Zootaxa 3635 (1): 027–039
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://dx.doi.org/10.11646/zootaxa.3635.1.3
http://zoobank.org/urn:lsid:zoobank.org:pub:25EBAAB4-4745-4C57-A922-06D071E58A87

The genus *Adicella* McLachlan (Trichoptera, Leptoceridae) in Japan

TOMIKO ITO[1], NAOTOSHI KUHARA[2] & NOBUYUKI KATSUMA[3]

[1]*Hokkaido Aquatic Biology, Hakuyo-chô, 3-3-5, Eniwa, Hokkaidô, 061-1434 Japan. E-mail: tobikera@siren.ocn.ne.jp*
[2]*Chitose Board of Education, 42-1, Osatsu, Chitose, Hokkaidô, 066-0001 Japan*
[3]*Environmental Research Center Co. Ltd., 3-1, Hanare, Tsukuba, Ibaraki, 305-0857 Japan*

Abstract

The Japanese species of the genus *Adicella* McLachlan (Trichoptera, Leptoceridae) are reviewed and confirmed, including a described species and 3 new species: *A. makaria* Malicky & Chantaramongkol 2002, originally described from Taiwan, *A. trichotoma* Ito & Kuhara **sp. nov.**, *A. paludicola* Ito & Kuhara **sp. nov.**, and *A. strigillata* Katsuma & Ito **sp. nov.** For clear comparisons, adults of all species are redescribed or described.

Key words: male, female, variation, East Asia

Introduction

About 150 named species of the genus *Adicella* McLachlan 1877 (Trichoptera, Leptoceridae) are known from the Oriental (113 species), West Palaearctic (18 species), Afrotropical (9 species), and East Palaearctic (2 species) regions (Morse 2012; Morse personal communication). The larvae live in various sizes of flowing waters, from springs to rivers, often among dense vegetation (Lepneva 1971; Wallace *et al*. 2003; Graf *et al.* 2008).

Japanese *Adicella* was first recorded with three unnamed 'species' by Uenishi (1993), but the 'species' have not been described. Recently, *A. makaria* Malicky & Chantaramongkol 2002 (in Malicky *et al.* 2002), originally described from Taiwan, has been recorded from Yonaguni-jima Island, in the southwestern-most part of Japan (Shimura 2010). In this paper, we redescribe or describe the adults of 4 species of *Adicella* including 3 new species.

Material and methods

Association of the male and female of each species was based on similar general body characteristics from among specimens collected together. Genitalic segments were figured after treatment in hot dilute KOH solution. Morphological terms mainly follow Yang & Morse (2000). The type series and other materials are deposited in the collections of the Natural History Museum and Institute, Chiba (CBM) and persons or museum shown in parentheses, respectively. All specimens are preserved in 70–80% ethyl alcohol. Collecting methods, collectors and depositories (depositories are in parentheses) are abbreviated as follows: L, light trap; M, Malaise trap; S, sweep netting; NKA, N. Katsuma; NKU, N. Kuhara; TI, T. Ito; MKNM, Minakuchi Kodomo-no-kuni Nature Museum (Shiga-ken).

Adicella makaria Malicky & Chantaramongkol 2002

(Figs. 1, 6)

Adicella makaria Malicky & Chantaramongkol 2002 *in* Malicky *et al*. 2002: 27, fig. 27, male, “Thailand”; Malicky 2006: 1514, correction: the type locality is not Thailand but is Taiwan; Shimura 2010: 50, 54, photo of adult, Japan (Ryûkyû Islands, Yonaguni-jima).

Accepted by J. Morse: 18 Feb. 2013; published: 25 Mar. 2013

Adult (Fig. 1). Light brown, body length (from front of head to end of abdomen) 4.5–6.0 mm in male (n=7) and 4.5–6.0 mm in female (n=9). Antennae 4.0–4.5 times as long as body in male (n=3) and 3.5–4.0 times in female (n=2); scapes thick, long, each about 4 times as long as its pedicel. Maxillary palpi each 5-segmented, total length about 2.2 mm in male (n=2) and 2.0 mm in female (n=2); labial palpi each 3-segmented, total length 0.5–0.8 mm in male (n=4) and 0.55–0.60 mm in female (n=2); all segments of both palpi cylindrical and covered with fine setae. Head with large anterodorsal setal wart (ad; anteromesal setal wart in Wiggins & Currie 1996; vertexal medioantennal compact setal wart in Oláh & Johanson 2007) and 4 pairs of warts posterior from it, including dorsal (small, d; anterior setal warts in Wiggins & Currie 1996; vertexal ocellar compact setal warts in Oláh & Johanson 2007), postero-dorsal (large, pd; posterior setal warts in Wiggins & Currie 1996; occipal setal warts in Oláh & Johanson 2007), postero-lateral (small, pl; posterolateral setal warts in Wiggins & Currie 1996; postgenal setal warts in Oláh & Johanson 2007) and postoccipital (small, p; unnamed in Wiggins & Currie 1996 and Oláh & Johanson 2007) setal warts (Fig. 1A). Pronotum with 1–2 pairs of warts, mesoscutum with pair of longitudinal setal lines, and mesoscutellum sometimes with pair of very small setal warts (Fig. 1A).

Wings narrow (Fig. 1B). Forewings mostly covered with brown hairs. Hind wings subacute apically, covered with brown hairs, with long fringes at posterior margins. Venation similar in both sexes. Forewings with apical forks I, II and V, fork I with stalk, fork II sub-rectangular, fork V sessil; discoidal cell narrow and long, about 1/3 as long as wing, thyridial cell narrow and very long, about 1/2 as long as wing; *r-s* crossvein present in some specimens; Cu2 and P connected by *cu-p* crossvein, then P fused with E+1A+2A to form single curved vein ending at arculus. Hind wings with apical forks I and II, fork II sub-rectangular; discoidal and thyridial cells absent; R fine (often invisible without staining) and fused to Sc near midlength of wings. Lengths of forewings and hind wings each 5.0–7.0 mm and 4.0–5.0 mm respectively in males (n=7), 4.5–6.0 mm and 3.5–4.5 mm respectively in females (n=9).

Male genitalia (Figs. 1C–G). Segment IX (IX) rectangular, posterolateral margins slightly convex in lateral view (Fig. 1C); in dorsal view posterodorsal margin produced with two triangular lobes (Fig. 1D, pdp IX). Upper part of tergum X (up X) trifurcate, setose apically, middle process longer than lateral processes (Figs. 1C, D). Lower part of tergum X (lo X) tall, hood-like, composed of two large vertical lobes fused dorsally in basal half, directed ventrocaudad in basal half then gently curved and directed caudad (Fig. 1C), apex of each lobe subacute in dorsal view (Fig. 1D). Preanal appendages (pr ap) oval, subacute apically in lateral view, round apically in dorsal view (Figs. 1C, D). Inferior appendages each with three branches (Figs. 1C, E, F): Upper branch (up in ap) club-like with many short setae mesally; middle branch (mi in ap) longest, bar-like, gently curved mesad, acute apically with few short setae on apical outer surfaces; lower branch (lo in ap) thick at base, gradually tapered with many long and short setae on ventral surface, subacute apically. Phallobase (phb) tubular, curved 90˚; paramere spines absent; phallicata (phc) tubular, almost straight, about 2/3 as long as phallobase (Fig. 1G), with U- or V-shaped phallotremal sclerite.

