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Redescription of *Polyplectropus protensus* ULMER, 1908 and description of two new *Polyplectropus* species from Japan (Trichoptera, Polycentropodidae)¹

T. NOZAKI, N. KATSUMA & T. HATTORI

A b s t r a c t : *Polyplectropus protensus* ULMER 1908 is redescribed based on specimens collected from central Honshu, Japan. Two new species, *P. moritai* and *P. malickyi*, are described also from central Honshu, Japan.

K e y w o r d s : Trichoptera, Polycentropodidae, *Polyplectropus protensus*, new species, Japan.

Introduction

The genus *Polyplectropus* ULMER (Trichoptera, Polycentropodidae) is composed of 185 named species from all biogeographic regions except for West Palearctic and Antarctic regions (MORSE 2009). In Japan, the first species, *P. protensus*, was described by ULMER (1908) from ‘Akazawa, 2200 Fuß’. After long period, KAWASE et al. (2004) provided a new record based on two males from a stream of Mt. Tsukuba, Ibaraki Prefecture, central Honshu. Subsequently, KATSUMA (2005) recorded two additional males from another stream in the same area, however, KATSUMA (2008) pointed out that some genitalic structures of these males do not agree with those illustrated by ULMER (1908). Furthermore, MORITA (1998) recorded a male from Mie Prefecture, central Honshu, as *Polyplectropus* sp. (af. *protensis* [sic]) with illustrations of the male genitalia.

To solve this taxonomic problem, we examined specimens collected from central Honshu, and compared them with photographs of the holotype male kindly provided by Dr. R. PETERS, Zoologisches Museum Hamburg. Thus, we concluded that the species recorded by KAWASE et al. (2004) and KATSUMA (2005) is the same species as *P. protensus*, and another species recorded by MORITA (1998) is new to science. In this paper, we redescribe *P. protensus* based on new materials collected from central Honshu including the type locality, and describe a related species collected from Mie Prefecture as a new species. An additional new species found from central Honshu during this study is also described.

¹ This paper is dedicated to Prof. Dr. Hans Malicky on the occasion of his 75th birthday.

Material and methods

Immature stages were associated with the adult by the metamorphose method. Male and female genitalia were figured after being cleared in a 10 % solution of KOH. Morphological terms mainly follows SCHMID (1998) 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); N. Kawase, Minakuchi-cho (NKW); Minakuchi Kodomo-no-mori Nature Museum, Minakuchi-cho (MKNM); Zoologisches Museum Hamburg (ZMH) and authors (T. Nozaki (TN), N. Katsuma (NKT)).

Results

Polyplectropus protensus ULMER, 1908 (Figs 1, 4, 6)

Polyplectropus protensus ULMER, 1908, 350-352, ♂, ♀; KAWASE et al. 2004, 111; KATSUMA 2005, 6.

A d u l t . Head and body dark brown; antennae light brown. Forewings dark brown with many small golden spots, 4.5-5.5 mm long in male, 5.0-6.5 mm long in female.

Male genitalia (Fig. 1a-g). Sternum IX long triangular with posterodorsal square projection in lateral aspect; anterior margin bilobed, each finger-like in ventral aspect. Tergum IX short trapezoid in dorsal aspect, dark pigmented posteriorly. Segment X membranous, tapering to round apex. Preanal appendages long club-like in lateral aspect. Dorsobasal process of preanal appendage slender; basal 1/3 directed anteriorly, sinuous; distal 2/3 curved backward, almost straight with acute apex. Inferior appendages large spine-like, directed dorsolaterally, bulged ventromesally at middle part; ventral lobe large, C-shaped in lateral aspect, posterior margin dark pigmented. Subphallic sclerite bilobed with round apices in ventral aspect. Phallus simple, narrow near apex in dorsal aspect.

Female genitalia (Fig. 1h-i). Ventral lobes of Sternum VIII long, tapering to acute apices laterally in ventral aspect. Vulval scale large, weakly pigmented except for apical margin, with shallow notch apically in ventral aspect, with dorsal carina mesally. Segment X large, prolonged anterolaterally; lateral part strongly sclerotized, dark pigmented; dorsal part weakly sclerotized, not pigmented. Vaginal apparatus with donut-like sclerite anteriorly.

