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Description of nine new species of Psychomyiidae (Trichoptera) from Sulawesi

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Abstract. Nine new caddisfly species of the family Psychomyiidae WALKER, 1852: *Psychomyia arassandii* sp. nov., *P. luwukensis* sp. nov., *Tinodes lokomatanus* sp. nov., *T. tongariuanus* sp. nov., *T. tanatorajaensis* sp. nov., *T. pelenensis* sp. nov., *T. saluopanus* sp. nov., *T. ular* sp. nov. and *T. dendsensis* sp. nov. are described from Sulawesi, Indonesia.

Keywords: Trichoptera, Psychomyiidae, Psychomyia, Tinodes, new species, Sulawesi

Introduction

The caddisfly family Psychomyiidae is widespread, but centered in the Oriental region (HOLZENTHAL, 2008). Larvae of most psychomyiids graze on diatoms and other algae, and construct silken tubes, which attach to rocks and tree limbs in or somewhat above the water level (HOLZENTHAL, 2008). The adult Psychomyiids are small and modest-looking caddisflies in their general appearance, but the male genital structures show significant inter-species diversity and are the basis for the species level taxonomy (MALICKY, 2010).

Five species of Psychomyiidae are known from Sulawesi (MORSE 2020), all of them were described during the last few decades: *Psychomyia kotamobagu* MALICKY, 1993, *P. zimmermanni* MALICKY, 1993, *Paduniella celebensis* MEY, 2006, *P. toraut* MALICKY, O'CONNOR & ASHE, 2009 and *Tinodes elok* Malicky, O'CONNOR & ASHE, 2009. Being not reported elsewhere, they all seem endemic to Sulawesi. Genus *Tinodes* is likely the most poorly known taxon – as a comparison eleven species of *Tinodes* are known from the neighbouring island Java. Here we describe two new species of *Psychomyia* and seven new species of *Tinodes* from South and Central Sulawesi.

Material and methods

All specimens were sampled by Marko Jaakkola in South and Central Sulawesi in 2019 – 2020. The used equipment was a single battery operating, custom-built 8W LED system, using 365 nm, 450 nm, 530 nm and white coloured LEDs. The specimens were stored dry for transport, and in 80% alcohol in the laboratory. The abdomens (all males) of the holotypes and paratypes were cleared in 10% NaOH. The genital structures were drawn from the holotypes by Hans Malicky and digitized by Juha Salokannel. All the holotypes are deposited in the research collection of Hans Malicky in Lunz Am See, Austria and the paratypes in the Finnish Museum of Natural History (FMNH) in Helsinki, Finland.

Systematics

The abbreviations in the text and figures are the following: D = Dorsal view, L = Lateral view, V = Ventral view, Dst9 = Dorsal structure of sternite IX, H = Harpagone, IA = Inferior Appendages, IBA = Internal Basal Appendages, Ph = Phallus, SA = Superior Appendages.

Genus *Psychomyia* LATREILLE, 1829

Three species were recorded. The two new species are externally similar with typical members of the genus: spur formula 2-4-4; forewings 2-3 mm long, relatively narrow. The hind edge of the greyish forewings has lighter fur, but this character is typically

not anymore visible in specimens stored in alcohol. The front edge of the hind wings has a triangular protrusion typical for the genus. Each new species are given forewing length of the type specimen as well as the description of the main characters of the male genital structures in text and drawings.

Psychomyia kotamobagu MALICKY, 1993

The species is described from North Sulawesi, Kotamobagu (MALICKY 1993).

New records: 1) Indonesia, Central Sulawesi, Banggai regency, Luwuk, Hanga-Hanga, Pila waterfalls, 0°57'04.1"S, 122°46'13.7"E, alt. 461 m., 7th Feb 2020, river, falls, 8 males. 2) INDONESIA Central Sulawesi, Leboni, Saluopa waterfalls, 1°44'59.6"S, 120°32'29.2"E, alt. 563 m., 17th Feb 2020, 2 males.