Female genitalia (Figs. 1H–J). Segment IX (IX) short, tergum IX produced into subtriangular lobe posteromedially and fused with tergum X and preanal appendages (Figs. 1H, I). Preanal appendages (pr ap) represented as broad setose mounds (Figs. 1H, I). Segment X (X) forming longitudinally short tube with semimembranous ventral surface (Figs. 1H, J). Lamellae irregularly shaped, vertical, setose lobes, each with small round flap on dorsolateral margin (Fig. 1H). Gonopod plate (go pl) rugose, broadly semicircular or subquadrate; pair of small, round, vertical lobes (vl go pl) emerging from posterolateral ends, about 1/4 as large as lamellae in lateral view (Fig. 1H), triangular in ventral view (Fig. 1J). Apicomesal process of internal part of gonopod (ap go pl) slightly convex (Fig. 1J), sometimes trapezoidal. Spermathecal sclerite (sp sc) subcircular in ventral view (Fig. 1J), trapezoidal in lateral view (Fig. 1H).

Specimens examined. **JAPAN: Ryûkyû Islands. Ishigaki-jima**: Hakusui, Nagura-gawa, small tributary, 12–21.x.1999, K. Konishi, M, 3 females (TI); same data except 11–12.iii.2009, TI, L & S, 3 females (TI); same data except 11–13.iv.2011, TI, L & S, 1 male, 2 females (TI); same data except 25–31.X.2012, TI, S & M, 1 male, 1 female (TI); Miyara-gawa, Nagura-damu-ue, 12.iv.2011, TI, L & S, 2 males (TI). **Iriomote-jima**: Sonai, 13–17.iii.2002, T. Yoshida & G. Sugaya, M, 1 male, 1 female (TI); small stream near boat station of Urauchi-gawa, 18.x.2005, TI, S, 1 male (TI). **Yonaguni-jima**: Hikawa-suigen, 24.iii.2009, N. Shimura, 1 female (N. Shimura); same data except 30.iii–1.iv.2010, N. Shimura, 3 males, 1 female (N. Shimura); Bôsai-rin, small stream, 27.iii.2009, N. Shimura, 1 male (N. Shimura).

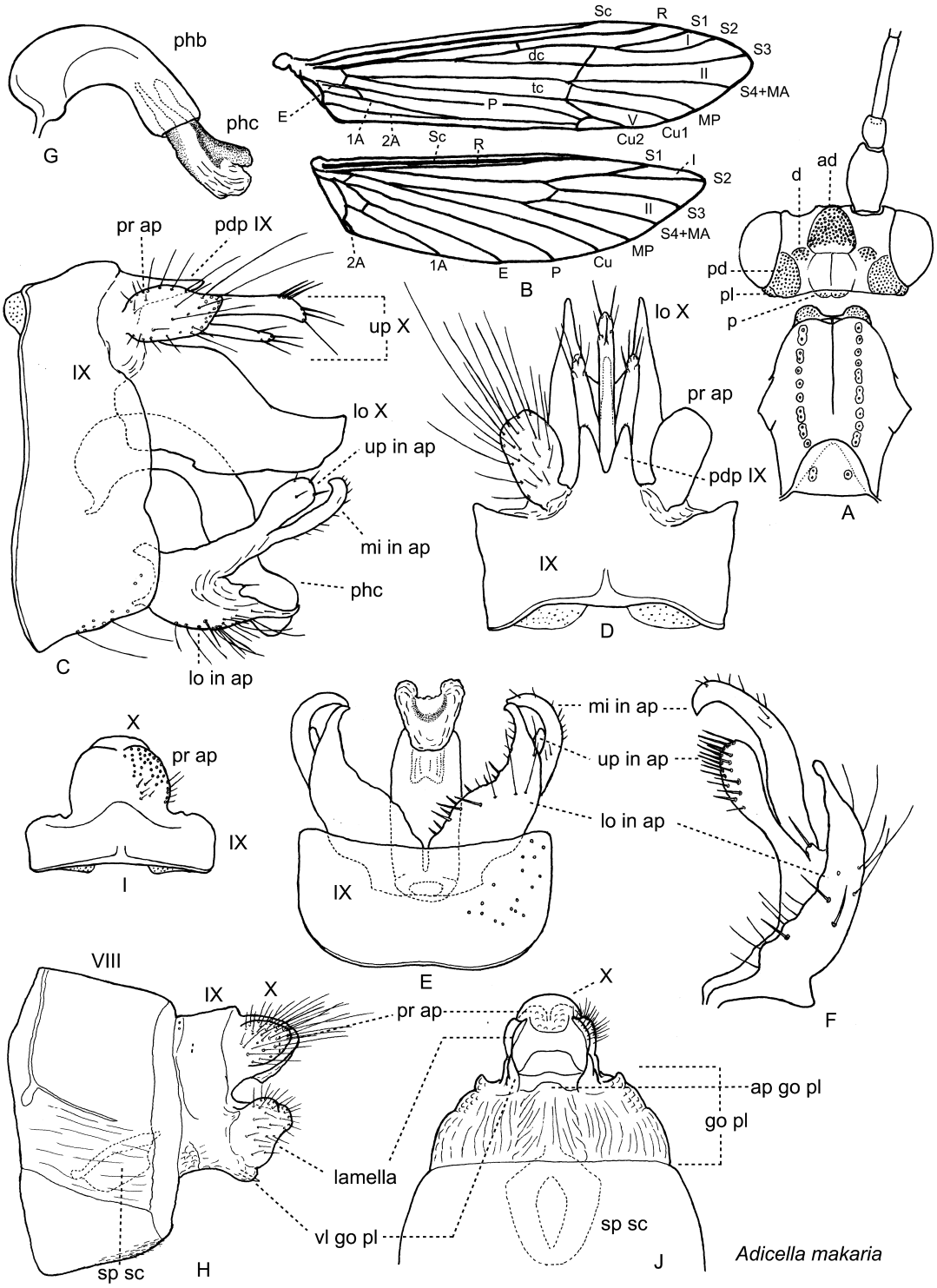

FIGURE 1. ***Adicella makaria***. **Male** (A–G, Yonaguni-jima): A, head, and pro- and meso-thorax, dorsal; B, left wings, ventral; C, genitalia, left lateral; D, same, dorsal; E, same, ventral; F, right inferior appendage, ventromesal; G, phallus, left lateral. **Female** (H–J, Yonaguni-jima): H, genitalia, left lateral; I, same, dorsal; J, same, ventral. Abbreviations. Head: ad=anterodorsal wart; d=dorsal wart; p=postoccipital wart; pd=posterodorsal wart; pl=posterolateral wart. Wings: I, II and V=fork I, fork II and fork V; dc=discoidal cell; tc=thyridial cell. Male: IX and X=9th and 10th abdominal segments; lo X=lower part of tergum X; lo in ap=lower branch of an inferior appendage; mi in ap=middle branch of an inferior appendage; up in ap=upper branch of inferior appendage; pdp IX=posterodorsal projection of segment IX; phb=phallobase; phc=phallicata; pr ap=a preanal appendage; up X=upper part of tergum X. Female: VIII–X=8th to 10th abdominal segments; ap go pl=apicomesal process of internal gonopod plate; go pl=gonopod plate; pr ap=a preanal appendage; sp sc=spermathecal sclerite; vl go pl=a vertical lobe of gonopod plate.

Remarks. Malicky & Chantaramongkol (2002, in Malicky *et al*. 2002) did not recognize any species similar to *Adicella makaria*. However, it apparently belongs to the *A. biramosa* Group (Kimmins 1963, Schmid 1994) and its male most closely resembles that of *A. trigitata* Yang & Morse 2000 in the shape of the inferior appendages; the male of *A. makaria* differs from that of *A. trigitata*, however, by the absence of paramere spines. The female of this species is described here for the first time. In this species group, only the females of *A. starmuehlneri* Mallicky 1979 (Malicky 1979), *A. biramosa* Martynov 1936 (Schmid 1958) and *A. capitata* Yang & Morse 2000 (Yang & Morse 2000) have been described previously. Among these, tergum X is much shorter in *A. makaria* and apically rounded in dorsal and ventral view, versus truncate (*A. starmuehlneri*, *A. capitata*) or with an acute dorsomesal projection (*A. biramosa*).