L a r v a (Fig. 4). Similar to that of *P. nanjingensis* (LI & MORSE 1997, figs 29-33). Length of larva (prepupal stage) up to 10 mm. Head of final instar larva about 1.2 mm wide, about 1.4 mm long, pale brown, with darker muscle scars on posterior half. Pronotum wider than length, pale brown, with darker muscle scars on posterior half. Abdominal segments without gills. Anal leg long; anal claw slender, doglegged apical 1/3, without teeth.

P u p a (Fig. 6). Mandibles slender, curved mesad; base globular. 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 anterolaterally, those on segments III and IV branched. Anal processes short and lobate, with many long setae. Most pupal cocoon covered with rough dome-shaped shelter constructed of plant pieces, but a few constructed of small rock fragments. Pupal cases were found from a very small and shallow flow in mountain area.

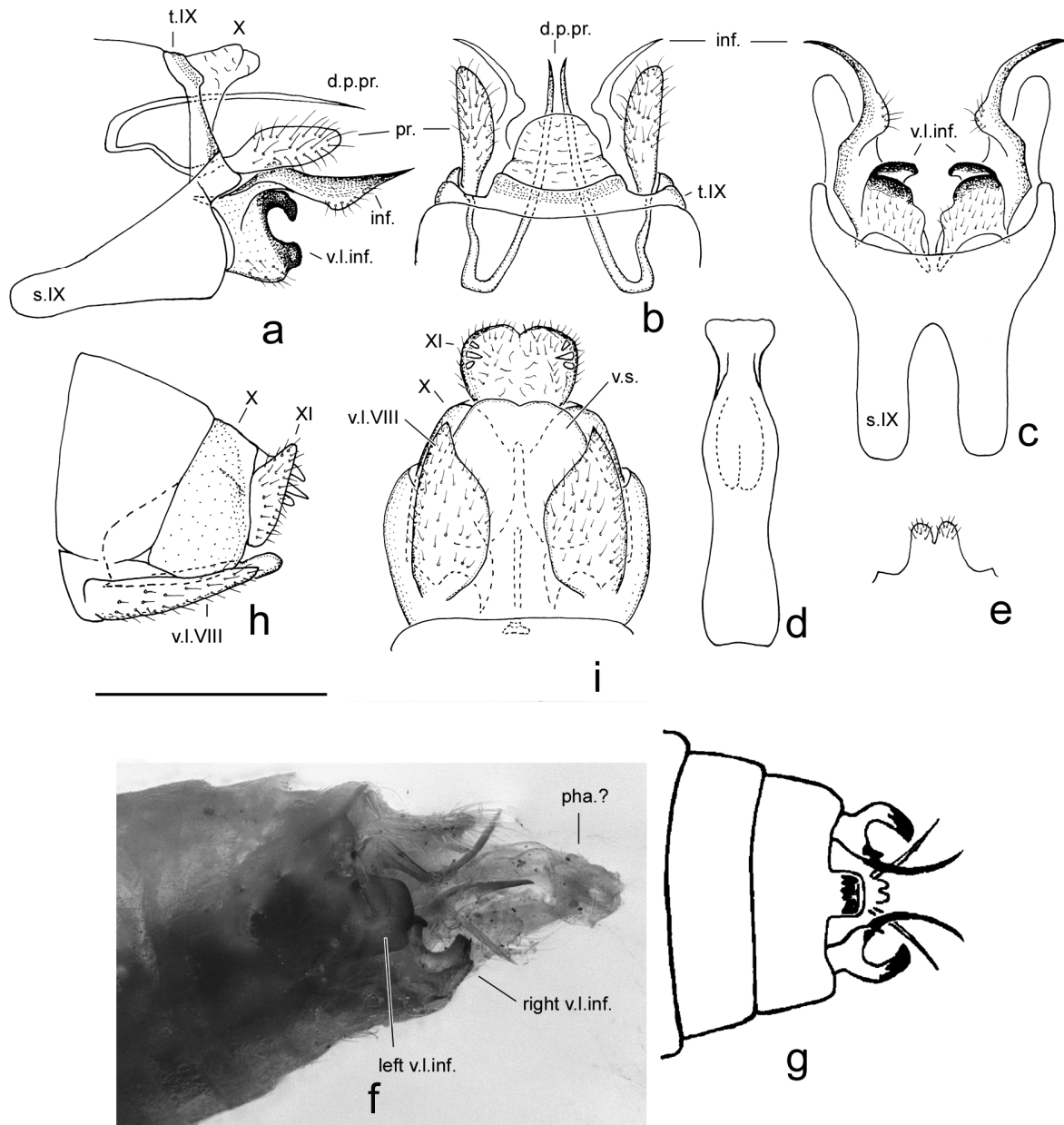


Fig. 1: *Polypsectropus protensus*. Male genitalia (a-g): (a) lateral; (b) dorsal; (c) ventral; (d) phallus, dorsal; (e) subphallic sclerite, ventral; (f) holotype, ventral (photo R. Peters); (g) ventral, redrawn from ULMER (1908). Female genitalia (h-i): (h) lateral; (i) ventral. Abbreviations: X, XI, abdominal segments IX and X; d.p.pr, dorsobasal process of preanal appendage; inf., inferior appendage; pha., phallus; s.IX, sternum IX; t.IX, tergum IX; v.l.inf., ventral lobe of inferior appendage; v.l.VIII, ventral lobe of sternum VIII; v.s., vulval scale. Scale: 0.5 mm for a-e, h and i.

Specimens examined: Japan. Ibaraki: 2♂♂, 1♀, Shobusawa, Ishioka-shi, 10-17.VIII.1997 (Malaise trap), N. Kawase (NKW); 1♂, Hatori, Sakuragawa-shi, 13.VIII.2004 (at light), N. Katsuma (NKT), 1♂, ibid. 11.VIII.2007 (at light), N. Katsuma (TN); 1♂, 3♀♀, Ono, Tsuchiura-shi, 21.VI-5.VII.2008 (Malaise trap), N. Katsuma (CBM); 2♂♂, 4♀♀, ibid., 2-17.VIII.2008 (Malaise trap), N. Katsuma (NKT); 1♀, ibid., 17-31.VIII.2008 (Malaise trap), N. Katsuma (TN); 1♀, ibid., 31.VIII-15.IX.2008 (Malaise trap), N. Katsuma (NKT); 1♂, Numata, Tsukuba-shi, 29.IX.2009 (at light), N. Katsuma (NKT). Yamanashi: 1♂, 1♀, Akasawa, 470-500 m a.s.l., Hayakawa-cho, 3-4.VIII.2008 (at light), T. Nozaki & T. Hattori (TN); 1♂, Akasawa, 685 m a.s.l., Hayakawa-cho, 3.VIII.2008 (at light), T. Nozaki & T. Hattori (ZMH: topotype). Shizuoka: 1♂, Hirano, Aoi-ku, Shizuoka-shi, 17.IX.1989, T. Hattori (TN); 1♀, ibid., 20.VIII.2009 (at light), T. Hattori (TN); 7 pupae, 3 prepupae, Sumata-kyo, Oma, 550 m a.s.l., Senzu, Kawanehon-cho, 21.V.2006, T. Hattori (TN).

Distribution. Japan (Honshu).

Remarks. The holotype male was little distorted probably by compression. A ventral quadrangular process of sternum IX described by ULMER (1908) must be the ventral lobe of the left inferior appendage, which twisted and located mesally (Fig. 1f, g). Furthermore, the phallus extruded from the abdomen (Fig. 1f) was probably described as a long dorsal process by ULMER (1908, fig. 14).

ULMER (1908) recorded the collection data of this species as ‘Akazawa, 2200 Fuß, 6-8 VIII 1905, SAUTER, No. 3937 (kamen zur Lampe)’, but the place name ‘Akazawa (or Akasawa)’ is known from several districts in Japan. In the same paper, ULMER (1908) described *Oecetis nigropunctata* and *Psychomyiella acutipennis* based on specimens collected by the same collector, H. SAUTER, from ‘Utsubusa, 300 Fuß’ on 3 August 1905 (specimen No. 3869 & 3870), and recorded *Chimarra* sp. from ‘Kuenji, 1880 Fuß’ in August 1905, also collected by H. SAUTER (specimen No. 3924). ‘Utsubusa’ and ‘Kuenji’ are both unique names, and present names of these localities must be ‘Utsubusa, Shibakawa-cho, Shizuoka’ and ‘Kuon-ji, Minobu, Minobu-cho, Yamanashi’, respectively. *P. protensus* must have been collected from near these localities. Therefore, we believe that the type locality of *P. protensus* is ‘Akasawa, Hayakawa-cho, Yamanashi (35°23’N, 138°23’E)’. We collected two additional males of *P. protensus* there on 3 August 2008.