Psychomyia arassandii sp. nov. (Page 24)

Diagnosis: The species is closely related to *P. dara* MALICKY, 1993 (Sumatra) and *P. plexippos* MALICKY, 2008 (Borneo), but *arassandii* is different in all male genital characters: the main branch of the SA is more slender, especially the dorsal part of the IA is different; the inner branches of the SA as well as the IA are also unique.

Description: Forewing 3.0 mm. Segment IX rounded in lateral view. Superior appendage complex with long main branches and shorter inner branches; main branch sparsely setose and elongate with a ventral pigmented protrusion in lateral view; inner face with a spike in the basal part and a pigmented uniform widening extending from middle to the apical quarter. Inner branch bifurcated; dorsal inner branch short, setose, outer face with a spike; ventral inner branch reaching to the middle of the main branches. IA bifurcated, reaching to the inner spike of the SA; ventral branch setose, angularly s-shaped in ventral view; dorsal branch bald, narrow, pointed.

Holotype ♂: Indonesia, South Sulawesi, Mandetek, Sadang river, 3°03'41.1"S, 119°52'05.3"E, alt. 765 m., 26th Feb 2019. Specimen code: JSLK-SULA-T032. Paratypes: 1) a male from the same sample as the holotype; specimen code: JSLK-SULA-T032-2, FMNH reference: <http://id.luomus.fi/GZ.51116>; 2) a male from INDONESIA, South Sulawesi, Sopai, Sikore waterfall, 2°58'05.6"S 119°50'38.6"E, alt. 934 m., 24th Dec 2019; specimen code: JSLK-SULA-T043, FMNH reference: <http://id.luomus.fi/GZ.51117>.

Etymology: The species is named after Mr. M Nur Aras Sandi who made the sampling in Sulawesi possible by handling a lot of practicalities.

Psychomyia luwukensis sp. nov. (Page 24)

Diagnosis: The deeply bifurcated IA remind one of some other *Psychomyia* spp., e.g. *P. chompu* MALICKY & CHANTARAMONGKOL, 1993, but the combination with the SA is unique.

Description: Forewing 3.2 mm. Segment IX rounded in lateral view. Superior appendage complex with long main branches and short inner section; main branch sparsely setose, extended apically in lateral view; inner face with a blunt protrusion before middle, concave before a small pointed subapical protrusion; the inner section fused, except the four pointed tips. IA deeply bifurcated; dorsal branch setose, digitate; ventral branch bald, narrow, slightly curved ventrad before the tip curved dorsad.

Holotype ♂: Indonesia, Central Sulawesi, Luwuk, Pila waterfalls, 0°57'04.1"S, 122°46'13.7"E, alt. 461 m., 7th Feb 2020, specimen code: JSLK-SULA-T383.

Etymology: The species is named after Luwuk town, close to the type locality.

Genus *Tinodes* CURTIS, 1834

All the seven recorded *Tinodes* species are new to science. Their general appearance is similar: spur formula 2-4-4; forewing length 3 – 4,5 mm.; forewings greyish coloured with some brownish or yellowish fur in the basal half; ventral side of body, legs and the basal third of the antenna are yellowish. The colours have become faint in the specimens stored in alcohol. Each new species description is given with forewing length of the type specimens as well as the description of the main characters of the male genital structures in text and drawings.

Tinodes lokomatanus sp. nov. (Page 24)

Diagnosis: We found no close relative among *Tinodes*, the species has unique male genital structures, especially the IA and the IBA.