Habitat. Most adults were collected near small streams in forests.

Distribution (Fig. 6). Taiwan: Nantou County, and Japan: Ryûkyû Islands (Ishigaki-jima, Iriomote-jima, Yonaguni-jima).

Japanese name. Taiwan-ko-higenaga-tobikera.

Adicella trichotoma Ito & Kuhara sp. nov.

(Figs. 2, 3, 6)

Adicella sp.: Kuhara 1997: 62, Japan (Hokkaidô); Kuhara 2001: 20, Japan (Hokkaidô); Ito *et al*. 2010: 64, Japan (Hokkaidô).

Diagnosis. Also a species of the *Adicella biramosa* Group (Kimmins 1963, Schmid 1994), the male of this species resembles that of *Adicella mita* Yang & Morse, 2000, described from southeastern China, in having a trifurcate upper part of tergum X with shortest middle process and phallus without paramere spines. However, it clearly differs from *A. mita* as follows. *Adicella trichotoma* has (1) preanal appendages oval with no acute posterior margin in dorsal and lateral aspects, and (2) inferior appendages tribranched. On the other hand, *A. mita* has (1) preanal appendages orbicular with subacute posterior margin in dorsal and lateral aspects, and (2) inferior appendages mitten-like, with broad, short lower branch.

Among the *A. biramosa* Group for which the female is known, the female of this species resembles that of *A. makaria* in its short tergum X, but is distinguishable from the latter as follows: In *A. trichotoma*, vertical lobes of the gonopod plate are rather large, about 4/5 as large as lamellae in lateral view; in *A. makaria*, they are small, 1/4 as large as lamellae in lateral view.

Adult (Figs. 2, 3). Light brown, body length 5.0–6.5 mm in male (n=6) and 4.0–6.5 mm in female (n=8). Antennae 3.1–3.6 times as long as body in male (n=4), 2.8–3.1 times in female (n=4); scapes thick, long, each about 4 times as long as its pedicel. Maxillary palpi each 5-segmented, total length 1.5–1.7 mm in male (n=2), 1.8–2.0 mm in female (n=5); labial palpi each 3-segmented, total length 0.5 mm in male (n=2), 0.5–0.8 mm in female (n=5); all segments of both palpi cylindrical and covered with fine setae. Warts on head and thorax as in *A. makaria*.

Wings: Color and venation as in *A. makaria*. Lengths of forewings and hind wings each 6.0–7.0 mm and 5.0–5.5 mm respectively in males (n=7), 4.5–6.5 mm and 3.5–5.0 mm respectively in females (n=5).

Male genitalia (Fig. 2). Segment IX rectangular in lateral view with posterolateral margins slightly convex (Fig. 2A), in dorsal view posterodorsal margin produced triangularly often with two lobes variable in size and shape individually (Figs. 2B, D1–9), mostly asymmetrical (Figs. 2D1–4, 8, 9), sometimes absent (Figs. 2D7, 8). Preanal appendages oval in dorsal and lateral views (Figs. 2A, B). Upper part of tergum X trifurcate, setose apically, middle process shorter than lateral processes (Figs. 2A, B). Lower part of tergum X tall, hood-like, composed of two large vertical lobes fused dorsally in basal half, directed ventrocaudad (Figs. 2A, B), apex of each lobe broad in lateral view (Fig. 2A), subacute in dorsal view (Fig. 2B). Inferior appendages each with three branches and variable in shape among sites and also individually in each site, with numerous short thick setae mesally and long slender setae ventrally and laterally (Figs. 2A, C, F, G1–8): Upper branch finger-like, slightly bent ventrad (Figs. 2A, G1–8); in lateral view, gently tapered with subacute apices in most specimens (Figs. 2A, G2, G4, G5, G7), but parallel-sided with round apices in few specimens (Figs. 2G1, G6, G8); middle branch thick, bar-like (Figs. 2A, F, G), strongly curled mesad apically with subacute apex in ventral view (Fig. 2C), in lateral view, thickest among three branches (Figs. 2A, G), longest among three branches in most specimens (Figs. 2A, G1–G4, G7), but slightly shorter than upper branch in few specimens (Fig. 2G6), almost parallel sided with round

or subquadrate apex in most specimens (Figs. 2G1, G2, G5, G6, G7, G8), but apex slightly tapered (Fig. 2G4) or broadened (Figs. 2A, G3) in few specimens. Ratio of widths of middle part of middle branch to widths of middle part of upper branch 1.8–2.0 in Hokkaidô (n=7) (Figs. 2A, G1), 2.0–2.5 in Iwate (n=2) (Fig. 2G2), about 3 in Ibaraki (n=4) (Fig. 2G3), 1.8–2.3 in Mie (n=5) (Fig. 2G4), 1.1–2.9 in Shikoku (n=9) (Figs. 2D5, 7), 1.1 in Shimane (n=1) (Fig. 2G6) and 1.5 in Okinawa (n=2) (Fig. 2G8), with geographical cline not found in ratio; lower branch (Figs. 2A, F, G) shortest, variable in size even at each site, often only protuberance (Figs. 2G1, 3G7). Phallobase tube curved 90˚; paramere spines absent; phallicata tubular, almost straight, about 2/3 as long as phallobase, with U- or V-shaped phallotremal sclerite (Figs. 2C, E).

Female genitalia (Fig. 3). Segment IX short, fused with tergum X and preanal appendages (Fig. 3A); terga IXa (IXa) and IXb (IXb) conspicuous in dorsal view (Fig. 3B); IXb variable in size and shape individually even at each site (Fig. 3D1–8), round (Fig. 3D1) or subtrapezoidal (Fig. 3D2), with (Figs. 3B, D3–5, D7, D8) or without (Figs. 3D1, 2) middle notch, asymmetrical in some specimens (Figs. 3D5, 6), very short in few specimens (Fig. 3D8). Preanal appendages (pr ap) represented as round, setose mounds (Fig. 3A), semicircular in dorsal and ventral views (Figs. 3B, C). Segment X (X) membranous, short, tube-like (Fig. 3C), mesoventral slit present in few specimens. Lamellae round, vertical, setose lobe, each with rugose flap basolaterally (Figs. 3A, C). Gonopod plate (go pl) broad, rugose laterally, with round vertical lobes (vl go pl) posterolaterally (Figs. 3A, C); vertical lobes large, about 4/5 as large as lamellae in lateral view (Fig. 3A), triangular in ventral view (Fig. 3C). Apicomesal process of internal part of gonopod (ap go pl) semimembranous, subquadrate in ventral view (Fig. 3C), acute in lateral view (Fig. 3A). Spermathecal sclerite (sp sc) large sub-pentagonal in ventral view (Fig. 3C), trapezoidal in lateral view (Fig. 3A).

Holotype male: **JAPAN**: Hokkaidô; Otaru-shi, Okusawa-suigenchi (43˚09'N, 140˚58'E, 220 m), 26.viii.1996, Y. Sasaki & F. Takahashi, M (CBM-ZI 146707).

Paratypes: type locality, but 29.vii.1996, Y. Sasaki & F. Takahashi, M, 1 male, 2 females (CBM-ZI 146708–146710).