***Polyplectropus moritai* nov.sp. (Fig. 2)**

Polyplectropus sp. (af. *protensis* [sic]): MORITA 1998, 72, 74, male.

Diagnosis. This species is very similar to *P. protensus*, but easily distinguishable by the shape of inferior appendage in male. A large spine-like process is present on the inferior appendages of this species, but absent in *P. protensus*.

Adult. Male (Fig. 2). General morphology and coloration very similar to those of *P. protensus*. Length of forewings 5-5.5 mm. Sternum IX large oval in lateral aspect, with square projection posterodorsally; each anterolateral projection broader than that of *P. protensus* in ventral aspect. Tergum IX short trapezoid in dorsal aspect, dark pigmented posteriorly. Segment X large, membranous. Preanal appendages long club-like in lateral aspect. Dorsobasal process of preanal appendage slender; basal 1/3 directed anteriorly, sinuous; distal 2/3 curved backward, almost straight with acute apex. Inferior appendages long spine-like, directed dorsolaterally, with large spine-like process ventromesally at middle part, also with small spine apicodorsally; ventral lobe large, deeply concaved mesally, posterior margin dark pigmented. Subphallic sclerite bilobed, each apex broader than that of *P. protensus* in ventral aspect. Phallus simple, tube-like in dorsal aspect.

Female and immature stage. Unknown.

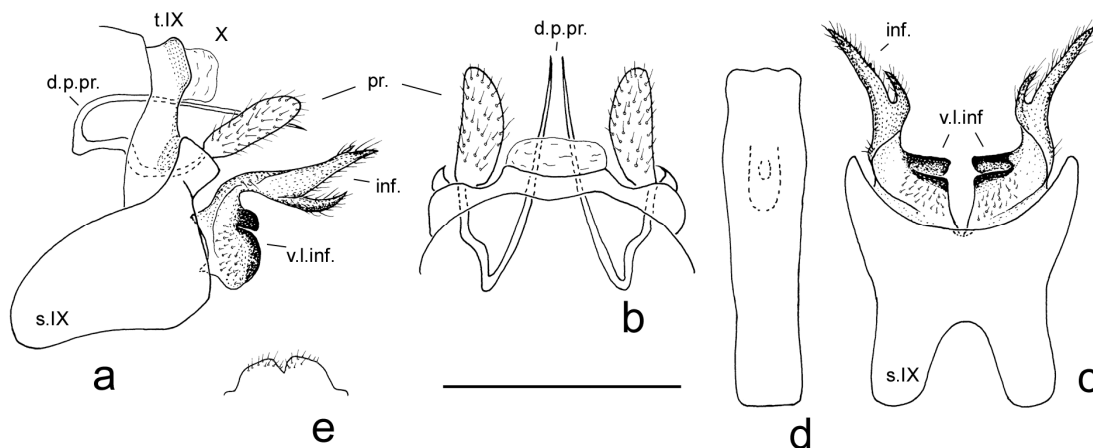


Fig. 2: *Polypsectropus moritai* nov.sp. Male genitalia (a-e): (a) lateral; (b) dorsal; (c) ventral; (d) phallus, dorsal; (e) subphallic sclerite, ventral. Abbreviations as in Fig. 1. Scale: 0.5 mm.

H o l o t y p e . Male (in alcohol): Japan: Mie: Kanmuri-yama, Suizawa-cho, 34°59'16"N, 136°25'37"E, 510 m a.s.l., 18.VII-3.VIII.2009 (Malaise trap), H. Morita (CBM-ZI 136956).

P a r a t y p e s . Japan. Mie: 1♂ (in alcohol), same data as the holotype except 5-25.IX.2009 (ZMH); 1♂ (in alcohol), Kawakami, Misugi-cho, Tsu-shi, 34°28'10"N, 136°14' 7"E, 700 m a.s.l., 28.VII.2009 (at light), N. Katsuma (CBM-ZI 136957); 1♂ (in alcohol, right wings lost), Otogi-toge, Nishiyama, Iga-shi, 34°48'17"N, 136°4'41"E, 510 m a.s.l., 6.VII.1997, H. Morita (TN).

E t y m o l o g y . This species is dedicated to Mr. H. Morita, who recorded this species for the first time with fine illustrations (MORITA 1998).