Description: Forewing 3,3-4,0 mm. Sternite IX with triangular basal part in lateral view. Tergum IX elongated triangular in dorsal view, apically bent down in lateral view. SA uniformly slender, slightly curved. DSt9 slightly curved downwards in lateral view; pointed, widest in about middle in dorsal view; apical half dorsolaterally populated with curved long stout setae. IBA single, basis slightly clubbed, stem narrow, apical part strongly expanded; ventrally rounded, sharp protrusions on the dorsal and posterior edge in lateral view. IA with basal half fused ventrally, blunt triangular in lateral view; a group of large setae present at posterolateral corners, few shorter ones at lateral faces; posterodorsal branch digitate, apically curved, sharp; harpagone half shorter, blunt, setose; both posterodorsal branch and harpagone not visible in lateral view, posteroventral branch absent.

Holotype ♂: Indonesia, South Sulawesi, Tonga Riu, Lo'ko MATA, 2°54'15.3"S, 119°51'44.5"E, alt. 1453 m., 14th Jan 2020, specimen code: JSLK-SULA-T250. Paratypes: 1) A male from the same sample with the holotype; specimen code: JSLK-SULA-T244, FMNH reference: <http://id.luomus.fi/GZ.51119>, 2) a male from the same sample; specimen code: JSLK-SULA-T245, FMNH reference: <http://id.luomus.fi/GZ.51120>, 3) a male from the same site on 4th Mar 2019; specimen code: JSLK-SULA-T128-3, FMNH reference: <http://id.luomus.fi/GZ.51118>.

Etymology: The species is named after the holotype locality.

Tinodes tongariuanus sp. nov. (Page 25)

Diagnosis: The species is related to several Asian species: *T. aningalani* MEY 1998 (Panay), *T. chichina* MOSELY 1942 (China), *T. elok* MALICKY, O'CONNOR & ASHE 2009 (Sulawesi), *T. higashiyamana* TSUDA 1942 (Japan), *T. miostyllos* MEY 1998 (Mindanao). A main difference is the clearly different shape of IBA.

Description: Forewing 4,0 mm. Sternite IX with subtriangular basal part in lateral view. Tergum IX triangular in dorsal view. SA large, somewhat thickened in the middle, slightly curved down in lateral view. Dst9 deeply divided in dorsal view. Basal half of Dst9 bald, apical half narrowed in lateral view; dorsolaterally populated with long stout setae, shorter setae at the tip. IBA single, basal club thick, stem narrow, apical part widened and branched; the dorsal branch sharp, relatively large.

IA joined with a seam in ventral view; posterodorsal branch elongated, slightly curved ventrad; posteroventral branch shorter, curved ventrad. Harpagone rectangular in lateral view, reaching to half of the posterodorsal branch, setose.

Holotype ♂: Indonesia, South Sulawesi, Tonga Riu, Lo'ko MATA, 2°54'15.3"S, 119°51'44.5"E, alt. 1453 m., 4th Mar 2019, specimen code: JSLK-SULA-T128-2.

Etymology: The species is named after the holotype locality.

Tinodes tanatorajaensis sp. nov. (Page 25)

Diagnosis: Some *Tinodes*, e.g. *T. zohar* MALICKY, 2009 (Borneo) and *T. multispinosa* SCHMID 1972 (Peninsular Malaysia) have comparable strikingly long setae at the faces of the IA, but otherwise all characters are different. In addition to the IA setae, the unique shape of tergum IX is a quick character to distinguish the new species from most other *Tinodes* except *T. austrotagatica* MEY 1998 and *T. tabonica* MEY 1998 (both from Mindanao) which have a similar tergite 9 but are different in the other structures.

Description: Forewing 3,3 – 4,0 mm. Sternite IX with rectangular basal part, narrow dorsal part, in lateral view. Tergum IX elongated, bifurcated; both branch with a dorsal hook before the middle, apices curved dorsolaterad. SA large, club-like, asymmetric. DSt9 large, equally thick, curved downwards in lateral view; tip shortly tapered; 1-2 very long and stout setae close to the tip, pointing anterad on both sides. Phallus elongated, paramere and its short ventral branch sharp, pointing posterodorsad. IBA basally clubbed, stem narrow, apical part with a large curved dorsal branch; the ventral branch short, bifurcated in lateral view. IA blunt triangular; posterodorsal branch sharp, posteroventral protusion absent; ventrolateral face covered with very long setae. Harpago blunt, setose, reaching as long as the posterodorsal branch.