Other specimens. **JAPAN**: **Hokkaidô**: Otaru-shi, Okusawa-suigenchi, Anataki, 26.vii.1995, NKU, 1 female (NKU); Otaru-shi, Okusawa-suigenchi, Anataki, small stream, 26.vii.1995, NKU, 1 males, 1 female (NKU); Otaru-shi, Okusawa-suigenchi, 29.vii.1996, Y. Sasaki & F. Takahashi, M, 2 males, 5 females (1 male, 1 female, TI; 3 females, NKU); Otaru-shi, Okusawa-suigenchi, Shiraisawa, 2.viii.1996, Y. Sasaki & F. Takahashi, M, 2 males, 29 females (NKU); Otaru-shi, Okusawa-suigenchi, 9.viii.1996, Y. Sasaki & F. Takahashi, M, 10 females (NKU); Otaru-shi, Okusawa-suigenchi, 19.viii.1996, Y. Sasaki and F. Takahashi, M, 1 female (NKU); Shimamaki-mura, Chihase-gawa, Nagumono-sawa, 160 m, 5.viii.2008, TI, S, 1 male (TI); Shiriuchi-chô, Idesu-gawa, 180 m, 12.vii.2008, TI, S, 1 female (TI). **Honshû. Iwate**: Iwaizumi-chô, Mitagai-gawa, headwater, 18.vii.2004, NKU, 3 males, 1 female (NKU); Iwaizumi-chô, Osada, tributary of Ôkawa, 12.vii.1997, NKU, 1 male, 3 females (NKU); Iwaizumi-chô, small tributary of Akka-gawa, 650 m, 19.vii.2004, NKU, 1 male, 2 females (NKU); Miyako-shi, Kadoma, tributary of Miyama-gawa, 13.vii.1997, NKU, 1 male (NKU); Kuji-shi, Kassemba, 12.vii.1997, NKU, 1 male (NKU). **Ibaraki**: Hitachi-ômiya-shi, Shimoisehata, mountain stream, 25.vi.2005, NKA, 4 males, 5 females (TI); Hitachi-ôta-shi, Okami, small marsh, 8.viii.2009, NKA, 1 male, 2 females (NKA). **Mie**: Daian-chô, Ishigure-minami, small stream, 13.vii.2001, H. Morita, M, 1 male, 3 females (TI); same data except 30.vii.2001, H. Morita, M, 1 male, 1 female (NKU); same data except 25.vii.2001, H. Morita, M, 1 male, 1 female (TI); Yokkaichi-shi, Suizawa-chô, small stream, 19.vi.2009, H. Morita, M, 1 male, 5 females (TI); same data except 5.vii.2009, H. Morita, M, 1 male (TI). **Shimane**: Okuizumi-chô, Sentsuzan, 5–26.vii.2006, M. Hayashi, M, 1 male (MKNM). **Shikoku. Ehime**: Uchiko-chô, Odamiyama, Namakusa-dani, 29.vi.2000, E. Yamamoto, M, 1 male, 1 female (TI); Uchiko-chô, Odamiyama, Odamiyama-keikoku, small stream, 15.viii.2000, E. Yamamoto, M, 5 males, 5 females (TI). **Kochi**: Kôchi-shi, Tosayama, Kuishiyama, 8.vi.2005, M. Takai, 1 male (TI); Kôchi-shi, Tosayama, Kuishiyama, 2.ix.2005, M. Takai, 2 males (TI); Kami-shi, Monobe, Nishikumabeppu-rindô, 25.vii.2004, M. Takai, 1 males (TI); Ino-chô, Teragawa, Yosakoi-tôge, 19.vi.2006, M. Takai, 1 male (TI); same data except 3.viii.2001, I. Yamashita, 1 male (MKNM). **Ryûkyû Islands. Amami-ôshima**: Amami-shi, Setouchi, Miyama-gawa, Daini-miyama-bashi, 21.iv.2008, TI, S, 3 females (TI). **Okinawa-jima**: Nago-shi, Genka-kawa, hygropetric habitat near Hogen-hashi, 8.iv.2011, TI, S, 2 males, 2 females (TI); Ôgimi-son, Takasato-gawa, small tributary at end of road, 17.iii.2012, TI, S, 1 male, 4 females (TI); Kunigami-son, Oguni, small stream, 21.iii.1999, TI & A. Ohkawa, S, 1 female (TI); Kunigami-son, Oku, small stream, 22.iii.1999, TI & A. Ohkawa, S, 1 female (TI); Kunigami-son, Ie, 11–15.iv.2001, K. Uesugi, M, 1 female (TI).

FIGURE 2. ***Adicella trichotoma*** **sp. nov**. **Male** (A–D1, E, F, type locality; D2–D9, G, other localities): A, left genitalia, lateral; B, same, dorsal; C, same, ventral; D, posterodorsal projection of segment IX, dorsal, variation: 1, Hokkaidô, Otaru-shi; 2, Iwate, Iwaizumi-chô; 3–5, Ibaraki, Hitachi-ôta-shi; 6–8, Mie, Daian-chô; 9, Kôchi, Kami-shi; E, phallus, left lateral; F, left inferior appendage, ventromesal; G, left inferior appendage, left lateral, variation: 1, Hokkaidô, Shimamaki-mura; 2, Iwate, Iwaizumi-chô; 3, Ibaraki, Hitachi-ôta-shi; 4, Mie, Daian-chô; 5, Shimane, Oku-izumo-shi; 6, Kôchi, Monobe-mura; 7, Kôchi, Kami-shi; 8, Okinawa, Genka-kawa.