D i s t r i b u t i o n . Japan (Honshu).

***Polypsectropus malickyi* nov.sp. (Figs 3, 5)**

D i a g n o s i s . The male is unique in having short triangular preanal appendages among East Palaearctic species. Female is distinguishable from that of *P. protensus* by the shape of vulval scale: shallow apical notch and dorsomesal carina present in *P. protensus* but absent in this species.

A d u l t . General morphology and coloration very similar to those of *P. protensus*. Length of forewings 3.5-4.5 mm in male, 4.0-5.0 mm in female.

Male genitalia (Fig. 3a-e). Sternum IX large oval in lateral aspect, with square projection posterodorsally; each anterolateral projection broad. Tergum IX narrow, dark pigmented posterodorsally and ventrolaterally. Segment X sclerotized laterally, membranous mesally, each sclerite dark pigmented. Preanal appendages short, triangular in lateral aspect, with blunt apices. Dorsobasal process of preanal appendage slender; basal 2/5 directed anteriorly; distal 3/5 curved backward, with acute apex. Inferior appendages approximately 2.5 times as long as its basal width in ventral aspect, curved mesad in ventral aspect, concaved ventrally; apices dark pigmented. Subphallic sclerite subrectangular in ventral aspect, with apicocentral notch; each posterior margin with several setae, one or two of them very long. Phallus simple, slightly expanding dorsolaterally at apical 1/3 in dorsal aspect, apex curved ventrad.

Female genitalia (Fig. 3f-g). Ventral lobes of Sternum VIII leaf-like, tapering to blunt apices in ventral aspect. Vulval scale large in ventral aspect, unpigmented posteriorly. Segment X rectangular in lateral aspect, shorter than vertical length, strongly sclerotized and pigmented, but dorsal part weakly sclerotized and unpigmented. Vaginal apparatus with donut-like sclerite anteriorly.

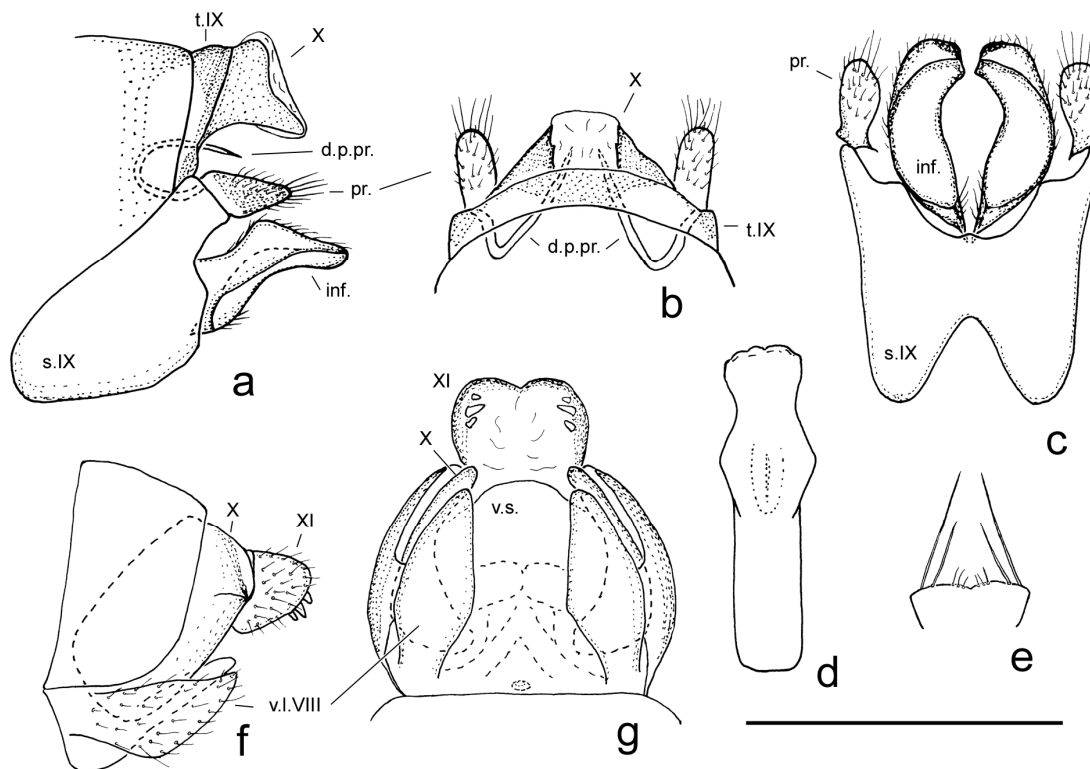


Fig. 3: *Polypectropus malickyi* nov.sp. Male genitalia (a-e): (a), lateral; (b) dorsal; (c) ventral; (d) phallus, dorsal; (e) subphallic sclerite, ventral. Female genitalia (f-g): (f) lateral; (g) ventral. Abbreviations as in Fig. 1. Scale: 0.5 mm.