Holotype ♂: Indonesia, South Sulawesi, Sopai, Sikore waterfall, 2°58'05.5"S, 119°50'41.8"E, alt. 973 m., 24th Dec 2019, specimen code: JSLK-SULA-T202. Paratypes: 1) a male from the same sample with the holotype; specimen code: JSLK-SULA-T201, FMNH reference: <http://id.luomus.fi/GZ.51122>, 2) a male from INDONESIA, South Sulawesi, Sopai, Bulu-Bulu, 3°01'06.4"S 119°51'21.7"E, alt. 819 m., 2nd Mar 2019, specimen code: JSLK-SULA-T118, FMNH reference: <http://id.luomus.fi/GZ.51121>.

Etymology: The species is named after to the area of the type localities.

Tinodes pelengensis sp. nov. (Page 25)

Diagnosis: The species has some similarities with several SE Asian *Tinodes*, for example its IBA is rather similar with that of *T. theseus* MALICKY & PROMMI 2006 (Thailand), but each appendage and the combination of their characters are unique.

Description: Forewing 3,2 – 3,5 mm. Sternite IX with subrectangular basal part in lateral view. Tergum IX rectangular in dorsal view. SA slender, slightly thickened and curved in the middle. Basal half of Dst9 elongated, apically rounded; basal half bald, apical half populated with long and short setae dorsally, shorter spikes laterally. IBA single, basally slightly clubbed, stem narrow, apical part wide; dorsally rounded, apically sharp triangular; narrow ventral branch divided symmetrically. IA with basal half fused ventrally, oval in lateral view; posterior branches sharp, curved ventrad; harpagone blunt, setose, not reaching the tip of the posterodorsal branch.

Holotype ♂: Indonesia, South Sulawesi, Banggai Kepulauan, Peleng island, Patukuki, 1°26'03.5"S, 123°11'19.7"E, alt. 93 m., 12th Feb 2020. Specimen code: JSLK-PELE-T042. Paratypes: Two males from the same sample with the holotype: 1) specimen code: JSLK-PELE-T042-2, FMNH reference: <http://id.luomus.fi/GZ.51123> and 2) specimen code: JSLK-PELE-T042-3, FMNH reference: <http://id.luomus.fi/GZ.51124>.

Etymology: The species is named according to the Peleng island where the type specimen were found.

Tinodes saluopanus sp. nov. (Page 26)

Diagnosis: The genital characters remind one distantly of some SE Asian *Tinodes*, e.g. the Dst9 is rather similar *T. gapbona* JOHANSSON & OLAH, 2008 (Vietnam), but the other characters are different.

Description: Forewing 4,1 mm. Sternite IX with elongated triangular basal part in lateral view. Tergum IX blunt and short dorsal view. SA slender, faintly curved. IBA paired, basis and stem narrow, apical part expanded and divided into two large claws curved ventrad. Dst9 curved ventrad, blunt; ventrolateral branches narrow, pigmented. IA basally fused ventrally, pointed triangular in lateral view; posterodorsal branch pointed, slightly curved ventrad in lateral view, claw-like in ventral view. Harpagones digitiform, shorter than the tip of the basal segment.

Holotype ♂: Indonesia, Central Sulawesi, Leboni, Saluopa waterfalls, 1°44'59.6"S, 120°32'29.2"E, alt. 563 m., 17th Feb 2020, specimen code: JSLK-SULA-T316.

Etymology: The species is named after to the magnificent type-locality.

Tinodes ular sp. nov. (Page 26)

Diagnosis: We've found no close relatives of this species, its genital structures are unique, especially the notched phallus, IBA's toothed sickle and the strongly curved posteroventral branch of IA are easy to distinguish from other *Tinodes*.