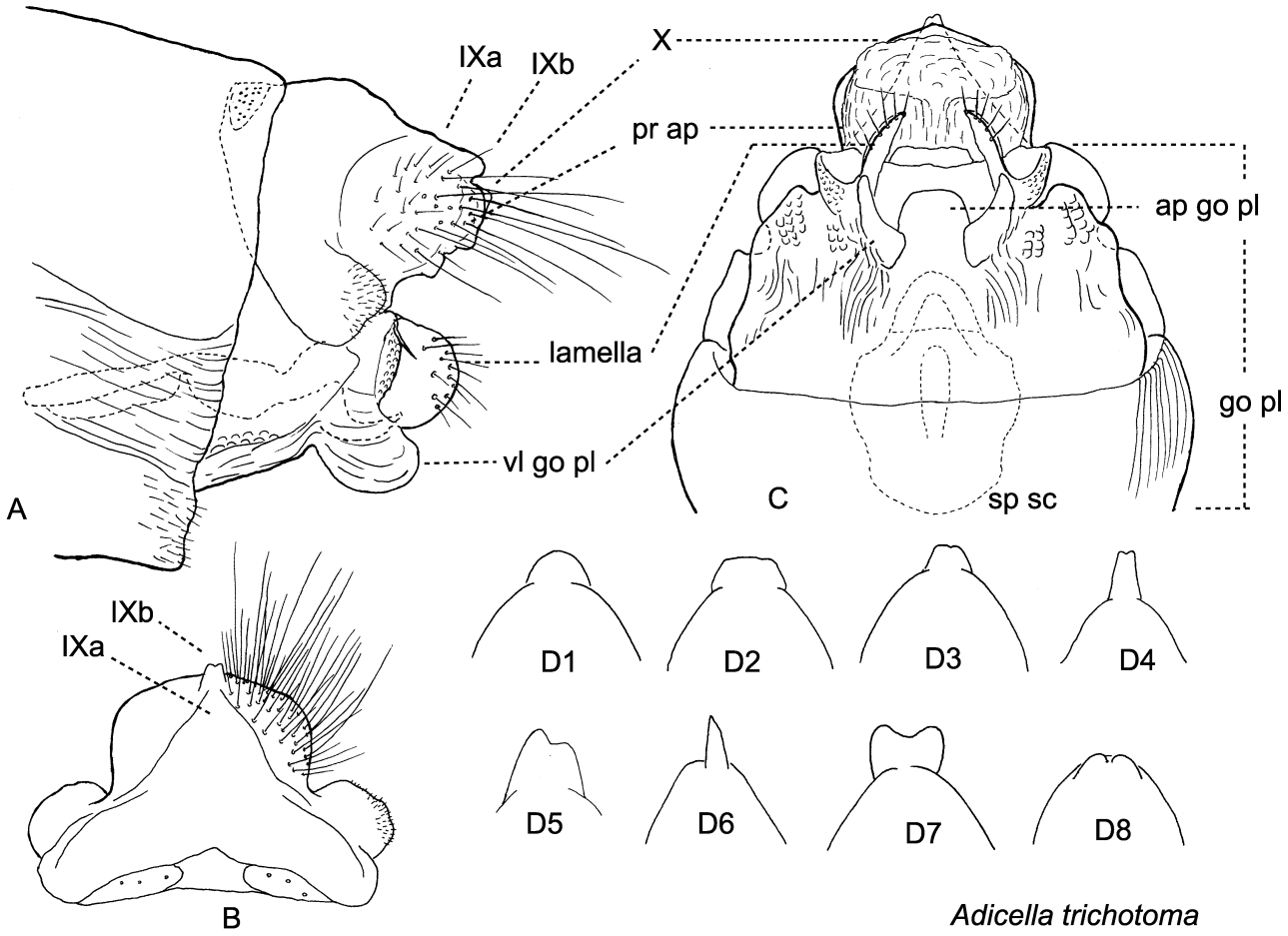

FIGURE 3. ***Adicella trichotoma*** **sp. nov**. **Female** (A–C, D1–3, type locality; D4–8, other localities): A, genitalia, left lateral; B, same, dorsal; C, same, ventral; D, terga IXa and IXb, dorsal, variation: 4, Iwate, Iwaizumi-chô; 5, Ibaraki, Hitachi-ota-shi, 6, Mie, Daian-chô; 7, 8, Ehime, Oda-chô. Abbreviations: IXa=tergum IXa; IXb=tergum IXb; ap go pl=apicomesal process of internal gonopod plate; go pl=gonopod plate; pr ap=a preanal appendage; sp sc=spermathecal sclerite; vl go pl=a vertical lobe of gonopod plate.

Etymology. The specific epithet is a latinized version of the Greek adverb "τρίχα" (=in 3 parts) and a variant of the Greek adjective "τομαῖος, -α, -ον" (=cut), referring to the shape of the three-branched upper part of tergum X.

Habitat. Most adults were collected near streams in mountain area.

Distribution (Fig. 6). Japan: Hokkaidô, Honshû, Shikoku, Ryûkyû Islands (Amami-ôshima, Okinawa-jima).

Japanese name. Mitsumata-ko-higenaga-tobikera.

Adicella paludicola **Ito & Kuhara sp. nov.**
(Figs. 4, 6)

Adicella sp. 1: Ito *et al*. 2007: 153, Japan (Hokkaidô); Ito & Kosugi 2007: 55, Japan (Hokkaidô).

Diagnosis. A species of the *Adicella pulcherrima* Group (Schmid 1994), the male of this species resembles that of *A. papillosa* Yang & Morse 2000, distributed in southwestern China, in having the upper part of tergum X with seta-bearing papillae, a large lower part of tergum X and inferior appendages without branches. However, it clearly differs from the latter as follows: This species has (1) the upper part of tergum X is without a deep and wide dorsomesal slit and is never longer than the preanal appendages, (2) the lower part of tergum X is not extending beneath the phallus, and (3) the phallicata is without a phallotremal sclerite. On the other hand, *A. papillosa* has (1) the upper part of tergum X with a deep and wide dorsomesal slit and is much longer than the preanal appendages

(2) the lower part of tergum X is extending mesad beneath the phallus, and (3) the phallicata has a U-shaped phallotremal sclerite.

The female of this species resembles that of *A. trichotoma* but is distinguishable from the latter as follows: In *A. trichotoma*, the vertical lobes of the gonopod plate are relatively large, about 4/5 times as large as the lamellae in lateral view; in *A. paludicola*, the vertical lobes of the gonopod plate are rather small, about 2/3 as large as the lamellae and each is largely fused to its lamella along its dorsal edge in lateral view.

Adult (Fig. 4). Light brown, body length 4.1–5.9 mm in male (n=11) and 4.0–5.5 mm in female (n=11). Antennae 3.0–4.6 times as long as body in male (n=8), 2.8–3.5 times in female (n=5); scapes thick, long, each 2.0 times as long as its pedicel. Maxillary palpi each 5-segmented, total length 1.8–2.0 mm in male (n=3), 1.8 mm in female (n=2); labial palpi each 3-segmented, total length 0.5–0.6 mm in male (n=2), 0.7 mm in female (n=2); all segments of both palpi cylindrical and covered with fine setae. Warts on head and thorax as in *A. makaria*.

Wings: Shape, color and venation as in *A.makaria*, long hair pencil of hind wing absent. Lengths of forewings and hind wings each 6.0–7.1 mm and 4.5–5.4 mm respectively in males (n=11), 5.3–6.2 mm and 4.3–5.1 mm respectively in females (n=11).

Male genitalia (Figs. 4A–G). Segment IX rectangular, posterior margins almost straight or very slightly convex in lateral view (Fig. 4A), small excision present near base of inferior appendages in some specimens (Fig. 4A); in dorsal view posterodorsal margin produced backward at center in broad triangular process, with small lobes beneath; lobes variable in size individually and sometimes asymmetrical (Fig. 4B). Preanal appendages oval (Figs. 4A, B). Upper part of tergum X forming broad plate extending to, but never exceeding, tips of preanal appendages, with 10 seta-bearing papillae apically and with very narrow dorsomesal slit in few specimens (Figs. 4B, D). Lower part of tergum X tall, hood-like composed of two large vertical lobes fused dorsally in basal half, each lobe directed ventrocaudad (Figs. 4A, B), apices broad in lateral view (Fig. 4A) and subacute in dorsal view (Fig. 4B). Inferior appendages upcurved, each about 3 times as long as wide, without branches (Figs. 4A, C, E, F); in lateral view, almost parallel-sided, truncate apically (Fig. 4A) or truncate with protruding ventrocaudal corner (Fig. 4F); at 3/5 from base small dorso-mesal protuberance present with numerous spines (Figs. 4C, E). Phallobase slender tube curved 90˚; paramere spines absent; phallicata tubular, sinuate, about 4/5 times as long as phallobase, without phallotremal sclerite (Fig. 4G).

Female genitalia (Figs. 4H–K). Segment IX short; tergum IXa (a) produced into triangular or subtriangular lobe posteromedially (Figs. 4H, I, K1–5), sometimes asymmetrical (Figs. 4K1, K2); tergum IXb (b) round (Figs. 4K2, K4), subtriangular (Figs. 4K1) or subtrapezoidal (Figs. 4I, K3, K5) in dorsal view, often with pair of small lobes (Figs. 4K1, K2, K4), sometimes asymmetrical (Fig. 4K3). Preanal appendages represented as broad setose mounds fused with tergum X (Figs. 4H, I). Segment X forming longitudinally short tube with semimembranous ventral surface (Fig. 4J). Lamellae round lobes, flattened laterally, each with oblique ridge on outer surface, posterior 2/5 covered with setae (Figs. 4H, J). Gonopod plate broad, subsquadrarte, lateral regions rugose with vertical lobes on posterolateral margins (Figs. 4H, J); vertical lobes round, rather small, about 2/3 as large as lamellae and each fused to its lamella along its dorsal edge in lateral view (Fig. 4H), thin and triangular in ventral view (Fig. 4J). Apicomesal process of internal part of gonopod subquadrate or semicircular (Fig. 4J). Spermathecal sclerite pentagonal in ventral view (Fig. 4J), trapezoidal in lateral view (Fig. 4H).