Larva (Fig. 5). Similar to that of *P. protensus*, but smaller than the latter. Length up to 8 mm. Head of final instar larva about 0.83 mm wide, about 0.95 mm long, pale yellow; muscle scars present on posterior half, but only weakly pigmented or indistinct. Pronotum similar to that of *P. protensus*, pale yellow, muscle scars indistinct. Anal leg long; anal claw doglegged apical 1/3, without teeth.

Pupa. Very similar to that of *P. protensus*, but abdominal gills present on segments II to V (often also on VI) anterolaterally, those on segments III and IV branched. Pupal cocoon covered rough dome-shaped shelter constructed mainly of small rock fragments. Pupal cases were found from a small stream in lowland area.

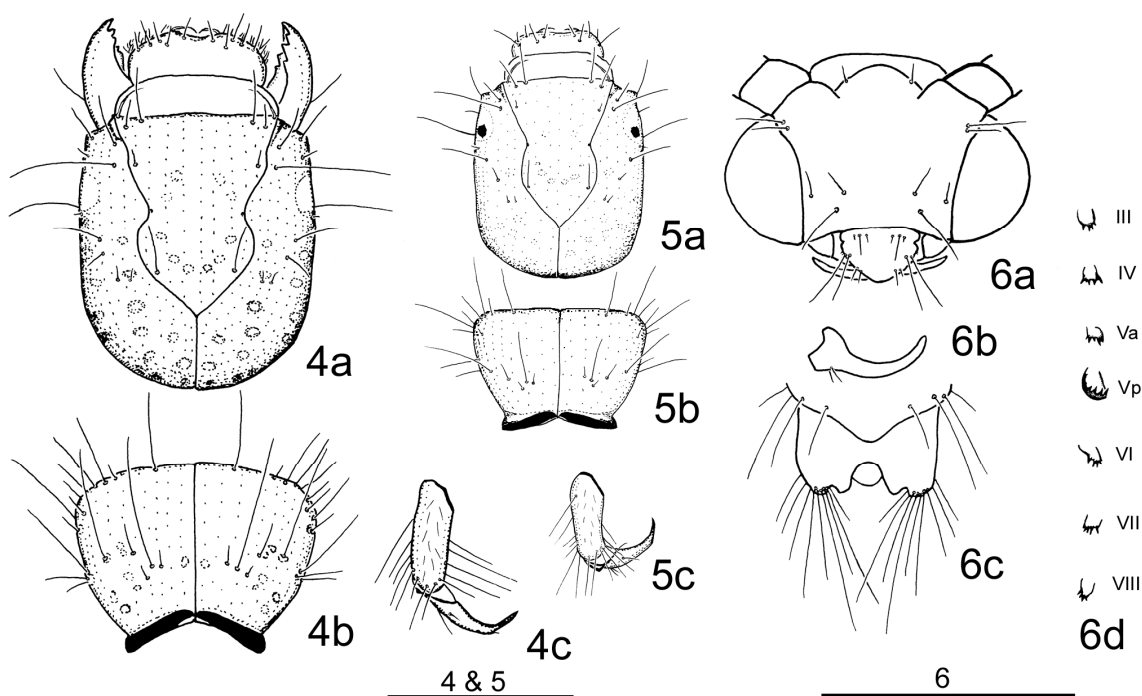
Holotype. Male (pinned): Japan: Shizuoka: Shinmaya-gawa, 50 m a.s.l., Shinma, Aoi-ku, Shizuoka-shi, 34°59'13"N, 138°18'36"E, 24.VI.2009 (at light), T. Hattori (CBM-ZI 136958).

Paratypes. 2♂♂, 3♀♀ (pinned), same data as the holotype (1♂, 2♀♀: CBM-ZI 136959-136961; 1♂, 1♀: ZMH).

