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**SYSTEMATIC STUDY OF THE GENUS TRICHADENOTECCUM IN NEPAL  
(PSOCODEA: 'PSOCEPTERA': PSOCIDAE)**

By KAZUNORI YOSHIZAWA, CHARLES LIENHARD, and VASANT KUMAR THAPA

*Abstract*

YOSHIZAWA, K., LIENHARD, C., and THAPA, V. K. 2007. Systematic study of the genus *Trichadenotecnum* in Nepal (Psocodea: 'Psocoptera': Psocidae). *Ins. matsum. n. s.* 63: 1–33, 21 figs.

Nepalese species of the genus *Trichadenotecnum* Enderlein are revised. A total of 16 species are recognized of which six are newly described: *Trichadenotecnum isseii* n. sp., *T. suwai* n. sp., and *T. danieli* n. sp. belonging to the *spiniserrulum* group, *T. nepalense* n. sp. and *T. depitarensense* n. sp. belonging to the newly established *distinctum* group, and *T. malickyi* n. sp. belonging to the newly established *digitatum* group. *T. distinctum* Datta, originally described from India, and *T. sclerotum* New, originally described from Bhutan, are newly recorded from Nepal. Four possibly undescribed species are also recognized; however, these species are not named here because they are represented only by female specimens. One of these species belongs to the newly established *longimucronatum* group, which was formerly recognized as an independent genus, *Conothoracalis* Li, here newly synonymized with *Trichadenotecnum*. The holotype male of *T. masoni* New and the allotype male of *T. godavarensense* New are considered to be "chimeras" composed of general body parts of one species and male terminalia of the other species. Therefore, terminal parts of the holotype male of *T. masoni* are here excluded from the holotype. Several new generic combinations and species group assignments are also proposed for non-Nepalese species.

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## INTRODUCTION

*Trichadenotecnum* Enderlein is one of the most diverse genera of the family Psocidae, including nearly 200 species from all zoogeographical regions except for the Australian one (Lienhard & Smithers, 2002; Lienhard, 2003a, 2003b, 2003c, 2004, 2005, 2006; Yoshizawa & Smithers, 2006; Yoshizawa et al., submitted). Recently, several systematic studies on the genus have been carried out, which provided much information about diversity and distribution of the genus (Yoshizawa, 2001, 2003; Li, 2002; Endang et al., 2002; Yoshizawa & Lienhard, 2004; Endang & New, 2005; Yoshizawa & Smithers, 2006; Yoshizawa et al., submitted). The world-based phylogenetic analysis of *Trichadenotecnum* showed an interesting Arcto-Tertiary distributional pattern between the eastern Asian and the New World species of the genus (Yoshizawa et al., submitted).

In Asia, relicts of Arcto-Tertiary biota are frequently observed in the region known in phytogeography as the Sino-Japanese Region (Good, 1953). Some relict insects are also known to show the Sino-Japanese distributional pattern (e.g., Sano & Akimoto, 2005). Japan is located at the eastern end of the Sino-Japanese Region. Systematics of *Trichadenotecnum* in Japan is well investigated morphologically and molecularly (Yoshizawa, 2001, 2003, 2004). Nepal is located at the opposite end of the Sino-Japanese Region so that the *Trichadenotecnum* fauna in this country is of special interest for understanding the phylogeny and biogeography of the genus in this region.

The psocid fauna of Nepal has been investigated in a series of papers published by New (1971, 1973, 1983). In these papers, 37 species of psocids were described or recorded from Nepal, four of them belonging to *Trichadenotecnum*. Judging from the high diversity of the genus in neighbouring regions (e.g., Li, 2002), it is evident that the *Trichadenotecnum* fauna in Nepal is only very poorly understood. Furthermore, phylogenetic positions of Nepalese species of the genus are completely unknown to date.

In the present paper, we revise the Nepalese species of *Trichadenotecnum*. A total of 16 species are recognized, of which six species are described here as new to science. Fifteen of these species are classified into four monophyletic species groups, the *spiniserrulum*, *distinctum*, *digitatum* and *longimucronatum* groups. One species (*T. pokhariense*) remains *incertae sedis*. The *spiniserrulum* group is widely distributed through Africa to the Oriental Region, but the latter groups are newly established here and are unique to Nepal and neighbouring regions. Some systematic and biogeographical discussions are also provided under the Remarks to each species or in relation with species-group diagnoses.

Specimens will be deposited in the following institutions: Natural History Museum, Nepal (NHMN); Systematic Entomology, Hokkaido University, Japan (SEHU); Geneva Natural History Museum, Switzerland (MHNG). Type series of some known species were borrowed from the Canadian National Collection, Ottawa (CNC). Specimens collected in October 2005 were freshly killed in 99.5% ethanol and stored in freezer. Other specimens were stored in 80% ethanol at room temperature until here described.

The following abbreviations were used in the descriptions: IO/D = the ratio between interocular space and eye-diameter, B = body length, Fw = forewing length, Hw = hindwing length. Measurements are indicated in mm.

KEY TO NEPALESE SPECIES OF TRICHADENOTECNUM

1. Forewing extensively covered with tiny spots (Fig. 1A) ..... 2
- Forewing not extensively covered with tiny spots (Fig. 1I) ..... 14
2. Anterodorsal margin of mesoscutal anterior lobe smoothly rounded ..... *spiniserrulum* group 3
- Anterodorsal corner of mesoscutal anterior lobe strongly projected and angled .....  
..... *longimucronatum* group, *Trichadenotecnum* sp. 10
3. Male (males of *T. sp. 2* and *T. sp. 4* are unknown) ..... 4
- Female (females of *T. dobhanense* and *T. danieli* are unknown) ..... 9
4. Hypandrium (including median tongue) asymmetrical ..... 5
- Hypandrium symmetrical ..... 8
5. Epiproct lobe short, not extended over clunium (Fig. 7A) ..... 6
- Epiproct lobe long, extended over clunium (Fig. 2A) ..... *T. isseii* n. sp.
6. Hypandrial median tongue with long process, its apex exceeding right hypandrial process (Figs 8D, 10D) ..... 7
- Hypandrial median tongue without such long process (Fig. 7D) ..... *T. danieli* n. sp.
7. Process of hypandrial median tongue relatively short, much shorter than hypandrial length, nearly straight (Fig. 8D) ..... *T. sclerotum* New
- Process of hypandrial median tongue very long, about equal to hypandrial length, strongly arched (Fig. 10D) ..... *T. godavarensense* New
8. Hypandrium with a pair of long processes arising from its anterior region (Fig. 5C) .....  
..... *T. suwai* n. sp.
- Anterior region of hypandrium without processes (Fig. 4C) ..... *T. dobhanense* New
9. Ventral valve of gonapophyses long, its apex far exceeding posterior margin of external valve (Fig. 6B) ..... 10
- Ventral valve of gonapophyses short, its apex not exceeding posterior margin of external valve (Fig. 3B) ..... 13
10. Posterior margin of subgenital plate next to egg guide normal (Fig. 9A) ..... 11
- Posterior margin of subgenital plate next to egg guide strongly projecting posteriorly (Fig. 6A) ..  
..... 12
11. Egg guide nearly parallel sided (Fig. 12A) ..... *T. sp. 2*
- Egg guide distinctly broadened distally (Fig. 9A) ..... *T. sclerotum* New
12. Posterior margin of subgenital plate next egg guide with triangular projections (Fig. 13A) .....  
..... *T. sp. 5*
- Posterior margin of subgenital plate next egg guide with club-like free projections (Fig. 6A) .....  
..... *T. suwai* n. sp.
13. Forewing relatively sparsely spotted, small spots well separated from each other (Fig. 1F); posterior lobe of external valve of gonapophyses absent (Fig. 11B) ..... *T. godavarensense* New
- Forewing densely spotted, small spots fused with each other in basal half (Fig. 1A); posterior lobe of external valve of gonapophyses present (Fig. 3B) ..... *T. isseii* n. sp.
14. Distal half of cell rs not widely covered with tiny spots; outer margin of submarginal spots smooth (Fig. 1L) [*distinctum* group and *incertae sedis* (*T. pokhariense*)] ..... 15
- Distal half of cell rs widely covered with tiny brown spots; outer margins of submarginal spots jagged (Fig. 1N) ..... *digitatum* group, *T. malickyi* n. sp.
15. Male (male of *T. pokhariense* is unknown) ..... 16
- Female (females of *T. nepalense*, *T. depitarensense* and *T. masoni* are unknown) ..... 19
16. Large, forewing length  $\geq 4.0$  mm ..... 17
- Small, forewing length  $\ll 4.0$  mm ..... *T. depitarensense* n. sp.
17. Forewing markings normal, basal band continuous from M-CuA fork to posterior end of cell cup (Fig. 1J) ..... 18
- Forewing markings greatly reduced, basal band broadly interrupted at posterior region of cell cua

- (Fig. 1I) ..... *T. nepalense* n. sp.
18. Opposing spots in cell r widely fused with each other; submarginal spot obscure in cell m3 (Fig. 1J) ..... *T. masoni* New
- Opposing spots in cell r only touching each other or separated; submarginal spot distinct in cell m3 (Fig. 1L) ..... *T. distinctum* Datta
19. Ventral valve of gonapophyses short (Fig. 17B); egg guide short, shorter than its basal width (Fig. 17A) ..... *distinctum* group 20
- Ventral valve of gonapophyses long; egg guide long, much longer than its basal width ..... *T. pokariense* New
20. Opposing spots in cell r widely fused with each other (Fig. 1M); sclerotized arms of subgenital plate widely separated (Fig. 18A) ..... *T. sp. 9*
- Opposing spots in cell r only touching each other or separated (Fig. 1L); sclerotized arms of subgenital plate narrowly separated by V-shaped notch (Fig. 17A) ..... *T. distinctum* Datta

## SYSTEMATICS

### *Trichadenotecnum* Enderlein

*Trichadenotecnum* Enderlein, 1909: 329. Type species: *Hemerobius sexpunctatus* Linnaeus, 1758.

*Conothoracalis* Li, 1997: 507. New synonym. Type species: *Conothoracalis longimucronata* Li, 1997.

See Yoshizawa (2001, 2003) for generic definition.

#### The *spiniserrulum* group

See Yoshizawa (2001) and Yoshizawa & Lienhard (2004) for group diagnosis.

Remarks. Within the Nepalese species of the *spiniserrulum* group, three subgroups can be recognized. *T. doghanense*, *T. suwai* n. sp., *T. sp. 2* and *T. sp. 5* probably compose a monophyletic group, together with *T. bidens* Thornton, 1961 and its relatives (Yoshizawa & Lienhard, 2004), characterized by the secondary reduction of the paraproctal basal lobe in male (unknown for the latter two unnamed species) and the secondary elongation of the ventral valve of the gonapophyses. *T. danieli* n. sp., *T. sclerotum* and *T. godavarensense* also compose a monophyletic group characterized by the secondary reduction of the clunial arm and the fusion of the median tongue with the hypandrium. Judging from the structures of the paraproctal lobe and the hypandrium, these species are related to *T. multicuspidatum* (Li, 2002) and *T. jinxiuense* (Li, 2002) from China. A third monophyletic group is composed by *T. issei* n. sp. and its relatives (see Remarks under *T. issei*).

#### *Trichadenotecnum issei* Yoshizawa & Lienhard, n. sp. (Figs 1A, 2, 3)

Holotype male (NHMN), Godawari, 27°35'N 85°22'E, 7. x. 2005, K. Yoshizawa.

Paratypes (NHMN & SEHU): 1 female, same data as holotype; 3 females, same locality, 12. x. 2005, K. Yoshizawa; 1 female, Pharping, 27°36'N 85°17'E, 13. x. 2005, K. Yoshizawa; 1 female, Dakshinkali, 27°36'N 85°17'E, 13. x. 2005, K. Yoshizawa; 1 male 1 female, same locality, 16. x.