Description: Forewing 3,5 – 4,2 mm. Sternite IX with short triangular basal part in lateral view. Tergum IX short, slightly concave in dorsal view. SA slender, bent subbasally in dorsal view, curved slightly in lateral view. Dst9 with two elongate branches, both curved ventrad, apically pointed and setose. Phallus notched in the middle in lateral view; apically widened and narrowly lobed in dorsal view. IBA single, basis and stem narrow, sickle-shaped apical half elongated, equipped with a tooth. IA globular, basal half fused ventrally; posterodorsal branch narrow, almost uncurved; posteroventral branch pigmented, narrow, curved strongly anteroventrally; harpagone blunt, evenly wide in lateral view, narrow in ventral view, setose, reaching almost as long as the posterodorsal branch.

Holotype ♂: Indonesia, South Sulawesi, Dende, 2°58'58.0"S, 119°50'19.2"E, alt. 996 m., 3rd Jan 2020, specimen code: JSLK-SULA-T388. Paratype: A male from INDONESIA, South Sulawesi, Sopai, Sikore waterfall, 2°58'05.5"S, 119°50'41.8"E, alt. 973 m., 24th Dec 2019, specimen code: JSLK-SULA-T176, FMNH reference: <http://id.luomus.fi/GZ.51125>

Etymology: The species is named after its peculiar snake-shaped phallus.

Tinodes dendensis sp. nov. (Page 26)

Diagnosis: The IA are rather similar with *T. igok* KIMMINS, 1955 (Borneo), but the shape of Dst9 and phallus are clearly different.

Description: Forewing 4,1 mm. Tergum IX elongated triangular in dorsal view. SA slender, bent subbasally in dorsal view, curved slightly in lateral view. Dst9 with two branches, both spoon-shaped in lateral view, dorsally populated with some long, stout setae. Phallus blunt, widened apically in both lateral and dorsal view. IBA single, narrow with a sharp dorsal branch in the apical part. IA shortly basally fused in ventral view, rounded triangular in lateral view; posterodorsal branch triangular, tips curved inward in ventral view; posteroventral branch claw-like, curved ventrad; Harpago relatively narrow, blunt, setose, not quite reaching the tip of the posterodorsal branch.

Holotype ♂: Indonesia, South Sulawesi, Dende, 2°58'58.0"S, 119°50'19.2"E, alt. 996 m., 3rd Jan 2020, specimen code: JSLK-SULA-T389.

Etymology: The species is named after its type location.

Discussion

All but one of the ten recorded Psychomyiidae species were new to science. Also, four out of the nine described species were recorded from only a single specimen. This suggests that the sampling effort was still too low to detect all the Psychomyiidae species occurring in the studied areas of South and Central Sulawesi. Additional sampling efforts, even on the same sites, would probably reveal more diversity of this caddisfly family.

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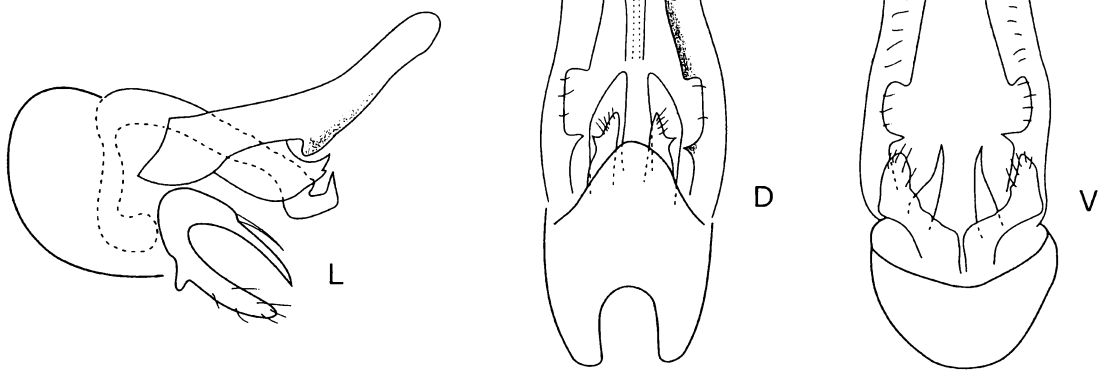
References