Other specimens examined. Japan. Ibaraki: 1♂, Hatori, Sakuragawa-shi, 13.VIII.2004 (at light), N. Katsuma (NKT); 4♂♂, Shimoisehata, Hitachiomiya-shi, 13.VIII.2005 (at light), N. Katsuma (NKT); 1♂, *ibid.*, 10.IX.2005 (at light), N. Katsuma (NKT); 1♂, 2♂♂, Ono, Tsuchiura-shi, 17-31.VIII.2008 (Malaise trap), N. Katsuma (TN); 1♀, *ibid.*, 31.VIII-15.IX.2008 (Malaise trap), N. Katsuma (NKT). Kanagawa: 2♂♂, Sakai-gawa, Amefurashi, Kawashiri, Shiroyama-cho, Sagami-hara-shi, 24.VIII.1984 (at light), T. Nozaki (TN); 1♂, *ibid.*, 6.IX.1984 (at light), T. Nozaki (TN); 1♂, 4♀♀, Moritogawa, Sakurayama, Zushi-shi, 20.VII.2009 (at light), T. Nozaki (TN); 5♂♂, 19♀♀, *ibid.*, 6.VIII.2009 (at light), T. Nozaki (TN); 8♂♂, 34♀♀, *ibid.*, 7.IX.2009 (at light), T. Nozaki (TN). Yamanashi: 1♂, Akasawa, 680 m a.s.l., Hayakawa-cho, 3.VIII.2008 (at light), T. Nozaki & T. Hattori (TN). Shizuoka: 1♂, 4♀♀, same data as the holotype (TN); 1♂, same data as the holotype except 21.V.2009 (TN); 2♀♀, same data as the holotype except 3.VIII.2009 (TN); 6 pupae, 3 prepupae, 1 larva, type locality, 14.V.2009, T. Hattori (TN); 1♂, 1♀, Kitakata, Fujieda-shi, 18.VIII.1989, T. Hattori. Aichi: 1♂, Taisho-ike, Kaisho-no-mori, Seto-shi, 18.VIII.1996 (at light), Y. Marunouchi (TN). Mie: 2♂♂, 11♀♀, Sakashita, Kameyama-shi, 24.VII.2005 (at light), N. Kawase (MKNM); 1♂, 1♀, Washiyama, Kameyama-shi, 29-30.IX.2006, N. Kawase (MKNM). Shiga: 1♂, Minami-tsuchiyama, Koka-shi, 15.IX.2008 (at light), N. Kawase (MKNM); 1♂, *ibid.*, 6.IX.2009, H. Morita (TN); 1♂, Ichino, Koka-shi, 10.VII.2000 (at light), Y. Imakiire (NKW).

E t y m o l o g y . This species is named in honor of Dr. H. Malicky, who described plenty of caddisfly species including the genus *Polyplectropus*.

D i s t r i b u t i o n . Japan (Honshu).



Figs 4-6: (4) Larva (prepupal stage) of *Polyplectropus protensus*: (a) head, dorsal; (b) pronotum, dorsal; (c) right anal claw, lateral. (5) Larva of *Polyplectropus malickyi*: (a) head, dorsal; (b) pronotum, dorsal; (c) right anal claw, lateral. (6) Pupa of *Polyplectropus protensus*: (a) head, frontal; (b) right mandible, dorsal; (c) abdominal segment IX, dorsal; (d) hook plates of abdominal segments. Abbreviations: III, IV, Va, VI-VIII, anterior hook plates on segments III-VIII; Vp, posterior hook plate on segment V. Scale: 1.0 mm.

Acknowledgements

We express our cordial thanks to Dr. R. Peters, Zoologisches Museum Hamburg, for providing fine photographs of the type specimen of *P. protensus*, and Dr. W. Mey, Museum für Naturkunde, Humboldt University, for the information of Ulmer's collection. We also grateful to Messrs. H. Morita, Yokkaichi-shi, and N. Kawase, Minakuchi Kodomo-no-mori Nature Museum, for the gift or loan of valuable specimens.

Zusammenfassung

Polypsectropus protensus Ulmer 1908 wird nach neu gesammelten Stücken aus Zentral – Honshu (Japan) beschrieben, und von ebendort werden zwei neue Arten (*P. moritai* und *P. malickyi*) beschrieben.

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