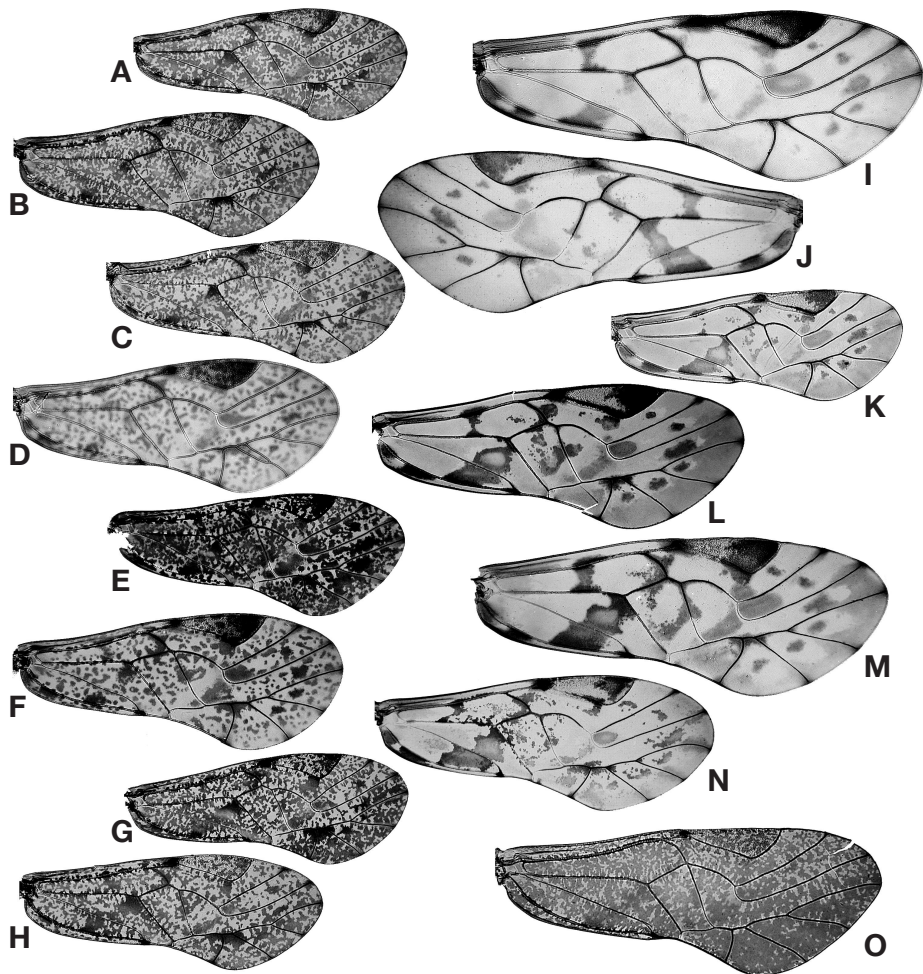


Fig. 1. Forewings of Nepalese *Trichadenotecnum*. A, *T. isseii* n. sp., holotype male; B, *T. doghanense*, male; C, *T. suwai* n. sp., holotype male; D, *T. danieli* n. sp., holotype male; E, *T. sclerotum*, male; F, *T. godavarensense*, male; G, *T. sp. 2*, female; H, *T. sp. 5*, female; I, *T. nepalense* n. sp., holotype male; J, *T. masoni*, holotype male; K, *T. depitarensense* n. sp., holotype male; L, *T. distinctum*, male; M, *T. sp. 9*, female; N, *T. malickyi* n. sp., holotype male; O, *T. sp. 10*, female.

2005, K. Yoshizawa.

Description. Male. Head yellowish white in ground color; vertical markings blackish brown, each marking separated from neighbours; with pair of blackish brown markings anterior to vertical markings; orbital markings blackish brown; coronal suture black; epicranial suture bordered with blackish brown band dorsally; frons with central pair of brown bands and lateral pair of blackish brown broader band; eye yellowish gray dorsally, gray ventrally, IO/D= 0.7; ocelli white, ocellar field black; gena mostly brackish brown except for white eye margin; postclypeus mostly blackish brown except dorsal



Fig. 2. Male terminalia of *T. isseii* n. sp. (holotype). A, terminalia, lateral view; B, epiproct, posterior view; C, hypandrium, ventral view; D, phallosome, ventral view.

region and ventrolateral corner white; anteclypeus blackish brown. Antenna pale brown, scape and pedicel blackish brown. Mouthparts brown.

Thorax. Prothorax blackish brown. Mesonotum brown, scutum with yellowish white band along sutures, at middle from anterior to posterior ends of scutum, and on anterior part of lateral lobe; lateral part of scutellum darker. Metanotum brown, median part and anterior region of lateral lobe of scutum yellowish white; scutellum darker. Meso- and metapleuron brown except white longitudinal band.

Legs. Mostly blackish brown, distal half of ventral surface of fore femur white, tibiae paler.

Forewing (Fig. 1A) extensively and densely covered with tiny spots. Opposing spots in cell r indistinct. Basal band narrow and obscure except for dark spots around Rs-M fusion, just below of M-Cu fork and in posterior part of cell cup. Distal band faint but broad. Spots on roof of cell m3 small. Submarginal spots distinct in cells r3, r5, m1 and m2, but obscure in other cells. Marginal clouds faint. Hindwing hyaline; veins blackish brown.

Abdomen. Dorsally yellowish white, ventrally white in ground color, each segment with transversal band broadened ventrally.

Terminalia. Clunial arm (Fig. 2A) well developed and broad, axe-shaped, and distally covered with papillae. Eighth sternum (Fig. 2C) fused with hypandrium, semicircular in shape. Epiproct (Fig. 2AB) long, much longer than wide, laterally with pair of projections directed posteriorly, basally with pair of swellings each bearing two

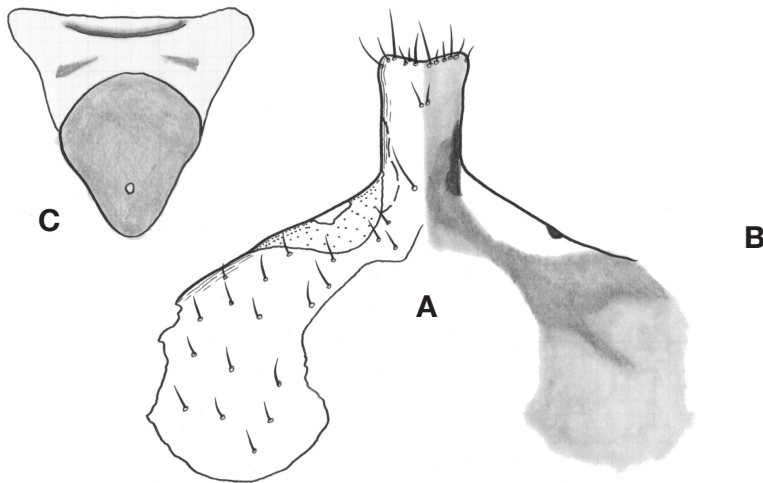


Fig. 3. Female genitalia of *T. isseii* n. sp., ventral view. A, subgenital plate; B, gonapophyses; C, internal plate.

long setae. Paraproct (Fig. 2A) with well developed basal process directed posteriorly; distal process short, directed posteriorly. Hypandrium (Fig. 2C) nearly symmetrical except for median tongue; left distal part bearing some denticles; median tongue long, asymmetrical, sickle-like in shape, distal margin serrate, pointed apically; outer process well developed, lobe-like, with few denticles posterointernally; left process small, conical; right process absent. Phallosome (Fig. 2D) closed posteriorly, with pair of serrate regions on posterior margin; anteriorly with narrow and moderately long apodeme.

Measurements. B 2.3-2.5, Fw 2.9-3.2, Hw 2.2-2.5.

Female. General morphology as in male. IO/D = 1.6.

Genitalia. Egg guide of subgenital plate (Fig. 3A) parallel sided, distal margin slightly concave medially; pigmented arms widely separated. Ventral valve of gonapophyses (Fig. 3B) short, apex only slightly exceeding anterior margin of external valve; external valve (Fig. 3B) small, with small posterior lobe. Internal plate as in Fig. 3C.

Measurements. B 2.0-2.2, Fw 2.8-3.2, Hw 2.1-2.4.

Etymology. The specific epithet is dedicated to Issei Ohshima (SEHU) in expressing KY's thanks for his very kind help in the field work.

Remarks. *T. isseii* composes a monophyletic group with *T. dolabratum* Li & Yang, 1987 from Tibet, *T. falx* Yoshizawa, 2001 from Japan, and *T. gombakense* New & Lee, 1992 from Malay Peninsula and Sumatra. Monophyly of the clade is strongly supported by the unique sickle-shaped, asymmetrical hypandrial median tongue [the median tongue of *T. gombakense* illustrated by Endang & New (2005) is left-skewed probably because the illustration was made from back side]. Among these species, *T. isseii* is most similar to *T. gombakense* but differs in the hypandrial outer process (with only few denticles in *T. isseii*; with entirely serrate posterior margin in *T. gombakense*).

*Trichadenotecnum doghanense* New  
(Figs 1B, 4)

*Trichadenotecnum doghanensis* [sic] New, 1973: 6.

Material examined: 1 male (NHMN), Pharping, 27°36'N 85°17'E, 8. x. 2005, K. Yoshizawa; 1 male (MHNG), Siwalik Range near Babai River dam, 28°25'N 81°23'E, 190m, 24. ii - 5. iii. 2003, H. Malicky.

Redescription of male terminalia. Clunial arm (Fig. 4A) long, thorn-like. Eighth sternum (Fig. 4C) fused with hypandrium, triangular in shape. Epiproct lobe (Fig. 4B) triangular in posterior aspect, much broader than high, pair of long setae arising from body of epiproct arranged on weak swelling. Paraproct (Fig. 4A) with strongly reduced and denticulate basal process; distal process short, almost straight, directed posteriorly. Hypandrium (Fig. 4CD) symmetrical, distally with pair of conical processes (left and right processes) directed posteriorly; outer process well developed, lobe-like, covered with denticles; median tongue medially divided into two bilaterally symmetrical sickle-like projections covered with denticles. Phallosome (Fig. 4E) pointed anteriorly,

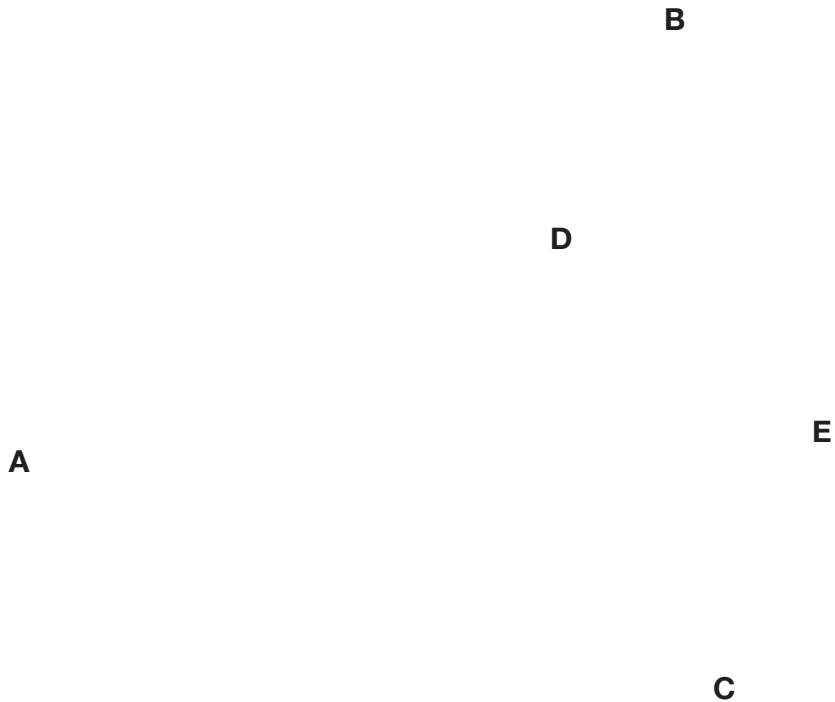


Fig. 4. Male terminalia of *T. doghanense* New. A, terminalia, lateral view; B, epiproct, posterior view; C, hypandrium, ventral view; D, ditto, posteromedian part; E, phallosome, ventral view.

closed and with pair of small projections posteriorly.

Female unknown (see also Remarks on *T. sp. 2*).