- HOLZENTHAL, R., BLAHNIK, R., PRATHER, A. & KJER, K. 2007. Order Trichoptera Kirby, 1813 (Insecta), Caddisflies. Zootaxa 1668: 639–698.
- MALICKY, H. 1993. Neue asiatische Köcherfliegen (Trichoptera: Philopotamidae, Polycentropodidae, Psychomyidae, Ecnomidae, Hydropsychidae, Leptoceridae). Linzer biol. Beitr. 25 (2): 1099–1136.
- MALICKY, H. 2010. Atlas of Southeast Asian Trichoptera. Faculty of Science Printing Unit, Chiang Mai University, Chiang Mai. 346 pp.

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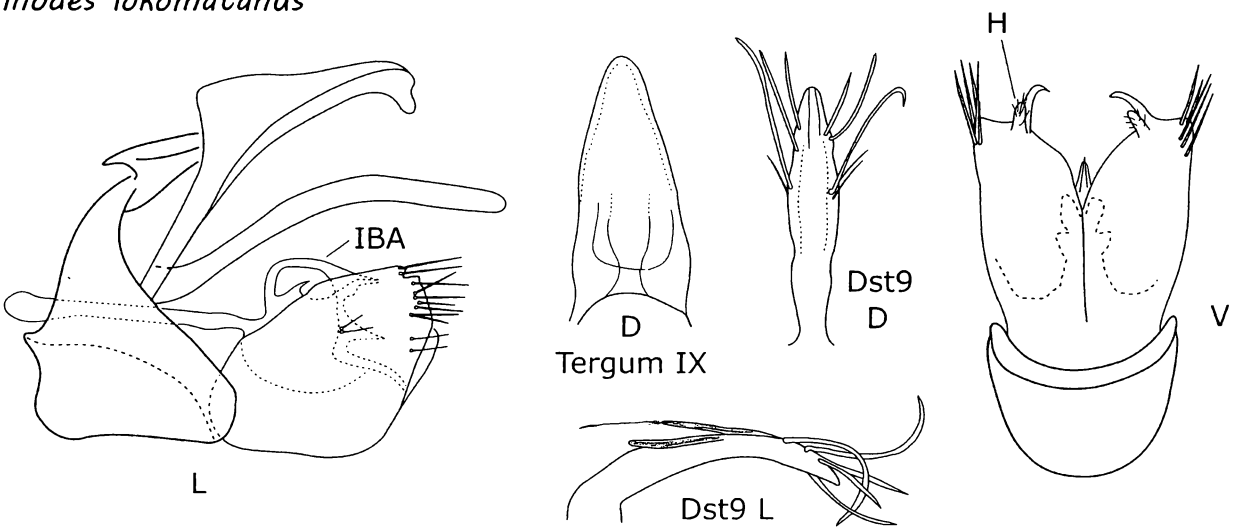
Psychomyia arassandii