Holotype male: **JAPAN**: **Hokkaidô**, Kushiro Shitsugen, Shibecha-chô, Kayanuma, Shirarutoro-ko, Ikoi-no-ie, (43˚11'N, 144˚30'E, 8 m), 28.vii.2012, TI, L (CBM-ZI 146711).

Paratypes: Same data as holotype, 2 males, 2 females (CBM-ZI 146712–146715).

Other specimens. **JAPAN**: **Hokkaidô**. Same data as holotype, 5 males, 16 females (TI); same data except 22.vii.2003, TI, L, 1 male (TI); same data except 7.viii.2006, TI, L, 1 male, 1 female (NKU); same data except 28.vii.2012, TI, L, 5 males, 7 females (TI); Kushiro Shitsugen, Shibecha-chô, Kayanuma, Shirarutoro-etoro-gawa, Tômi-bashi, 4.xi.2008, TI, L, 2 males, 2 females (TI); same data except 25.vii.2008, TI, L, 1 female (TI); Kushiro Shitsugen, Kushiro-shi, Kirakotan-misaki, 16.vii.2005, T. Kosugi, L, 1 male (TI); Yûfutsu Shitsugen, Tomakomai-shi, Uenae, Bibi-gawa, 4 m, 16.vii.2010, TI, L, 1 female (TI). **Honshû. Ibaraki**: Hitachi-ôta-shi, Okami, small marsh, 24.vi.2006, NKA, 13 males, 3 females (11 males, 2 females, TI; 2 males, 1 female, NKU); same data except 8.viii.2009, NKA, 1 male, 17 females (NKA); same data except 16.vii.2012, NKA, 2 males, 3 females (NKA). **Niigata**: Asahi-mura, Miomote-gawa, Futagoshima, Shinrin-kôen, 10.ix.2003, TI, L, 1 male (TI). **Aichi**: Toyota-shi, Asuke, Tanoshiri Shitsugen, 16.vii.2000, N. Kawase, 1 male (MKNM). **Shiga**: Kôka-shi, Kôka, Aburahi, Okunoin-shicchi, 6.vii.2008, N. Kawase, 1 male (MKNM).

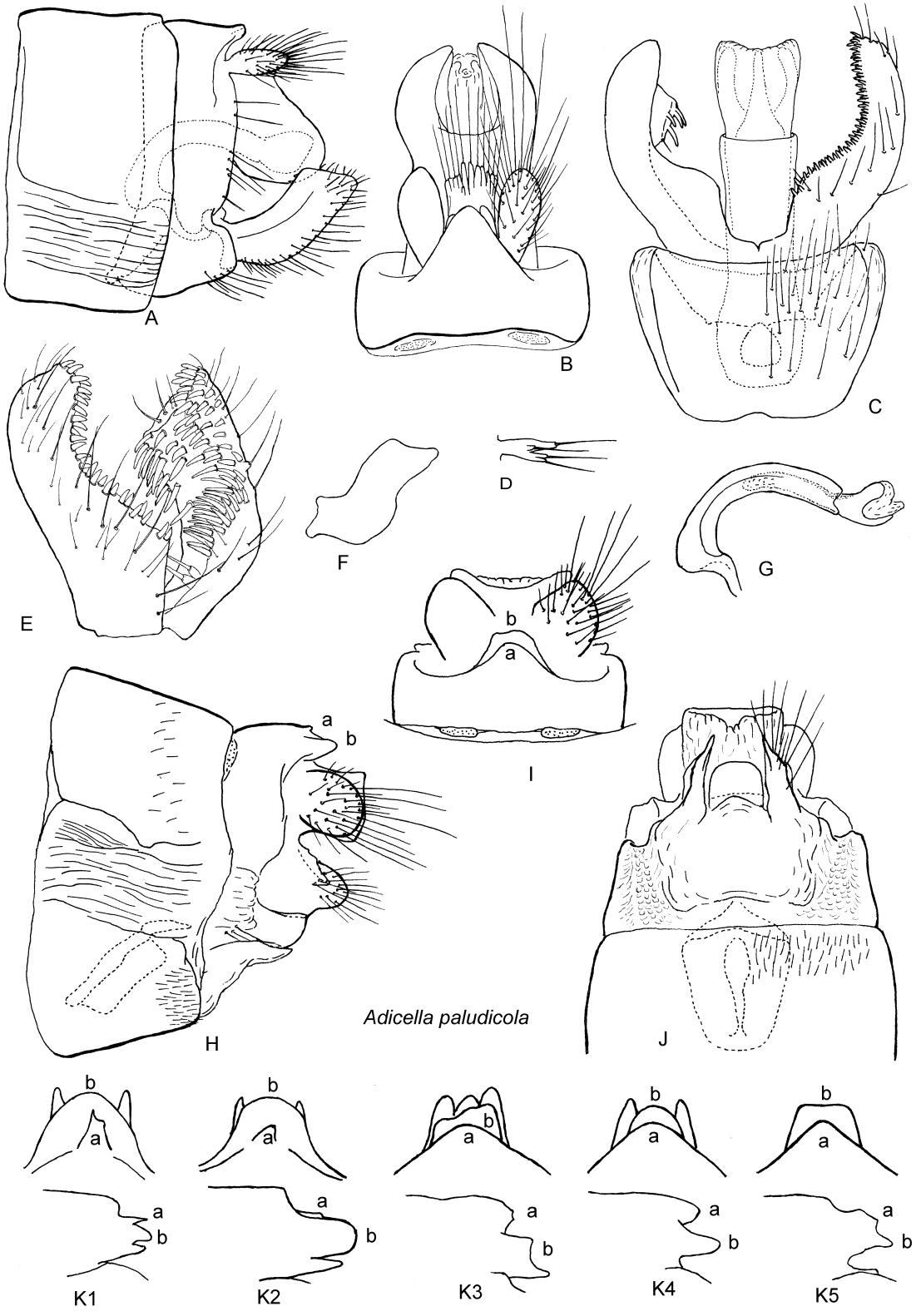

FIGURE 4. ***Adicella paludicola*** **sp. nov. Male** (A–G: A–E, G–I, type locality; F, Ibaraki, Hitachi-ôta-shi): A, genitalia, left lateral, upper part of X hidden by preanal appendage; B, same, dorsal; C, same, ventral; D, upper part of tergum X, left lateral; E, inferior appendages, left oblique ventrolateral and ventromesal; F, inferior appendage, left lateral, variation; G, phallus, left lateral. **Female** (H–K: H–K2, type locality; K3-5, Ibaraki, Hitachi-ôta-shi): H, left genitalia, lateral; I, same, dorsal; J, same, ventral; K, terga IXa and IXb, dorsal (upper) and left lateral (lower), variation. Abbreviations: a=tergum IXa; b=tergum IXb.

Etymology. The specific epithet is from the Latin noun "*palus, -udis*" (=marsh) and Latin suffix "*-colus, -a, -um*" (=living in), indicating that this species is a dweller of marshes.

Habitat. Most adults were collected in marshes.

Distribution (Fig. 6). Japan: Hokkaidô, Honshû.

Japanese name. Numa-ko-higenaga-tobikera.

***Adicella strigillata* Katsuma & Ito sp. nov.**
(Figs. 5–6)

Adicella sp. 1: Katsuma 2011: 68, Japan (Honshû).
Adicella sp. 3: Katsuma 2012: 67, Japan (Honshû).