Remarks. This species is very unique in having a medially divided hypandrial median tongue. However, the shape of the male epiproct and the presence of the paraproctal basal process clearly show that this species belongs to the *spiniserrulum* group. A bilaterally symmetrical, medially divided hypandrial median tongue is also present in *Trichadenotecnum bannaense* (Li, 2002) n. comb. from Yunnan, China, supporting the close relationship of these two species.

*Trichadenotecnum suwai* Yoshizawa & Lienhard, n. sp.  
(Figs 1C, 5, 6)

Holotype male (NHMN), Mt. Nagarjun, 27°44'N 85°16'E, 10. x. 2005, K. Yoshizawa.

Paratypes (NHMN & SEHU): 3 females, same data as holotype.

Description. Male. Head pale yellow in ground color; vertical markings blackish brown, each marking connected with neighbours; orbital markings blackish brown; coronal suture black; epicranial suture bordered with blackish brown band dorsally; frons with large median brown markings narrowly separated by thin white band and laterally with pair of blackish brown spots; eye yellow-gray dorsally, dark gray ventrally, IO/D= 0.8; ocelli white, ocellar field black; gena white, with pale brown marking medially; postclypeus with ca. 8 longitudinal rows of blackish brown spots, rows fused medially

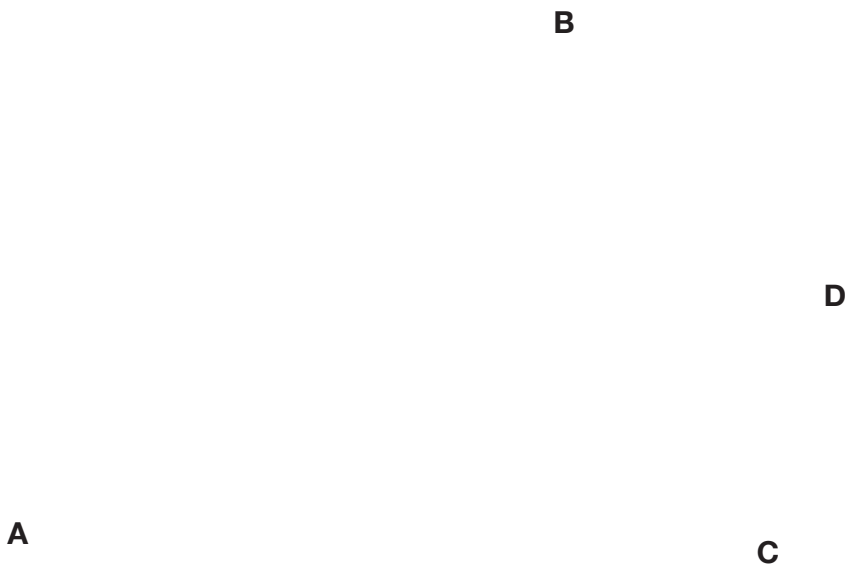


Fig. 5. Male terminalia of *T. suwai* n. sp. (holotype). A, terminalia, lateral view; B, epiproct, posterior view; C, hypandrium, ventral view; D, phallosome, ventral view.

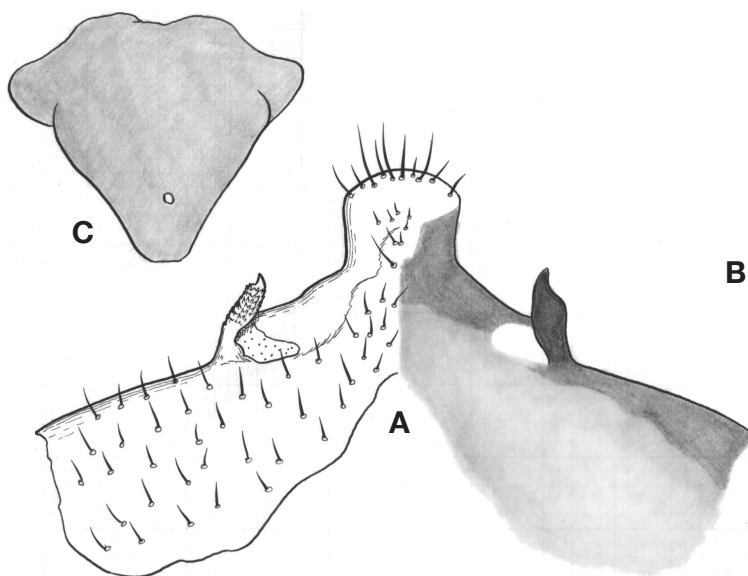


Fig. 6. Female genitalia of *T. suwai* n. sp., ventral view. A, subgenital plate; B, gonapophyses; C, internal plate.

to ventrally, forming large marking; anteclypeus blackish brown. Antenna pale brown, scape and pedicel darker. Mouthparts brown.

Thorax. Prothorax blackish brown. Mesonotum mostly dark brown, medially with white band from anterior to posterior ends of scutum, posterolateral margins of anterior lobe, anterointernal part and posterolateral margin of lateral lobe white. Metanotum dark brown, medially with white band from middle of anterior lobe to posterior end of scutum, posterior part of lateral lobe with white spot. Meso- and metapleuron blackish brown except white membranous regions.

Legs blackish brown except for ventral region of fore femur pale.

Forewing (Fig. 1C) extensively but rather sparsely covered with tiny spots. Distal spot in cell a1 distinct, basal spot obscure. Opposing spots in cell r obscure. Basal band narrow and faint except for dark spots at M-Cu fork and in posterior half of cell cup. Distal band apparent but narrow. Spot on roof of cell m3 dark and distinct, but narrow. Submarginal spots distinct in cells r5, m1 and m2 but obscure in other cells. Marginal clouds faint. Hindwing hyaline; veins brown.

Abdomen. Yellowish white in ground color, with brown transverse band on each segment dorsally and laterally, mostly brown ventrally.

Terminalia. Clunial arm (Fig. 5A) well developed, triangular in shape, dorsal margin with some denticles distally, ventral part pointed. Eighth sternum (Fig. 5C) fused with hypandrium, semicircular in shape. Epiproct lobe (Fig. 5B) semicircular in posterior aspect, broader than high, with small lobe-like projection dorsomedially; pair of long setae arising from strongly swelled body of epiproct. Paraproct (Fig. 5A) with strongly reduced basal process; distal process short, almost straight, directed posteriorly. Hypandrium (Fig. 5C) symmetrical, anteriorly with pair of long processes directed posterolaterally to posteriorly, distally with pair of conical processes (left and

right processes) directed posterolaterally; outer process well developed, pointed; median tongue absent. Phallosome (Fig. 5D) rounded anteriorly, posteriorly closed, posterior margin serrate.

Measurements. B 2.0, Fw 3.2, Hw 2.1.

Female. General morphology almost as in male. IO/D = 1.8.

Genitalia. Egg guide of subgenital plate (Fig. 6A) slightly broadened towards its arched distal margin; pigmented arms short and wide, posteriorly with pair of well developed free processes next to base of egg guide. Ventral valve of gonapophyses (Fig. 6B) long, apex far exceeding posterior margin of external valve; external valve short, posterior lobe small but distinct. Internal plate as in Fig. 6C.

Measurements. B 1.8-2.1, Fw 3.0-3.2, Hw 2.2-2.5.

Etymology. The specific epithet is dedicated to Professor Masaaki Suwa (SEHU), in recognition of his contribution in establishing strong tie between Japanese and Nepalese entomologists and in investigating Nepalese insects fauna (especially Diptera).

Remarks. The presence of a paraproctal basal process, although reduced in size, clearly shows that this species belongs to the *spiniserrulum* group. Judging from the shape of the hypandrium, this species is closely related to the Chinese species *Trichadenotecnum hengshanicum* (Li, 2002) n. comb. from Shanxi and *T. octogonum* (Li, 2002) n. comb. from Zhejiang, also characterized by the absence of the hypandrial median tongue and the presence of a pair of long processes arising from the anterolateral parts of the hypandrium. A feature similar to the latter is also observed in *T. furcalingum* Yoshizawa, 2001 from Japan and *T. multangulare* (Li, 2002) from Anhui, China, but these species are very different from *T. suwai* in shapes of the clunial arm, hypandrium, phallosome, and the ventral valve of the gonapophyses. Judging from shapes of the hypandrium, phallosome and ventral valve of the gonapophyses, *T. suwai* and its relatives are more closely related to *T. ianobidens* Yoshizawa & Lienhard, 2004.

The female of this species is unique in having a pair of horn-like processes arising posterolaterally from the subgenital plate. A similar character is also observed in *T. laticornutum* Endang, Thornton & New, 2002 from Indonesia. The short ventral valve and the absence of the posterior lobe of the external valve of the gonapophyses indicate that *T. laticornutum* is a member of the *spiniserrulum* group, although forewing markings are quite different from the other species of the group. On the basis of the pair of subgenital processes, *T. laticornutum* is considered to be closely related to *T. suwai*. However, these species are clearly different in forewing markings and in length of ventral valve (long in *T. suwai*).

*Trichadenotecnum danieli* Yoshizawa & Lienhard, n. sp.  
(Figs 1D, 7)

Holotype male (MHNG), Kosi, Mure, 20°10'N 87°16'E, 2000-2100m, 12. vi. 2001, Nat. Hist. Mus. Basel Nepal expedition.

Description. Male. Head pale brown in ground color; vertical markings dark brown, each marking connected with neighbours; orbital markings dark brown; coronal suture black; epicranial suture bordered with blackish brown band dorsally; frons with large brown marking medially and with pair of blackish brown lateral markings; eye black, IO/D= 1.0; ocelli white, ocellar field black; gena with dark brown band medially; postclypeus with ca. 8 blackish brown longitudinal stripes, fused medially to ventrally,

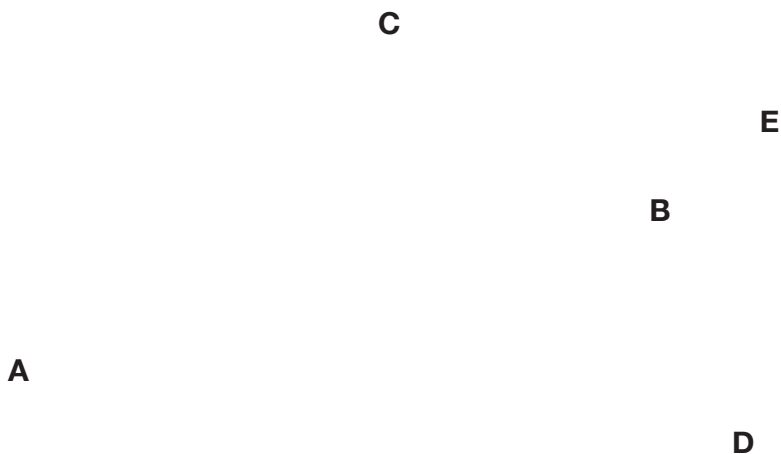


Fig. 7. Male terminalia of *T. danieli* n. sp. (holotype). A, terminalia, lateral view; B, epiproct, posterior view; C, paraproctal lobe, posterior view; D, hypandrium, ventral view; E, phallosome, ventral view.

forming large marking; anteclypeus blackish brown. Antenna brown, scape and pedicel darker. Mouthparts dark brown.

Thorax. Prothorax dark brown. Mesonotum mostly dark brown, medially with white band from anterior to posterior ends of scutum, posterolateral margins of anterior lobe, anterointernal part and posterolateral margin of lateral lobe white. Metanotum dark brown, medially with white band from middle of anterior lobe to posterior end of scutum, posterior part of lateral lobe with white spot. Meso- and metapleuron brown except for white membranous regions.

Legs brown to dark brown; distal 2/3 of fore femur pale.

Forewing (Fig. 1D) extensively but rather sparsely covered with tiny spots. Holotype male with abnormal M3 vein in right wing (Fig. 1D), but left wing with normal venation. Spots in cell a1 distinct, distal spot larger. Opposing spots in cell r distinct, large. Basal band faint and almost indistinct except for spots just above basal section of Rs, just below M-Cu fork and in posterior half of cell cup. Distal band distinct in cell r3, faint in anterior half of cell rs. Spot on roof of cell r3 distinct but narrow. Submarginal spots visible but somewhat obscure in cells r1 and m3, spot in r5 especially large. Marginal clouds faint. Hindwing hyaline; veins brown.