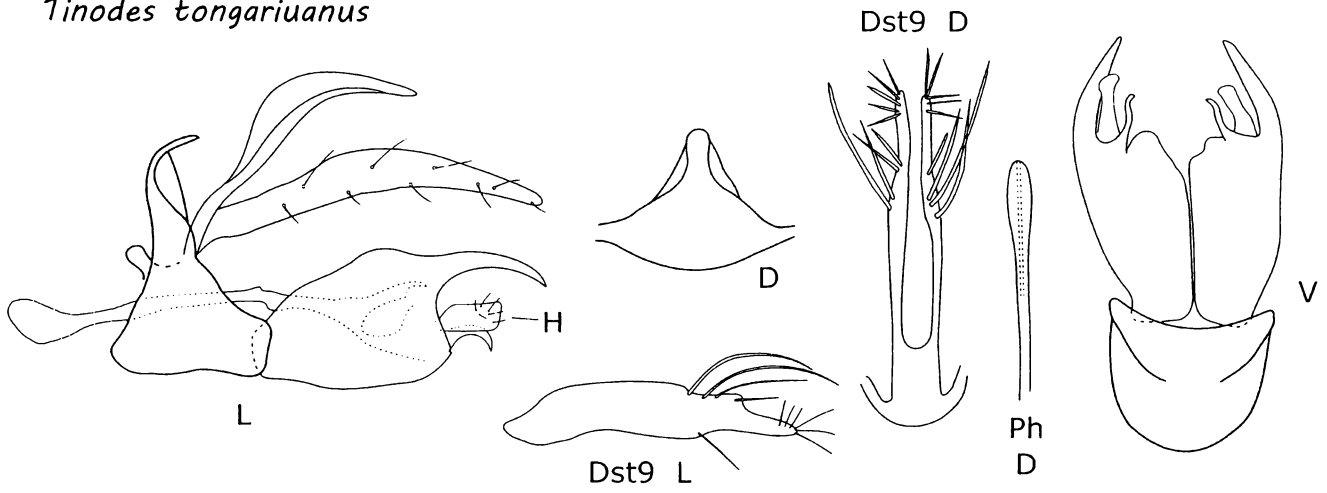
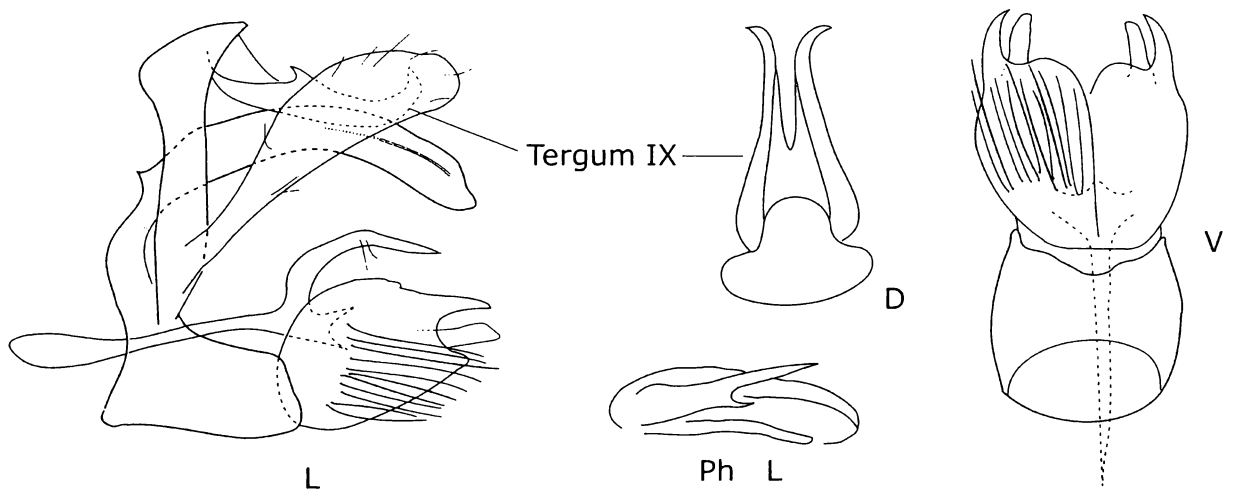
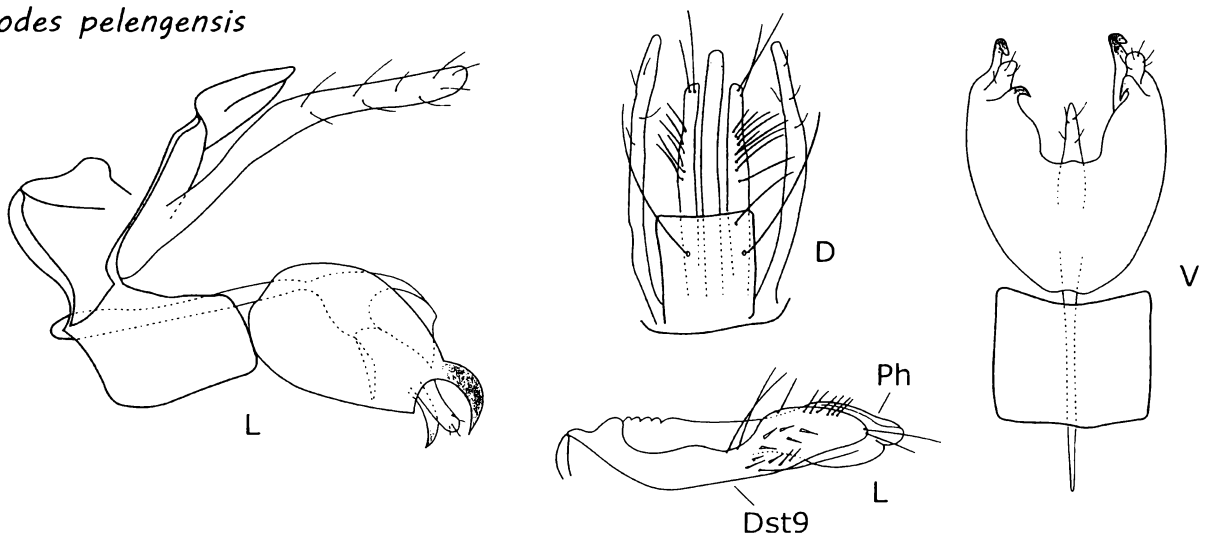