Diagnosis. Also a species of the *Adicella pulcherrima* Group (Schmid 1994), the male of this species resembles that of *A. penicillaris* Yang & Morse 2000, described from southeastern China, in having short inferior appendages and long hair-brushes of the hind wings. However, it differs from *A. penicillaris* by (1) the upper part of tergum X having only a single process in *A. penicillaris*, but with three processes in *A. strigillata* and (2) the lower part of tergum X being strongly sclerotized on its ventral margins and with its apices each produced into an acute dorsolateral projection and not bearing setae in *A. penicillaris*, but the lower part of tergum X is not sclerotized on its ventral margins and has rounded apices bearing apical setae in lateral view in *A. strigillata*.

Adult male (Fig. 5). Pale brown, body 4.2–5.0 mm long in male (n=3). Male antennae 3.6 times as long as body (n=1); scapes thick, long, each 2.0 times as long as its pedicel. Maxillary palpi each 5-segmented, 2.6 mm in total (n=2); labial palpi each 3-segmented, 0.8 mm in total (n=3); all segments of both palpi cylindrical and covered with fine setae. Warts on head and thorax as in *A. makaria*.

Wings (Fig. 5A). Forewings broader than those of other Japanese *Adicella* species with round apical margin, mostly covered with brown hairs. Hind wings broader than other Japanese *Adicella* species, each with slightly acute apical margin, covered with brown hairs, with long fringes at posterior margins; dark brown or black hair-brushes conspicuous, long, 2/3 as long as hind wings, arising from jugal lobe. Forewings each with apical forks I, II and V, fork I broad with long (as long as fork I) stalk, fork II sub-rectangular, fork V sessil; discoidal cell long, 1/3 as long as wing; thrydial cell very long, about 1/2 as long as wings; presence of cross vein *sc-r* variable individually even in opposite sides of single specimen; Cu2 and P connected by *cu-p* crossvein, then P fused with E+1A+2A to form single curved vein ending at arculus; 1A often not reaching 2A. Hind wings each with apical forks I and II, fork I short and broad, with very long stalk (about 2.5 times as long as fork I), fork II sub-rectangular; discoidal and thyridial cells absent; Sc and R fine, fused into single vein at midlength of wing, Sc+R slightly sinuate apically. Lengths of forewings and hind wings each 6.2–6.6 mm and 4.7–5.0 mm respectively in male (n=3).

Male genitalia (Fig. 5). Segment IX (IX) rectangular, anterior margins slightly convex and posterior margins widely concave in lateral view (Fig. 5B); in dorsal view posterodorsal margin produced backward at center in triangular process (Fig. 5C). Preanal appendages (pr ap) oval (Figs. 5B, C). Upper part of tergum X (up X) trifurcate, setose apically, middle process longer than lateral processes (Figs. 5B, C). Lower part of segment X (lo X) tall, hood-like, composed of two large vertical lobes fused dorsally at base, each lobe broad in basal half and narrow in apical half, round apically in lateral view, bar-like in dorsal view (Figs. 5B, C). Inferior appendages thick and short, each about 2 times as long as basal width, with humplike ventral branch (Fig. 5B); basal half broad and setose, apical half narrower, round, with many spines along subapicomesal margin in ventral and dorsal views (Figs. 5D, E). Phallobase (phb) thick almost straight, with about 10 short setae arranged in circle on inner surface of apical half; paramere spines absent; phallicata (phc) tubular, with phallotremal sclerite; phallotremal sclerite U-shaped in ventral view and subquadrate in lateral view (Figs. 5D, F).

Female. Unknown.

Holotype male: **JAPAN**: **Honshû**, **Ibaraki**, Takahagi-shi, Kami-kimida, Takinokura-shitsugen (36˚47'N, 140˚32'E), 18.vii.2010, NKA, L (CBM-ZI 146716).

Paratypes: Same data as holotype, 1 male (CBM-ZI 146717).

Other specimens. **Honshû**, **Ibaraki**: Same data as holotype, 1 male (TI); Hitachi-ôta-shi, Okami-shitsugen, 19.viii.2006, NKA, 2 males (NKA).

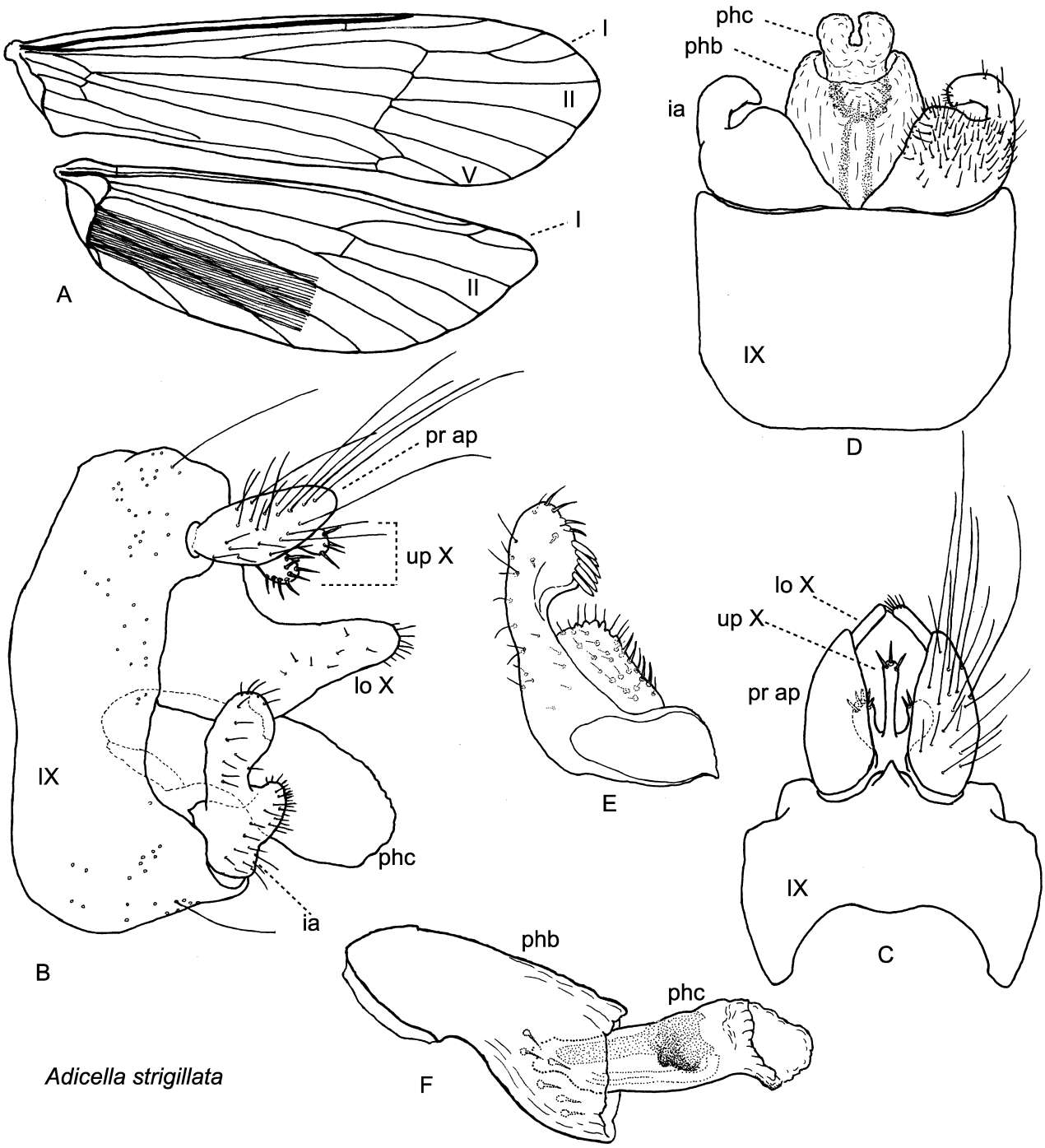

FIGURE 5. ***Adicella strigillata*** **sp. nov**. **Male** (type locality): A, left wings, ventral; B, genitalia, left lateral; C, same, dorsal; D, same, ventral; E, right inferior appendage, dorsal; F, phallus, left lateral. Abbreviations. Wings: I, II and V=fork I, fork II and fork V. Male: ia=an inferior appendage; IX=9th abdominal segment; lo X=lower part of tergum X; phb=phallobase; phc=phallicta; pr ap=a preanal appendage; up X=upper part of tergum X.