Abdomen. White in ground color, with brown transverse band on each segment.

Terminalia. Clunial arm (Fig. 7A) reduced, lateral hind margin of clunium only slightly projecting posteriorly. Eighth sternum (Fig. 7D) indistinct, only represented by narrow sclerotized area on anterior margin of hypandrium. Epiproct (Fig. 7AB) conical in shape, epiproct lobe directed posteriorly, not extending over clunium. Paraproct with complicated basal process strongly expanded laterally as in Fig. 7AC; distal process

short, directed posteriorly. Hypandrium (Fig. 7D) nearly symmetrical except for median tongue; left and right processes well developed, conical, directed posteriorly, right process slightly longer; lateral corners strongly projecting posteriorly, distal part covered with denticles; median tongue fused to body of hypandrium, with pair of well developed lateral processes directed posteriorly, nearly equal in length with hypandrial left and right processes, median lobe less developed, left-skewed. Phallosome (Fig. 7E) pointed anteriorly, opened posteriorly.

Measurements. B 2.7, Fw 3.5, Hw 2.6.

Female unknown.

Etymology. The specific epithet is dedicated to Daniel Burckhardt (Natural History Museum Basel, Switzerland), specialist of psyllids and tireless collector of psocids, in recognition of his depositing the psocids of the 2001 Nepal expedition of the Basel Natural History Museum in the Psocoptera collection of the MHNG.

Remarks. In several male terminal features, such as reduction of the clunial arm, relatively short conical epiproct, and highly complicated paraproctal lobe, this species is very similar to *T. sclerotum* and *T. godavarensense* treated below. However, *T. danieli* can be distinguished from these species by the hypandrial structure.

*Trichadenotecnum sclerotum* New  
(Figs 1E, 8, 9)

*Trichadenotecnum sclerotum* New, 1978: 80.



Fig. 8. Male terminalia of *T. sclerotum* New. A, terminalia, lateral view; B, epiproct, posterior view; C, paraproctal lobe, posterior view; D, hypandrium, ventral view; E, phallosome, ventral view.

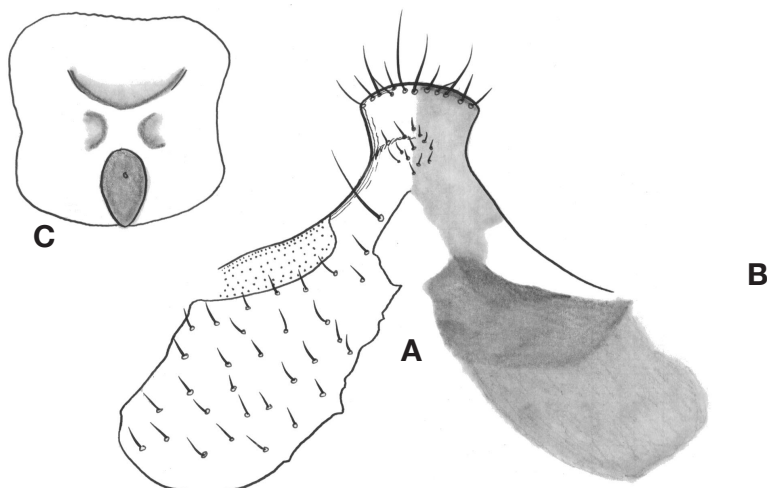


Fig. 9. Female genitalia of *T. sclerotum* New, ventral view. A, subgenital plate; B, gonapophyses; C, internal plate.

Material examined (NHMN & SEHU): 2 females, Godawari, 27°35'N 85°22'E, 7. x. 2005, K. Yoshizawa; 1 male 1 female, Mt. Phulchoki, nr Godawari, 27°35'N 85°22'E, 11. x. 2005, K. Yoshizawa; 1 male 1 female, Mt. Nagarjun, 27°44'N 85°16'E, 10. x. 2005, K. Yoshizawa.

Redescription of male terminalia. Clunial arm (Fig. 8A) indistinct, almost completely absent. Eighth sternum (Fig. 8D) fused with hypandrium. Epiproct lobe (Fig. 8AB) conical, short, directed posteriorly and not extended over clunium. Paraproct with complicated basal process strongly expanded laterally (as in Fig. 8AC); distal process short, directed posteriorly. Hypandrium (Fig. 8D) nearly symmetrical except for median tongue; left and right processes well developed, thorn-like, directed posteriorly, right process slightly longer; lateral corners strongly expanding, distal part covered with denticles; median tongue fused to body of hypandrium, asymmetrical, with long thorn-like process arising from right side and directed posteriorly. Phallosome (Fig. 8E) pointed anteriorly, opened posteriorly.

Description of female. General morphology as in male described by New (1978). IO/D = 2.2.

Genitalia. Egg guide of subgenital plate (Fig. 8A) broadened distally, distal margin slightly arched; pigmented arms closely approximated posteriorly then widely separated anteriorly. Ventral valve of gonapophyses (Fig. 8B) long, apex far exceeding posterior margin of external valve; external valve small, posterior lobe hardly recognizable, posterointernally with few short bristles. Internal plate as in Fig. 8C.

Remarks. This species is characterized by having a long ventral valve of the gonapophyses. The short ventral valve is considered to be an ancestral condition of the *spiniserrulum* group, and secondary elongation has been observed in *T. bidens* Thornton and related species (Yoshizawa, 2004; Yoshizawa & Lienhard, 2004: see also *T. suwai*, *T. sp. 2* and *T. sp. 5*). However, *T. sclerotum* is apparently closely related to *T. danieli* and *T. godavarensis*, although the ventral valve of the latter species is short (the female of *T. danieli* is not known). Therefore, the origin of the elongated ventral valve observed in *T. sclerotum* is probably independent from that of *T. bidens* and its relatives.

*Trichadenotecnum godavarensis* New  
(Figs 1F, 10, 11)

*Trichadenotecnum godavarensis* [sic] New, 1971: 197 (excluding terminalia of the allotype male: see *T. masoni* New, below).

*Trichadenotecnum masoni* New, 1971: 196 (part: terminalia of the holotype male).

Material examined: holotype female (CNC11566: terminalia not examined) and allotype male (CNC11566: terminalia not examined: judging from illustrations, terminal parts of the allotype male are considered to be from a different species, *T. masoni*; see Remarks below); 1 male, Kosi, Chichila, 27°28'N 87°14'E, 1900-2000m, 5. vi. 2001, Nat. Hist. Mus. Basel Nepal expedition (MHNG); 2 males 2 females, Mt. Phulchowki, nr. Godawari, 27°35'N 85°22'E, 11. x. 2005, K. Yoshizawa (NHMN & SEHU)

Description of male terminalia. Clunial arm (Fig. 10A) absent. Eighth sternum (Fig. 10D) indistinct, only represented by narrow sclerotized area on anterior margin of



Fig. 10. Male terminalia of *T. godavarensis* New. A, terminalia, lateral view; B, epiproct, posterior view; C, paraproctal lobe, posterior view; D, hypandrium, ventral view; E, phallosome, ventral view.

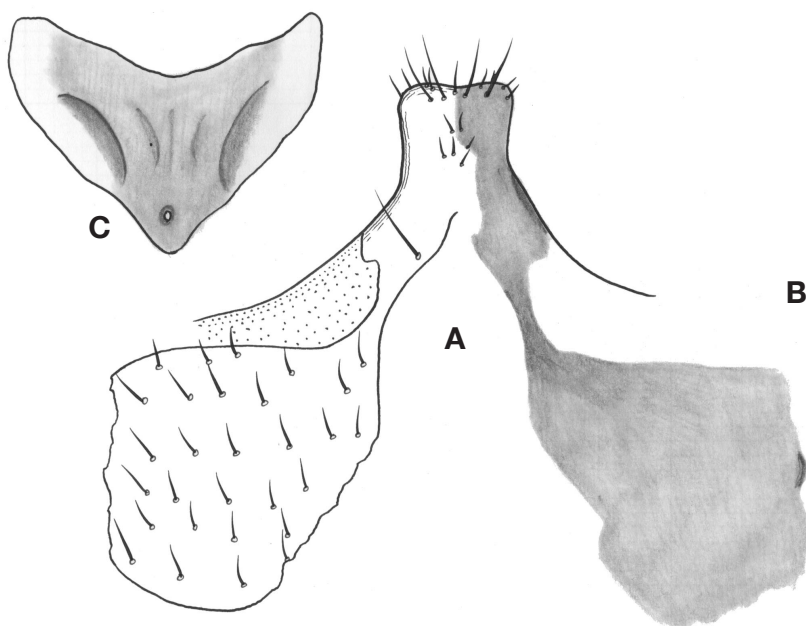


Fig. 11. Female genitalia of *T. godavarensis* New, ventral view. A, subgenital plate; B, gonapophyses; C, internal plate.

hypandrium. Epiproct lobe (Fig. 10AB) conical and long, directed posterodorsally, not extending over clunium. Paraproct with complicated basal process strongly expanded laterally as in Fig. 10AC; distal process short, directed posteriorly. Hypandrium (Fig. 10D) asymmetrical, including median tongue; left and right processes well developed, conical, directed posteriorly, right process slightly longer; lateral corners strongly projecting posterolaterally, distal part covered with denticles; median tongue fused to body of hypandrium, left side with well developed lateral process directed posteriorly, slightly longer than left process, median lobe short, rounded, serrate distally, medially with very long process strongly projecting posterolaterally and strongly sinuous distally, and with thorn-like process posteromedially. Phallosome (Fig. 10E) with broad and moderately long apodeme anteriorly, opened posteriorly.

Remarks. All morphological character states, including genital characters (Fig. 11), of the female specimens collected at Mt. Phulchowki are in complete agreement with the holotype female of *T. godavarensis*. In addition, they are collected near Godawari, the type locality of *T. godavarensis*. Therefore, these specimens can without any doubt be identified as *T. godavarensis*. General morphological features (i.e. other than terminal structures) of corresponding male specimens (simultaneously collected with females) are also in complete agreement with the allotype male of *T. godavarensis*. However, male terminal structures (Fig. 10) of these specimens are very different from those of the allotype male of *T. godavarensis* illustrated in the original description (New, 1971: figs 29–31), but are in complete agreement with the illustrations of the holotype male of *T. masoni* (New, 1971: figs 22–24). In turn, general morphological features of the male holotype of *T. masoni* are very similar to distantly related species, such as *T. nepalense*

(Fig. 11: see below), but the terminal structures of the latter species are very similar to the illustration of the allotype male of *T. godavarensis*.

Morphological incongruence between male terminalia and the other general morphology, as presented in the original description, is also evident in several other points of view: male terminalia of the holotype male of *T. masoni* show several apomorphic features of the *spiniserrulum* group (e.g., paraproctal basal lobe), but its forewing markings (not extensively covered with tiny spots) are far different from the other species of the *spiniserrulum* group (extensively covered with tiny spots). Similarly, forewing markings of the allotype male of *T. godavarensis* (not illustrated in the original description but examined for this study) indicate closer affinity to the *spiniserrulum* group, but its terminal structures are far different and do not have any apomorphies of the *spiniserrulum* group.

Judging from the above evidences, we conclude that the holotype male of *T. masoni* and the allotype male of *T. godavarensis* are “chimeras”, each type consisting of general body parts of one species and terminalia of the counter species. Under this situation, we need to exclude the terminalia or the other body parts from the holotype of *T. masoni* according to the Article 73.1.5 of ICZN (NB. Terminalia of both type specimens could not be discovered in the CNC; however, it is not sure if they are definitively lost). We propose here to exclude the slide mounted terminal structures from the holotype male of *T. masoni*. By opposite treatment (exclusion of the other body parts from the holotype) one of these species names would become invalid. Thus the exclusion of the terminalia from the holotype promotes nomenclatural stability. See also Remarks under *T. masoni*.

