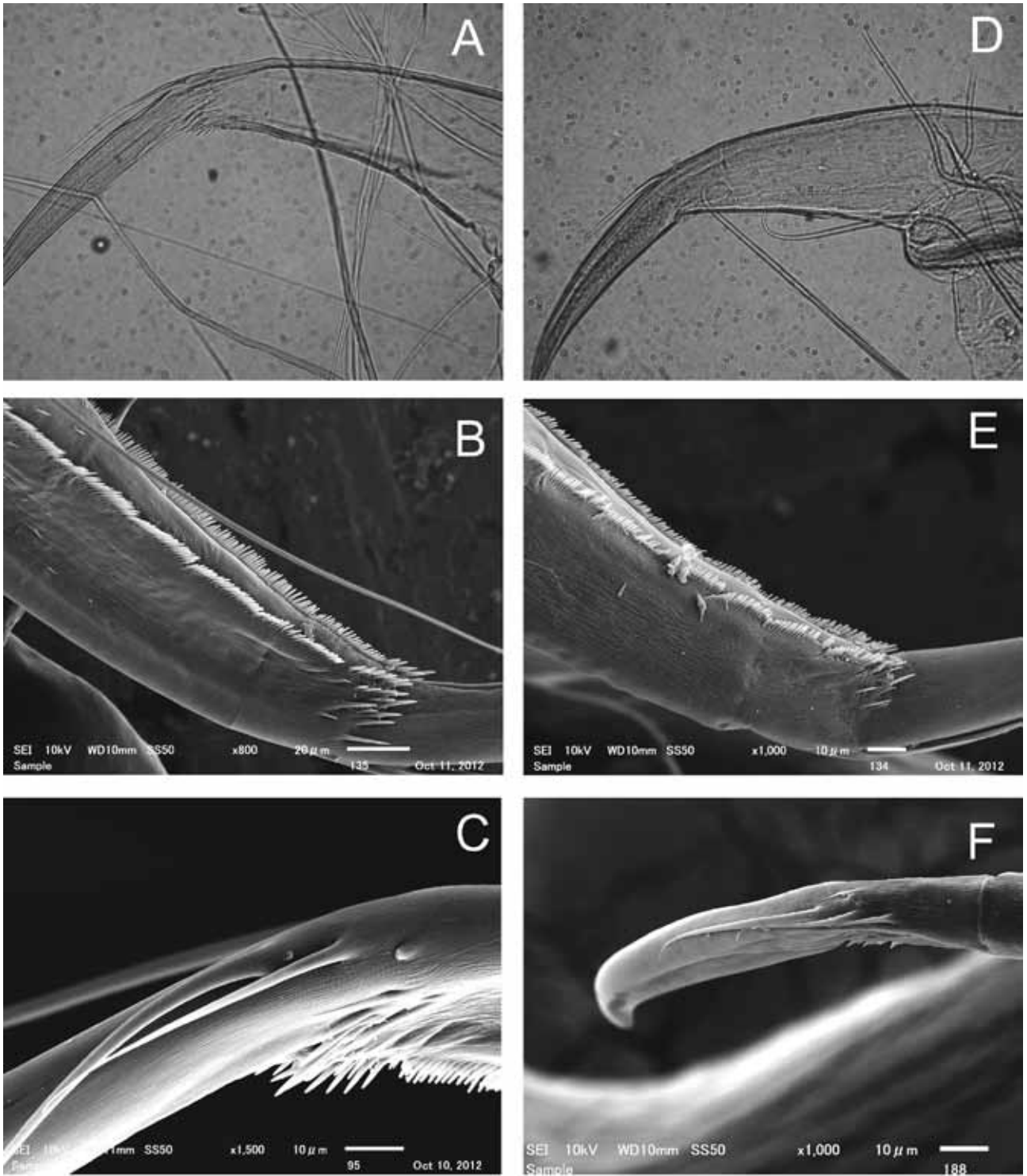


Fig. 5. Anal claws. *Plectrocnemia nigrospina* (A–C): A, right, right lateral; B, left, ventromesal; C, left, dorsal. *Polyplectropus unicus* (D–F): D, right, right lateral; E, left, ventromesal; F, left, dorsal.

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