Etymology. The specific epithet is from the Latin noun "*strigil*" (=scraper) and the Latin suffix "*-atus*, *-a*, *-um*" (=possessing), referring to the long hair-brushes of the hind wings.

Habitat. Specimens were collected near small marshes.

Distribution (Fig. 6). Japan: Honshû.

Japanese name. Chômô-ko-higenaga-tobikera.

FIGURE 6. Distribution of the 4 Japanese species of *Adicella* in East Asia.

Acknowledgements

We are sincerely grateful to Liangfang Yang, Nanjing Agricultural University, for her critical reading of our draft. Our deep thanks are also due to John C. Morse, Clemson University; David E. Ruiter, Oregon; Takao Nozaki, Ninomiya-machi, Kanagawa; Hisayuki Morita, Yokkaichi-shi, Mie; Naoki Kawase, Minakuchi Kodomo-no-mori Nature Museum; Noriyoshi Shimura, Yokohama; and Kazuhiko Konishi, National Agricultural Research Center for Hokkaido Region, for loan or gift of many valuable specimens and/or gathering references. We are deeply thankful to Kozue Yoshiyama, Hokkaido Toro Fisheries Cooperation, and Takaaki Kitamura, Okinawa Hentona High School, for their kind help on our field trips.

Refferences

Graf, W., Murphy, J., Dahl, J., Zamora-Muñoz, C. & López-Rodríguez, M.J. (2008) *Distribution and Ecological Preferences of European Freshwater Organisms, Volume 1, Trichoptera*. Pensoft, Sofia, 388 pp.

Ito, T., Itou, M., Kosugi, T. & Ohkawa, A. (2007) Trichoptera fauna of the Kushiro Marsh, northern Japan, with particular references to the fauna of Lake Takkobu. *Japanese Journal of Limnology*, 68, 145–156 [in Japanese with English abstract]. http://dx.doi.org/10.3739/rikusui.68.145

Ito, T. & Kosugi, T. (2007) Trichoptera fauna of Kirakotan Cape, the Kushiro Marsh, Hokkaido, northern Japan. *Sylvicola*, 25, 49–57 [in Japanese with English abstract].

Ito, T., Kuhara, N., Hattori, T. & Ohkawa, A. (2010) Caddisflies (Trichoptera) fauna of Oshima Peninsula, Hokkaido, northern Japan. *Biology of Inland Waters*, 25, 51–85 [in Japanese with English abstract].

Katsuma, N. (2011) Caddisflies collected from the Takinokura Marsh, Takahagi-shi, Ibaraki Prefecture. *Ruriboshi*, 40, 67–68 [in Japanese].

Katsuma, N. (2012) Caddisflies collected from the Okami Marsh, Hitachiota-shi, Ibaraki Prefecture. *In*: Ibaraki Nature Museum (Ed.), *Report of Comprehensive Survey of Plants, Animals and Geology in Ibaraki Prefecture by the Ibaraki Nature Museum: Trends of Insects and Other Invertebrates in 2011*. Ibaraki Nature Museum, Bando, Ibaraki, pp. 63–68 [in Japanese].

Kimmins, D.E. (1963) On the Leptocerinae of the Indian sub-continent and North East Burma (Trichoptera). *Bulletin of the British Museum* (*Natural History*), *Entomology*, 14 (6), 263–316.

Kuhara, N. (1997) Notes on insect fauna of the Okusawa-Suigenchi area, Otaru, central Hokkaido, Japan, No. 8 –Trichoptera-. *Bulletin of Otaru Museum*, 10, 57–62 [in Japanese with English abstract].

Kuhara, N. (2001) Notes on insect fauna of the Okusawa-Suigenchi area, Otaru, central Hokkaido, Japan, No. 23 -Record of Trichoptera collected by a Malaise trap in 1996-. *Bulletin of Otaru Museum*, 14, 13–22 [in Japanese with English abstract].

Lepneva, S.G. (1971) *Fauna of the USSR. Trichoptera*. *Larvae and Pupae of Integripalpia*. Israel Program for Scientific Translations, Jerusalem, 638 pp.

Malicky, H. (1979) Neue Köcherfliegen (Trichoptera) von den Andamanen-Inseln. *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen*, 30 (3/4), 97–109.

Malicky, H. (2006) Beiträge zur Kenntnis asiatischer Leptoceridae (Trichoptera: *Adicella*, *Athripsodes*, *Ceraclea*, *Leptocerus*, *Oecetis*, *Parasetodes*, *Tagalopsyche*, *Triaenodes*, *Trichosetodes*). *Linzer biologische Beiträge*, 38, 1507–1530.

Malicky, H., Chantaramongkol, P., Saengpradab [sic], N., Chaibu, P., Thani, I., Changthong, N., Cheunbarn, S., Laudee, P., Prommi, T. & Sompong, S. (2002) Neue asiatische Leptoceridae (Trichoptera). *Braueria*, 29, 15–30.

Martynov, A.V. (1936) On a collection of Trichoptera from the Indian Museum, part II: Integripalpia. *Records of the Indian Museum*, 38 (3), 239–306.

McLachlan, R. (1877) *A Monographic Revision and Synopsis of the Trichoptera of the European Fauna*, Part 6. Napier, Printers, London, pp. 281–348, plates 32–37.

Morse, J.C. (2012) Trichoptera World Checklist. Available from http://entweb.clemson.edu/ database/trichopt/ (accessed 28 August 2012).

Oláh, J. & Johanson, K.A. (2007) Trinominal terminology for cephalic setose warts in Trichoptera (Insecta). *Braueria*, 34, 43–50.

Schmid, F. (1958) Trichoptères de Ceylan. *Archiv für Hydrobiologie*, 54 (1–2), 1–173.

Schmid, F. (1994) Quelques *Adicella* Indiennes (Trichoptera, Leptoceridae). *Fabreries*, 19 (4), 85–127.

Shimura, N. (2010) Collection record of Ephemeroptera, Plecoptera and Trichoptera from Yonaguni-Island, westernmost part of Japan. *Hyôgo Freshwater Biology*, 61/62, 45–54 [in Japanese].

Uenishi, M. (1993) Genera and species of leptocerid caddisflies in Japan. *In*: Otto, C. (Ed.), *Proceedings of the 7th International Symposium on Trichoptera*. Backhuys Publishers, Leiden, pp. 79–84.

Wallace, I.D., Wallace, B. & Philipson, G.N. (2003) *Keys to the Case-Bearing Caddis Larvae of Britain and Ireland*. Freshwater Biological Association, Scientific Publication, Liverpool, 259 pp.

Wiggins, G.B. & Currie, D.C. (1996) Trichoptera families. *In*: Merritt, R. W., Cummins, K. W. & Berg, M.B. (Eds.), *An Introduction to the Aquatic Insects of North America, Fourth Edition*. Kendall/Hunt Publishing Company, Iowa, pp. 439–480.

Yang, L. & Morse, J.C. (2000) Leptoceridae (Trichoptera) of the People's Republic of China. *Memoirs of the American Entomological Institute*, 64, 1–309.