*Trichadenotecnum* sp. 2  
(Figs 1G, 12)

Material examined: 2 females, Charnakel, 27°38'N 85°17'E, 8. x. 2005, K. Yoshizawa (NHMN)

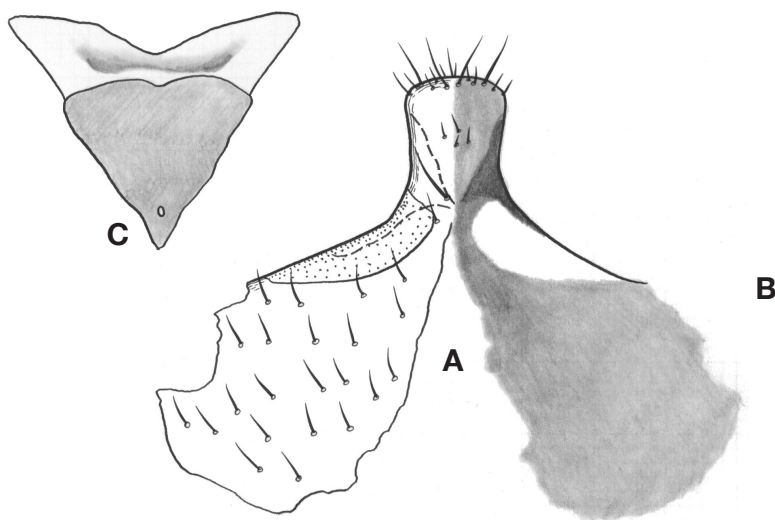


Fig. 12. Female genitalia of *T. sp. 2*, ventral view. A, subgenital plate; B, gonapophyses; C, internal plate.

& SEHU); 1 female, Mt. Nagarjun, 27°44'N 85°16'E, 10. x. 2005, K. Yoshizawa (NHMN); 1 female, Siwalik Range near Babai River dam, 28°25'N 81°23'E, 190m, 24. ii - 5. iii. 2003, H. Malicky (MHNG).

Remarks. This species is known only from four female specimens. Forewing markings and long ventral valve of the gonapophyses indicate that this species is related to *T. bidens*. Among the Nepalese species, *T. sp. 2* is probably closely related to *T. dobhanense*. The possibility exists that it represents the female of *T. dobhanense*, but the forewing markings are considerably different from those of the specimens known of *T. dobhanense*. This species is not named here because of absence of corresponding male specimens.

*Trichadenotecnum* sp. 5  
(Figs 1H, 13)

Material examined (NHMN & SEHU): 1 female, Mt. Nagarjun, 27°44'N 85°16'E, 10. x. 2005, K. Yoshizawa; 2 female, Mt. Phulchoki, nr. Godawari, 27°35'N 85°22'E, 11. x. 2005, K. Yoshizawa.

Remarks. This species is known only from three female specimens. Presence of a pair of posterior projections on the subgenital plate shows that this species is closely related to *T. suwai*, described above. *T. adika* Endang, Thornton & New, 2002 and *T. paradika* Endang & New, 2005 from Indonesia are also related to this species in having very similar triangular projections on the subgenital plate. This species is not named here because of absence of corresponding male specimens.

The *distinctum* group (new species group)

Group diagnosis. Forewing not extensively covered with small spots (Fig. 1I).

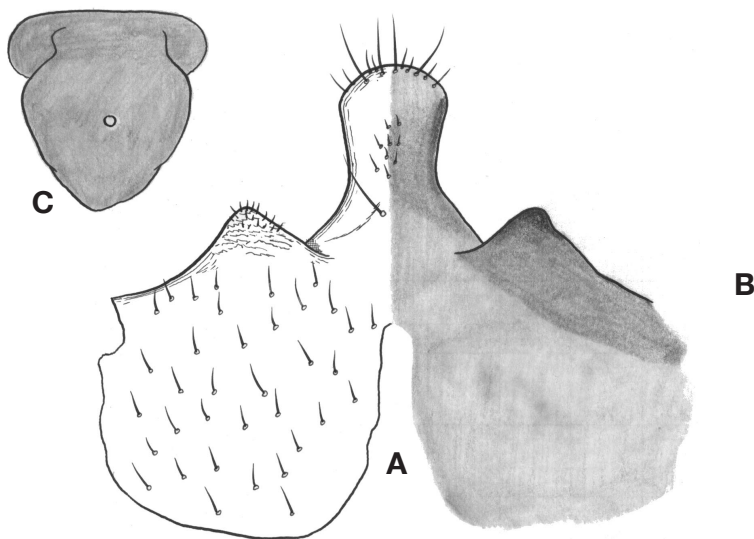


Fig. 13. Female genitalia of *T. sp. 5*, ventral view. A, subgenital plate; B, gonapophyses; C, internal plate.

Male terminalia: Epiproct (Fig. 14AC) chair-shaped; epiproct lobe long, extending over clunium. Hypandrium (Fig. 14D) with long left process. Phallosome (Fig. 14E) opened posteriorly, with pair of long projections directed posterolaterally. Female genitalia: Ventral valve of gonapophyses short (Fig. 17B), apex not exceeding posterior margin of external valve.

Remarks. The group name derives from *Trichadenotecnum distinctum* Datta, 1969 from Assam, India, the oldest name among the species included in this group. Presence of sclerites on the dorsal surface of the egg guide indicate some relation of this species group with the *majus* group. However, the two groups clearly differ by shapes of the male epiproct (*distinctum* group shows rather plesiomorphic condition for the genus) and phallosome (autapomorphic for *distinctum* group). Short ventral valve of the gonapophyses and distally opened phallosome further indicate that the *distinctum* group is related to *T. apertum* Thornton, 1961 and its relatives and thus is actually imbedded within the *majus* group. Shape of the epiproct lobe is known to be highly homoplasious (Yoshizawa, 2004), and its systematic status should be tested molecularly in the future.

*Trichadenotecnum nepalense* Yoshizawa & Lienhard, n. sp.  
(Figs 11, 14)

Holotype male (MHNG), Kosi, Jhor Pokhari, 27°19'N 87°30'E, 3000m, 21. vi. 2001, Nat. Hist. Mus. Basel Nepal expedition.

Description. Male. Head white in ground color; vertical markings blackish brown, each marking connected with neighbours, and with pair of pale brown spots anterior to vertical markings; orbital markings dark and dense; coronal suture black; epicranial suture bordered with brown band dorsally; frons with central pair of brown bands and lateral pair of brown spots; eye black, IO/D= 1.3; ocelli white, ocellar field black; gena pale brown, ventral margin bordered with narrow blackish brown band; postclypeus with ca. 10 longitudinal rows of blackish brown spots, lateral rows fused with each other; anteclypeus blackish brown. Antenna brown, scape and pedicel darker. Mouthparts brown; maxillary palpus blackish brown.

Thorax. Prothorax blackish brown. Mesonotum blackish brown, median part and posterolateral part of lateral lobe of scutum white, anterior region of lateral lobe paler. Metanotum blackish brown, median part and posterolateral region of lateral lobe white. Meso- and metapleuron blackish brown except for white membranous regions.

Legs. Mostly white; all coxae blackish brown; dorsal surface of all femora brown; tip of hind tarsus brown; all tibiae brown.

Forewing (Fig. 11) not extensively covered with tiny spots. Spots in cell a1 distinct, basal spot slightly larger. Opposing spots in cell r fused with each other. Basal band reduced, only visible along basal section of Rs, just below of M-Cu fork and in cell cup. Median spots almost completely reduced, only represented by faint marking along M. Distal band faint. Spot on roof of cell m3 very small. Submarginal spots present but spot in cell m3 hardly visible, spot in cell r5 large. Marginal clouds faint, only distinct at vein ends and in cell r5. Hindwing hyaline, cell cup with faint brownish tinge; veins brown.

Abdomen. White in ground color, with brown transverse band on each segment.

Terminalia. Clunial arm (Fig. 14AB) narrow, strongly curved inwards and covered with denticles distally. Eighth sternum (Fig. 14D) with pair of sclerites partly fused in middle. Epiproct lobe (Fig. 14AC) broad, nearly parallel sided, dorsal margin slightly

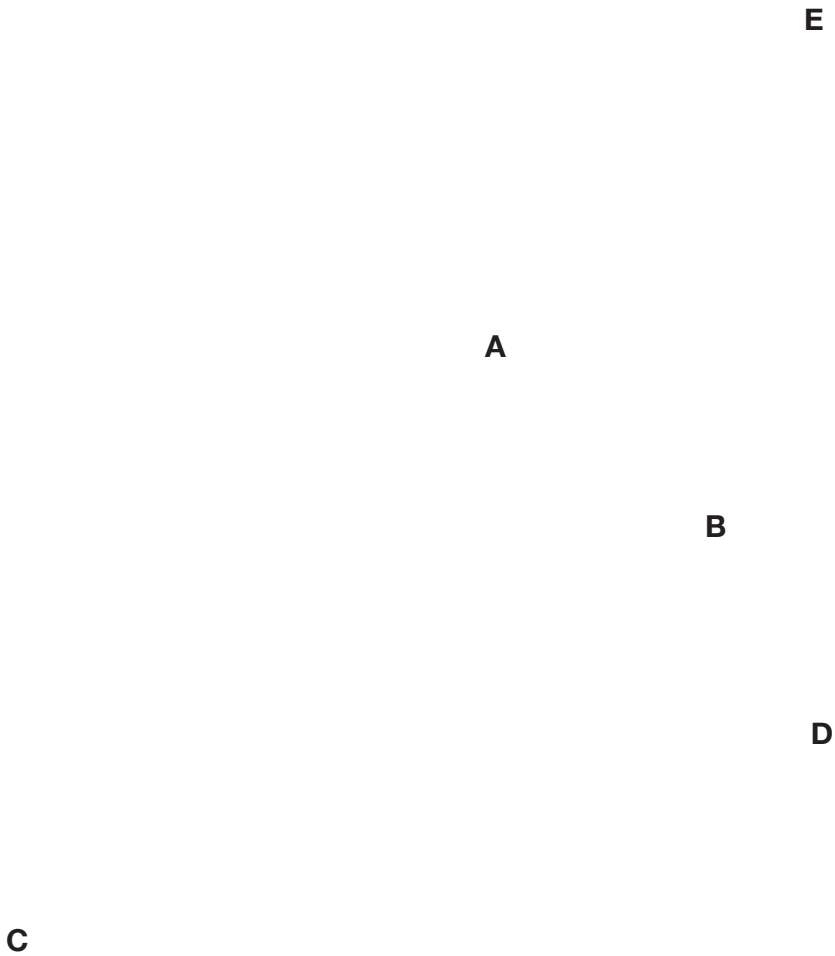


Fig. 14. Male terminalia of *T. nepalense* n. sp. (holotype). A, terminalia, lateral view; B, clunial arm, posterolateral view; C, epiproct, posterior view; D, hypandrium, ventral view; E, phallosome, ventral view.

sinuate. Paraproct (Fig. 14A) with narrow and long distal process directed upwards; distal region of trichobothrial field with some strong denticles and its dorsal margin serrate. Hypandrium (Fig. 14D) asymmetrical; left process in unusual position, its origin just dorsal to median tongue, strongly projected posterodorsally; right process strongly

modified, closely related to left process but separated by membranous region; lateral corners strongly projected posterolaterally; median tongue broad, posteromedially with very deep U-shaped notch. Phallosome (Fig. 14E) pointed anteriorly, distally opened, with pair of long posterior processes, strongly hooked and directed outwards, their apex slightly broadened.

Measurements. B 3.8, Fw 4.8, Hw 3.6.

Female unknown.

Etymology. The specific epithet is derived from Nepal, the country where the type locality is situated.

Remarks. This species is very similar to *T. masoni* in general morphology, but their forewing markings are considerably different (see Key to Species). Presence of heavy denticles at the distal region of the male trichobothrial field is very characteristic for *T. nepalense*. Such denticles are not illustrated in the original figures of *T. godavarensis* (which probably represent male terminalia of *T. masoni*: see above), providing further evidence for the isolated species status of *T. masoni* and *T. nepalense*.

*Trichadenotecnum masoni* New  
(Fig. 1J)

*Trichadenotecnum masoni* New, 1971: 196 (excluding male terminalia: see *T. godavarensis* New, above).

*Trichadenotecnum godavarensis* [sic] New, 1971: 197 (part: allotype male terminalia).

Material examined. Holotype male (terminalia not examined) (CNC11565).

Male. Morphology, excluding terminalia, as described by New (1971). Male terminalia of holotype male were not available for this study, but they should be excluded from the holotype (see below).

Female unknown (see also Remarks under *T. sp. 9*).

Remarks. As mentioned in the Remarks under *T. godavarensis*, the holotype male of *T. masoni* is here considered to be a “chimera”, its terminalia belonging to the allotype male of *T. godavarensis* from which they had inadvertently been separated and erroneously assigned to *T. masoni* by New (1971). Therefore, the terminalia should be excluded from the holotype of *T. masoni* (ICZN 73.1.5).

*Trichadenotecnum depitarense* Yoshizawa & Lienhard, n. sp.  
(Figs 1K, 15)

Holotype male (MHNG), Kosi, Depitar, SE of Thebe, 27°26'N 87°18'E, 560m, 12. vi. 2001, Nat. Hist. Mus. Basel Nepal expedition.

Paratype male (MHNG), Siwalik Range near Babai Basar, 28°21'N 81°42'E, 190m, 15 - 18. iii. 2003, H. Malicky.

Description. Male. Head white in ground color; vertical markings brown, each marking connected with neighbours, and with pair of blackish brown markings anterior to vertical markings; orbital markings distinct anteriorly but obscure dorsally; coronal suture black; epicranial suture bordered with blackish brown narrow band dorsally; frons with two pairs of triangular blackish brown markings; eye black, IO/D= 1.0; ocelli white, ocellar field black; gena white, ventral margin narrowly bordered with brown band;

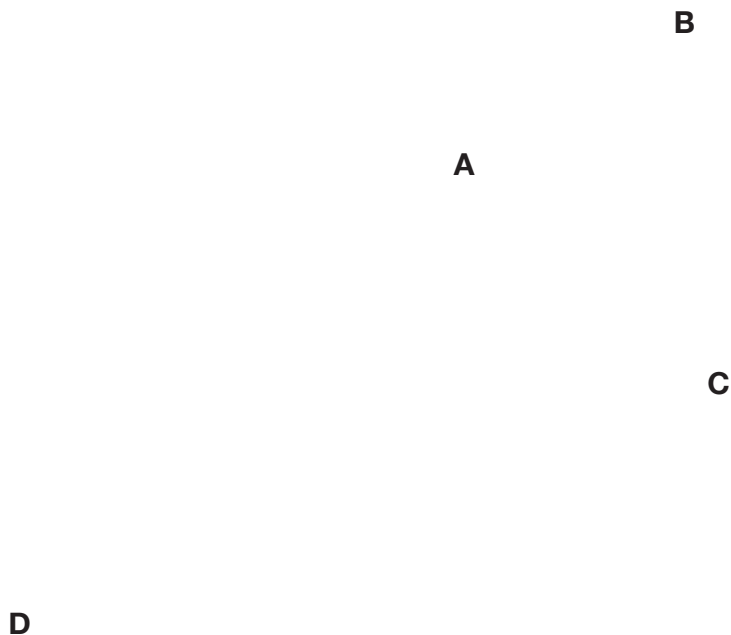


Fig. 15. Male terminalia of *T. depitarens* n. sp. (holotype). A, terminalia, lateral view; B, epiproct, posterior view; C, hypandrium, ventral view; D, phallosome, ventral view.

postclypeus blackish brown except dorsal region and ventrolateral corner; anteclypeus brown. Antenna brown, scape and pedicel darker. Mouthparts pale brown; maxillary palpus white, except 4th segment brown.

Thorax. Prothorax brown. Mesonotum dark brown, anterior lobe of scutum pale brown, anterior region of lateral lobe white. Metanotum brown, anterior region of lateral lobe of scutum white, scutellum dark brown. Meso- and metapleuron brown except white longitudinal median band.

Legs. Mostly white; fore coxa pale brown, mid and hind coxae brown; tip of femora with black spot ventrally; tarsi brown.

Forewing (Fig. 1K) not extensively covered with tiny spots. Spots in cell a1 distinct, distal spot larger and darker. Opposing spots in cell r reduced, anterior spot almost absent. Basal band reduced anteriorly, well developed posteriorly, marking in cell cua

with rounded light pigmented area. Median spots reduced, represented by few small markings. Distal band well developed in cell r3, reduced in cell rs. Spot on roof of cell m3 small. Submarginal spots distinct, spot in cell r1 small and spot in cell r5 large and elongated. Marginal clouds well developed but faint in cells r1 and r3. Hindwing hyaline, distal region of cell cup with pale brownish tinge; veins brown.

Abdomen. White in ground color, with brown transverse band on each segment, bands broader ventrally.

Terminalia. Clunial arm (Fig. 15A) broad and short, posterodorsally with pointed free process directed dorsally. Eighth sternum (Fig. 15C) with single transversal plate, its anterior margin slightly incised by membranous region. Epiproct lobe (Fig. 15AB) broad, nearly parallel sided basally and strongly constricted to truncated dorsal end, dorsal margin with papillae. Paraproct with narrow and long distal process directed upwards; distal region of trichobothrial field normal. Hypandrium (Fig. 15C) asymmetrical; left process conical, long, strongly projecting posterodorsally and slightly bent outwards at distal end; right process strongly modified, forming rounded lobe apically; right lateral corner expanded and strongly projecting posterolaterally; median tongue broad basally, strongly constricted to middle, and posterior margin with shallow V-shaped notch medially. Phallosome (Fig. 15D) pointed anteriorly, distally opened, with pair of long processes directed posteriorly, pointed at tip.

Measurements. B 2.5-2.6, Fw 3.1-3.6, Hw 2.4-2.6.

Female unknown.

Etymology. The specific epithet is derived from the name of the type locality.

Remarks. This species resembles *T. distinctum* but can be distinguished from it by the smaller body size, the narrower epiproct lobe and the modified hypandrial right process.

*Trichadenotecnum distinctum* Datta  
(Figs 1L, 16, 17)

*Trichadenotecnum distinctum* Datta, 1969: 148.

Material examined (NHMN & SEHU): 3 females, Mt. Nagarjun, 27°44'N 85°16'E, 10. x. 2005, K. Yoshizawa; 2 males 4 females, Mt. Phulchoki, nr. Godawari, 27°35'N 85°22'E, 11. x. 2005, K. Yoshizawa; 1 male, Dakshinkali, 27°36'N 85°17'E, 13. x. 2005, K. Yoshizawa.

Redescription of male terminalia. Clunial arm (Fig. 16A) broad and short, with narrow and pointed free process arising from posterodorsal corner and directed dorsally. Eighth sternum (Fig. 16C) with single broad sclerite, its anterior margin deeply incised. Epiproct lobe (Fig. 16AB) broad, slightly broadened at basal 1/3 then strongly constricted to truncated and slightly rounded dorsal margin. Paraproct (Fig. 16A) with narrow and long distal process directed upwards; trichobothrial field normal. Hypandrium (Fig. 16CD) asymmetrical; left process conical, long, strongly projected posterodorsally and slightly bent outwards apically; right process very short, serrated internally; right lateral corner strongly expanded; median tongue narrow and long, parallel sided, apically with V-shaped sharp notch. Phallosome (Fig. 16E) with broad and rounded apodeme anteriorly, distally opened, with pair of long processes directed posteriorly and strongly hooked, apical part directed outwards, with pointed tip.

Description of female. General morphology as in male (described by Datta, 1969).

Genitalia. Egg guide of subgenital plate (Fig. 17A) gradually narrowing to slightly arched distal margin, dorsal surface with pair of boomerang-shaped sclerites basally; pigmented arms broadly sclerotized. Gonapophyses and internal plate as in Fig. 17BC.

Remarks. Although we did not examine the type specimen of *T. distinctum*, the specimens examined here are in complete agreement with the original description of this

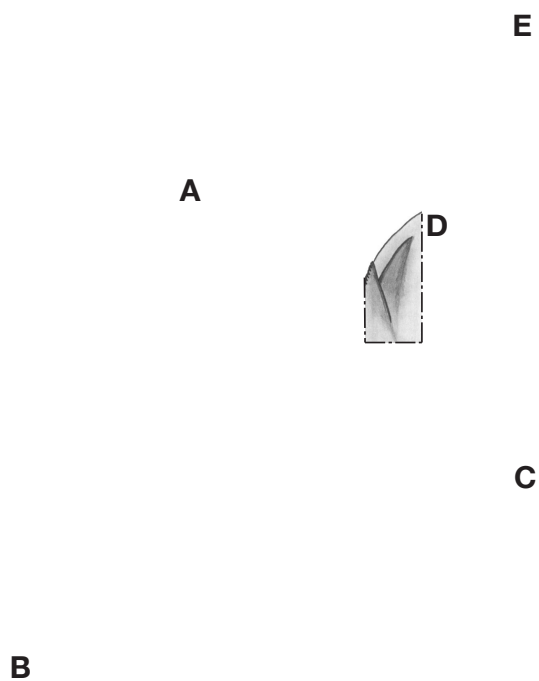


Fig. 16. Male terminalia of *T. distinctum* Datta. A, terminalia, lateral view; B, epiproct, posterior view; C, hypandrium, ventral view; D, ditto, right process and neighbouring region, showing coloration; E, phallosome, ventral view.

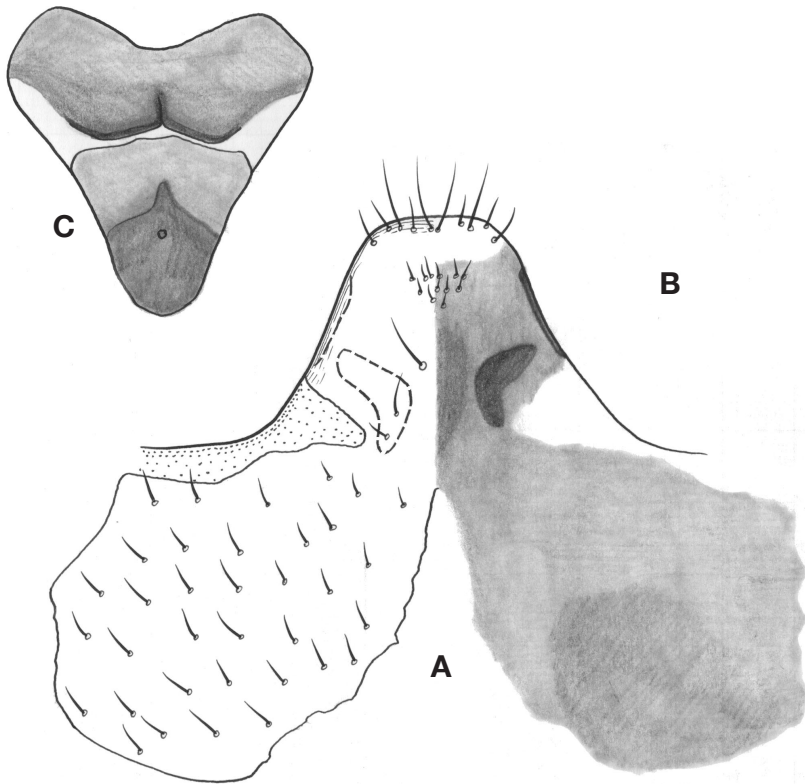


Fig. 17. Female genitalia of *T. distinctum* Datta, ventral view. A, subgenital plate; B, gonapophyses; C, internal plate.

species. In the original figure (Datta, 1969: fig. 10), a pair of processes are illustrated on the posterolateral part of the hypandrium, but they represent the right process (internal) and a thickened part of hypandrium (external) as shown in Fig. 16D.

*Trichadenotecnum* sp. 9  
(Figs 1M, 18)

Material examined (MHNG): 1 female, Kosi, Lamo Pokhari, 27°20'N 87°29'E to Jhor Pokhari, 2900-3000m, 19. vi. 2001, Nat. Hist. Mus. Basel Nepal expedition.

Remarks. This species is known only from a single female specimen. The short ventral valve of gonapophyses (Fig. 18B) and the presence of dorsal sclerites of the egg guide (Fig. 18A) indicate that this species is a member of the *distinctum* group. Other general morphology also closely resembles the other species of this group. This species is not named here because of the absence of corresponding male specimens. The possibility exists that it represents the female of *T. masoni*, but the forewing markings are considerably different from those of the only specimen known of *T. masoni* (holotype male).

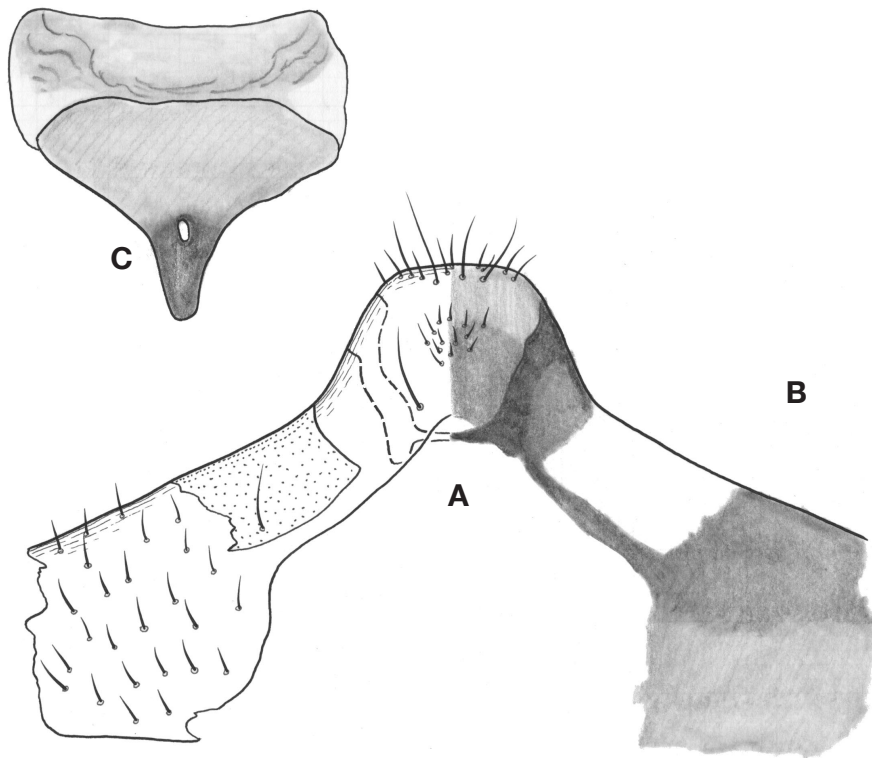


Fig. 18. Female genitalia of *T. sp. 9.*, ventral view. A, subgenital plate; B, gonapophyses; C, internal plate.

#### The *digitatum* group (new species group)

Diagnosis. Forewing not extensively covered with tiny spots (Fig. 1N). Hypandrial right process well developed and strongly projected (Fig. 19C); dorsal surface of median tongue covered with tiny denticles (Fig. 19D). Ventral valve of gonapophyses long (Fig. 20B).

Remarks. The group name is derived from *Trichadenotecnum digitatum* (Li, 2002) described from Nanning, China. This species group could be the sister group of the 'bulky' clade of the New World *Trichadenotecnum* (Yoshizawa et al., submitted) on the basis of the denticulate dorsal surface of the median tongue observed in *T. malickyi*, described below.

#### *Trichadenotecnum malickyi* Yoshizawa & Lienhard, n. sp. (Figs 1N, 19, 20)

Holotype male (MHNG), Siwalik Range near Babai River dam, 28°25'N 81°23'E, 190m, 24. ii - 5. iii. 2003, H. Malicky.

Paratypes (MHNG & SEHU): 2 females, same data as for holotype.

Description. Male. Head white in ground color; vertical markings blackish brown,

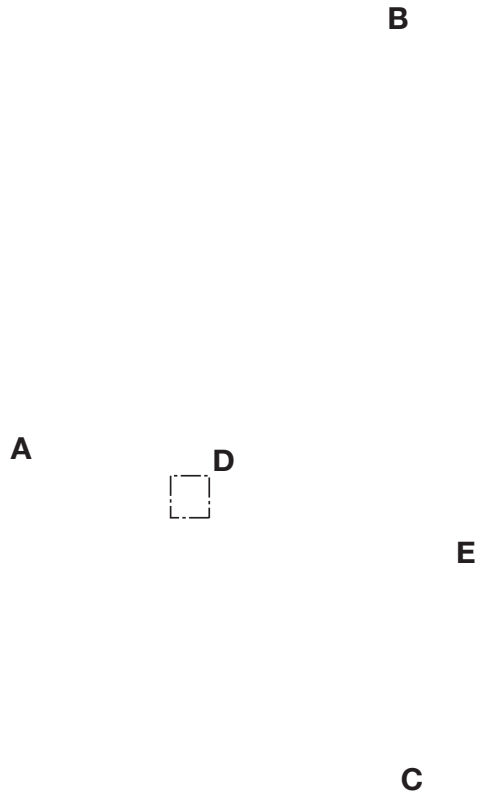


Fig. 19. Male terminalia of *T. malickyi* n. sp. (holotype). A, terminalia, lateral view; B, epiproct, posterior view; C, hypandrium, ventral view; D, dorsal surface of hypandrial median tongue; E, phallosome, ventral view.

each marking connected with neighbours; orbital markings dark brown anteriorly and pale brown posteriorly; coronal suture black; epicranial suture bordered with pale brown marking dorsally; frons with central pair of brown bands and lateral pair of pale brown spots; eye black, IO/D= 1.3; ocelli white, ocellar field black; gena white, ventrally bordered with pale brown band; postclypeus white, with T-shaped blackish brown marking medially to ventrally; dorsally with ca. 10 longitudinal rows of pale brown spots; anteclypeus blackish brown. Antenna pale brown, scape and pedicel brown. Mouthparts brown; maxillary palpus darker.

Thorax. Prothorax brown. Mesonotum brown; anterior lobe of scutum with pair of lighter spots and median white stripe, lateral lobe mostly white anteriorly with few irregular brown markings. Metanotum brown, posterior region of lateral lobe white. Meso- and metapleuron brown except white longitudinal median band.

Legs. Fore coxa pale brown, mid and hind coxae brown; fore and mid femora white,

apically with blackish brown marking ventrally, hind femur pale brown basally, white medially and dark brown distally; all tibiae pale brown with brown marking near apex; all tarsi brown.

Forewing (Fig. 1N) not extensively covered with tiny spots; distal region of cell r covered with tiny spots; basal regions of cells cua and cup with faint brown markings. Spots in cell a1 distinct, distal spot larger. Opposing spots in cell r distinct anteriorly, reduced posteriorly, but with extra blackish brown marking proximal to usual position of posterior spot. Basal band narrower anteriorly, interrupted at M-CuA fork, well developed posteriorly. Median spots well developed, consisting of some well separated tiny spots. Distal band well developed in cell r3, narrow in cell rs. Spots on roof of cell m3 well developed, proximally extending to CuA1-M fusion. Submarginal spots apparent, each spot with irregular outer margin, spot in cell r5 large and elongated, spot in cell m3 small and pale. Marginal clouds well developed, especially dark along distal ends of R4+5 and M1. Hindwing hyaline, cell cup with pale brown marking; veins blackish brown.

Abdomen white, each segment with blackish brown band, bands broader ventrally.

Terminalia. Clunial arm (Fig. 19A) broad, dorsal margin deeply incised by membranous region. Eighth sternum (Fig. 19C) with pair of sclerites weakly fused posteromedially. Epiproct lobe (Fig. 19AB) broad basally, then strongly constricted and forming circular lobe dorsally. Paraproct (Fig. 19A) with broad and rather short distal process directed upwards; ventrally with narrow and long strip of sclerite arising from anteroventral corner and reaching middle of trichobothrial field. Hypandrium (Fig. 19CD) asymmetrical, left process forming broad plate, serrate distally; right process well developed, long and conical, with extra short serrated process at internal base of right

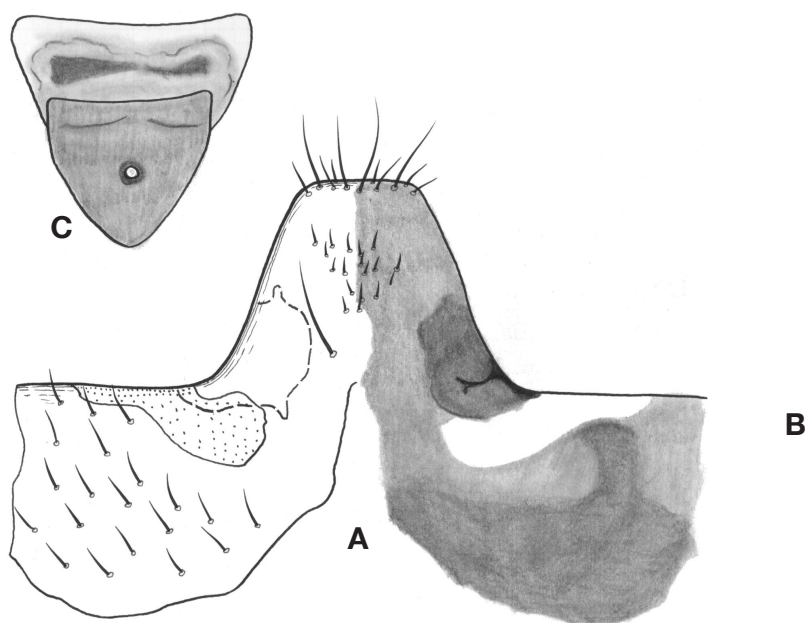


Fig. 20. Female genitalia of *T. malickyi* n. sp., ventral view. A, subgenital plate; B, gonapophyses; C, internal plate.

process; right lateral corner with some denticles; median tongue broad, distal margin serrate and widely notched, dorsal surface covered with small denticles. Phallosome (Fig. 19E) with long and pointed apodeme anteriorly, distally closed, but sclerotization of distal margin weak and very narrow, posterolaterally with pair of projections directed posteriorly.

Measurements. B 2.6, Fw 3.6, Hw 2.7.

Female. General morphology as in male. IO/D = 2.0.

Genitalia. Egg guide of subgenital plate (Fig. 20A) gradually narrowing to almost straight distal margin; dorsal surface of egg guide with large sclerotized portions laterobasally; pigmented arm short, almost as long as egg guide. Ventral valve of gonapophyses (Fig. 20B) long, apex far exceeding posterior margin of external valve; external valve rather long compared to its width, posterior lobe well developed, internally with two rounded projections each bearing long seta. Internal plate as in Fig. 20C.

Measurements. B 2.6-2.9, Fw 3.2-3.6, Hw 2.3-2.6.

Etymology. The specific epithet is dedicated to Hans Malicky, specialist of Trichoptera, who regularly enriches the Psocoptera collection of the MHNG by his collecting efforts.

Remarks. This species is similar to *T. digitatum* (Li) but can be distinguished by the shape of the epiproct (rectangular in *T. digitatum*).

#### The *longimucronatum* group (new species group)

Diagnosis. Forewing very densely covered with blackish brown spots; Rs-M fusion short, sometimes these veins even meeting at point. Anterior lobe of mesoscutum strongly projecting anteriorly. Male terminalia (from published description): paraproct normal, without basal lobe; hypandrium symmetrical. Female genitalia: Ventral valve of gonapophyses long.

Remarks. Phylogenetic affinity of this species group is unknown to date. However, as discussed under *Trichadenotecnum* sp. 10, this species group is probably imbedded within the clade composed of all members of the genus excluding the *roesleri*, *circularoides* and *corniculum* groups (see Yoshizawa, 2003, 2004 and Yoshizawa et al., submitted).

#### *Trichadenotecnum* sp. 10 (Figs 10, 21)

Material examined (MHNG): 1 female, Godaveri, 1550m, 6. iv. 1991, M. G. Allen.

This species is known only from a single female specimen so that we postpone to name it to avoid future confusion and possible synonymy. This species can be clearly distinguished from the other Nepalese species of *Trichadenotecnum* by extensively and densely marked forewing, very short Rs+M fusion (Fig. 10), and strongly projecting anterior lobe of mesoscutum. These character states, especially the last one, clearly show that this species is closely related to *Conothoracalis longimucronata* Li, 1997, the type species of the genus *Conothoracalis*. Judging from the original description and the redescription (Li, 2002) of *C. longimucronata*, this species shares several apomorphies with *Trichadenotecnum*, such as presence of the hypandrial median tongue and the clunial arm in male terminalia and obtuse Rs fork in the forewing. Especially, the latter

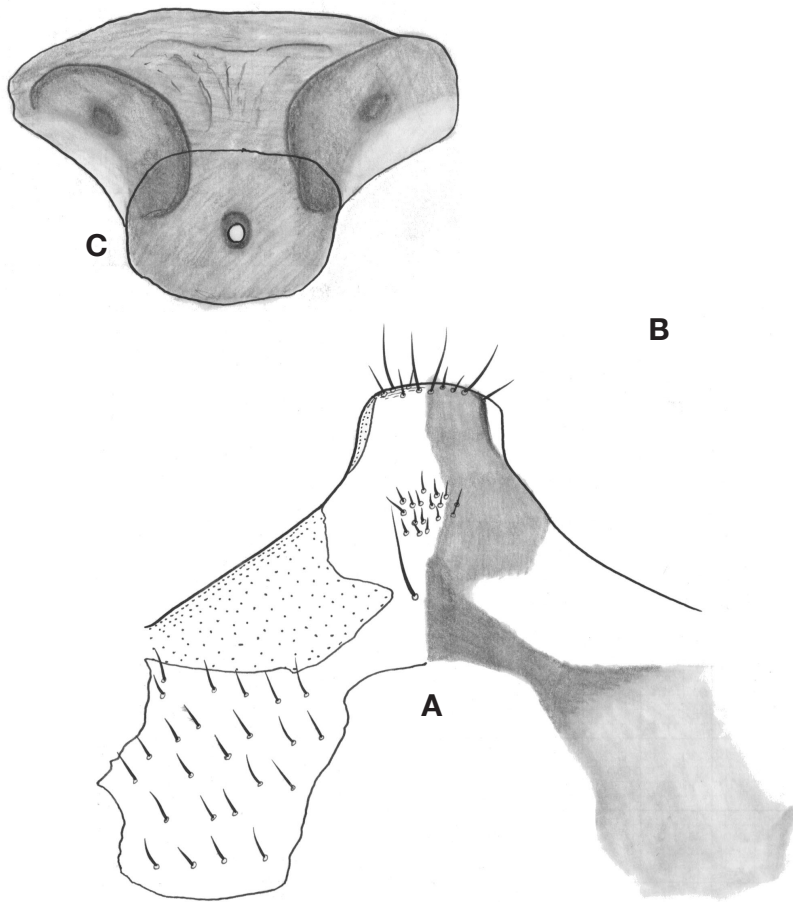


Fig. 21. Female genitalia of *T.* sp. 10, ventral view. A, subgenital plate; B, gonapophyses; C, internal plate.

two character states indicate that *C. longimucronata* is imbedded within a subclade of *Trichadenotecnum* and is not the sister group of the genus (Yoshizawa, 2003, 2004; Yoshizawa et al., submitted). All other diagnostic characters of *Conothoracalis* do not contradict this conclusion. Independent generic status for *C. longimucronata* would make the genus *Trichadenotecnum* paraphyletic. Therefore, we synonymize the genus *Conothoracalis* with *Trichadenotecnum* (see above). New species combinations resulting from this treatment are listed in the Appendix. *T. proctum* Endang & New, 2005 and *T. jambiense* Endang & New, 2005 from Sumatra apparently belong also to this species group, though the thorax character was not described in these species.

#### Unplaced species

##### *Trichadenotecnum pokhariense* New

*Trichadenotecnum pokhariense* New, 1983: 86.

Remarks. This species was described from the holotype female only. A closely resembling species or the corresponding male could not be found during the present study. Since female morphological characters are not sufficient to assign the species to a known species group or to establish a new species group, the species is here treated as *incertae sedis*. Judging from the forewing illustration given in the original description, systematic placement of this species within the genus *Trichadenotecnum* is justified.

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#### REFERENCES

- Datta, B. 1969. On a collection of Indian psocids (Psocoptera). *Zoologischer Anzeiger* 183: 144–150.
- Endang, S. K. & New, T. R. 2005. The genus *Trichadenotecnum* (Insecta: Psocoptera: Psocidae) in Sumatra, Indonesia, with description of thirteen new species. *Records of the Australian Museum* 57: 15–38.
- Endang, S. K., Thornton, I. W. B. & New, T. R. 2002. The Psocidae (Insecta: Psocoptera) of Java and the eastern islands of Indonesia. *Invertebrate Systematics* 16: 107–176.
- Good, R. D. O. 1953. *The geography of the flowering plants*, 2nd ed., Longman, London.
- Li, F. 1995. Psocoptera. Pp. 60–85. In Zhu, T. (ed.). *Insects and macrofungi of Gutianshan, Zhejiang*. Zhejiang Science and Technology Publishing House, Hangzhou.
- Li, F. 1997. Psocoptera: Psyllipsocidae, Amphientomidae, Pachytroctidae, Caeciliidae, Stenopsocidae, Amphipsocidae, Dasydemellidae, Lachesillidae, Ectopsocidae, Peripsocidae, Pseudocaeciliidae, Philotarsidae, Elipsocidae, Hemipsocidae and Psocidae. Pp. 385–530. In Yang, X. (ed.). *Insects of the Three Gorge Reservoir Area of Yangtze River. Part 1*. Chongqing Publishing House, Chongqing.
- Li, F. 2002. *Psocoptera of China* (2 volumes). Science Press, Beijing.
- Li, F. & Yang, C. 1987. Psocoptera: Psocidae. *Agricultural Insects Spiders, Plants Diseases and Weeds of Xizang* 1: 7–30.
- Lienhard C. 2003a. Additions and corrections (part 1) to Lienhard & Smithers, 2002: 'Psocoptera (Insecta) - World catalogue and bibliography'. *Psocid News* 4: 2–24.
- Lienhard C. 2003b. Additions and corrections (part 2) to Lienhard & Smithers, 2002: 'Psocoptera (Insecta) - World catalogue and bibliography'. *Psocid News* 5: 2–37.
- Lienhard, C. 2003c. Nomenclatural amendments concerning Chinese Psocoptera (Insecta), with remarks on species richness. *Revue suisse de Zoologie* 110: 695–721.
- Lienhard C. 2004. Additions and corrections (part 3) to Lienhard & Smithers, 2002: 'Psocoptera (Insecta) - World catalogue and bibliography'. *Psocid News* 6: 1–23.
- Lienhard C. 2005. Additions and corrections (part 4) to Lienhard & Smithers, 2002: 'Psocoptera (Insecta) - World catalogue and bibliography'. *Psocid News* 7: 1–16.
- Lienhard C. 2006. Additions and corrections (part 5) to Lienhard & Smithers, 2002: 'Psocoptera (Insecta) - World catalogue and bibliography'. *Psocid News* 8: 1–18.
- Lienhard C, Smithers CN. 2002. *Psocoptera (Insecta): World catalogue and bibliography*.

- Instrumenta Biodiversitatis 5. Muséum d'Histoire Naturelle, Genève.
- New, T. R. 1971. The Psocoptera of the Canadian Nepal expedition. *Canadian Entomologist* 103: 188–213.
- New, T. R. 1973. Some Psocoptera from Nepal. *Oriental Insects* 7: 1–10.
- New, T. R. 1978. Ergebnisse der Bhutan-Expedition 1972 des Naturhistorischen Museums in Basel - Psocoptera. *Entomologica Basiliensia* 3: 67–86.
- New, T. R. 1983. Psocoptera from the Nepal Himalayas. *Senckenbergiana biologica* 63: 73–89.
- New, T. R. & Lee, S. S. 1992. *Trichadenotecnum* Enderlein (Psocoptera: Psocidae) from West Malaysia. *Oriental Insects* 26: 153–158.
- Sano, M. & Akimoto, S. 2005. Distribution of bisexual and unisexual species in the aphid genus *Colopha* Monell (Aphididae: Eriosomatinae) with description of a new species in Japan. *Journal of Natural History* 39: 337–349.
- Thornton, I. W. B. 1961. The *Trichadenotecnum* group (Psocoptera: Psocidae) in Hong Kong, with descriptions of new species. *Transactions of the Royal Entomological Society of London* 113: 1–24.
- Yoshizawa, K. 2001. A systematic revision of Japanese *Trichadenotecnum* Enderlein (Psocodea: 'Psocoptera': Psocidae: Ptyctini), with redefinition and subdivision of the genus. *Invertebrate Taxonomy* 15: 159–204.
- Yoshizawa, K. 2003. Two new species that are likely to represent the most basal clade of the genus *Trichadenotecnum* (Psocoptera: Psocidae). *Entomological Science* 6: 301–308.
- Yoshizawa, K. 2004. Molecular phylogeny of major lineages of *Trichadenotecnum* and a review of diagnostic morphological characters (Psocoptera: Psocidae). *Systematic Entomology* 29: 383–394.
- Yoshizawa, K. & Lienhard, C. 2004. Systematics of *Trichadenotecnum* (Psocoptera: Psocidae) in Hong Kong. *Publicaciones Especiales del Instituto de Biología, UNAM* 20: 121–149.
- Yoshizawa, K., Garcia-Aldrete, A. N. & Mockford, E. L. Submitted. Systematics and biogeography of the New World species of *Trichadenotecnum* Enderlein (Insecta: Psocodea: 'Psocoptera': Psocidae).
- Yoshizawa, K. & Smithers, C. N. 2006. Systematic position of *Trichadenotecnum enderleini* (Roesler) (Psocodea: 'Psocoptera': Psocidae). *Record of the Australian Museum* 58: 411–415.

APPENDIX. TAXONOMIC ASSIGNMENTS, INCLUDING NEW NOMENCLATORIAL ACTS, PROPOSED IN THIS PAPER FOR NON-NEPALESE SPECIES.

Species newly assigned to the *longimucronatum* group

- Trichadenotecnum corollatum* (Li) n. comb.  
*Conothoracalis corollata* Li, 2002: 1524.
- Trichadenotecnum enneagonum* (Li) n. comb.  
*Conothoracalis enneagona* Li, 2002: 1520.
- Trichadenotecnum guangxiicum* (Li) n. comb.  
*Conothoracalis guangxiica* Li, 2002: 1527.
- Trichadenotecnum longimucronatum* (Li) n. comb.  
*Conothoracalis longimucronata* Li, 1997: 507.
- Trichadenotecnum perbellum* (Li) n. comb.  
*Conothoracalis perbella* Li, 2002: 1522.

*Trichadenotecnum quinarium* (Li) n. comb.  
    *Conothoracalis quinarina* Li, 2002: 1518.  
*Trichadenotecnum shilanicum* (Li) n. comb.  
    *Conothoracalis shilinicica* Li, 2002: 1525.  
*Trichadenotecnum turriiforme* (Li) n. comb.  
    *Loensia turriiformis* Li, 1995: 81.  
    *Conothoracalis turriiformis*: Li, 1997: 507.  
*Trichadenotecnum unciforme* (Li) n. comb.  
    *Conothoracalis unciformis* Li, 2002: 1526.  
*Trichadenotecnum proctum* Endang & New  
*Trichadenotecnum jambiense* Endang & New

Species newly assigned to the *spiniserrulum* group

*Trichadenotecnum bannaense* (Li) n. comb.  
    *Loensia bannaensis* Li, 2002: 1533.  
*Trichadenotecnum hengshanicum* (Li) n. comb.  
    *Loensia hengshanica* Li, 2002: 1534.  
*Trichadenotecnum octogonum* (Li) n. comb.  
    *Loensia octogona* Li, 2002: 1535.  
*Trichadenotecnum jinxiuense* (Li)  
*Trichadenotecnum multangulare* (Li)  
*Trichadenotecnum multicuspidatum* (Li)  
*Trichadenotecnum gombakense* New & Lee  
*Trichadenotecnum adika* Endang, Thornton & New  
*Trichadenotecnum laticornutum* Endang, Thornton & New  
*Trichadenotecnum paradika* Endang & New

Species newly assigned to the *digitatum* group

*Trichadenotecnum digitatum* (Li)