Psychomyia luwukensis

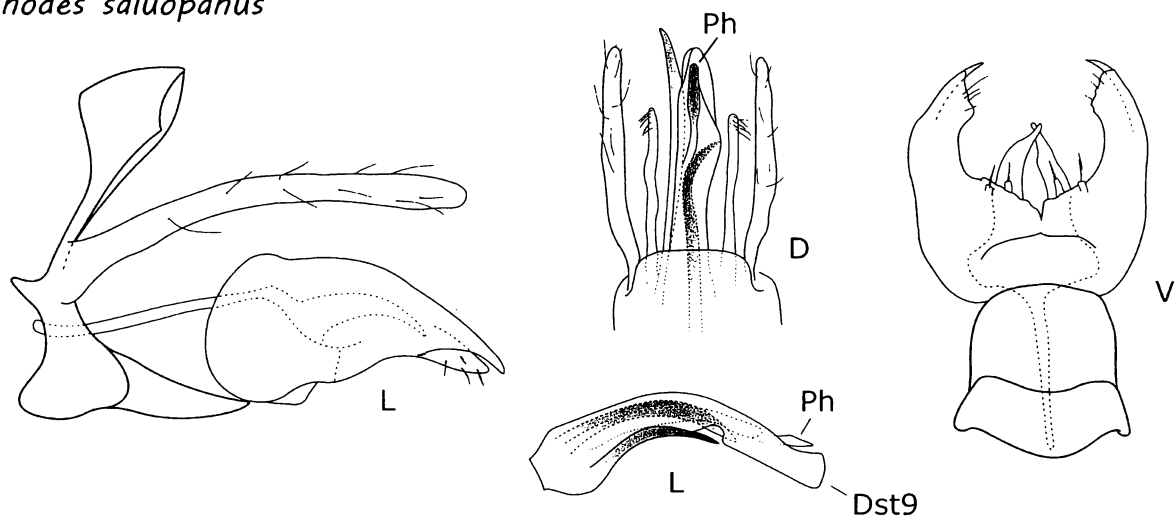


Tinodes lokomatanus

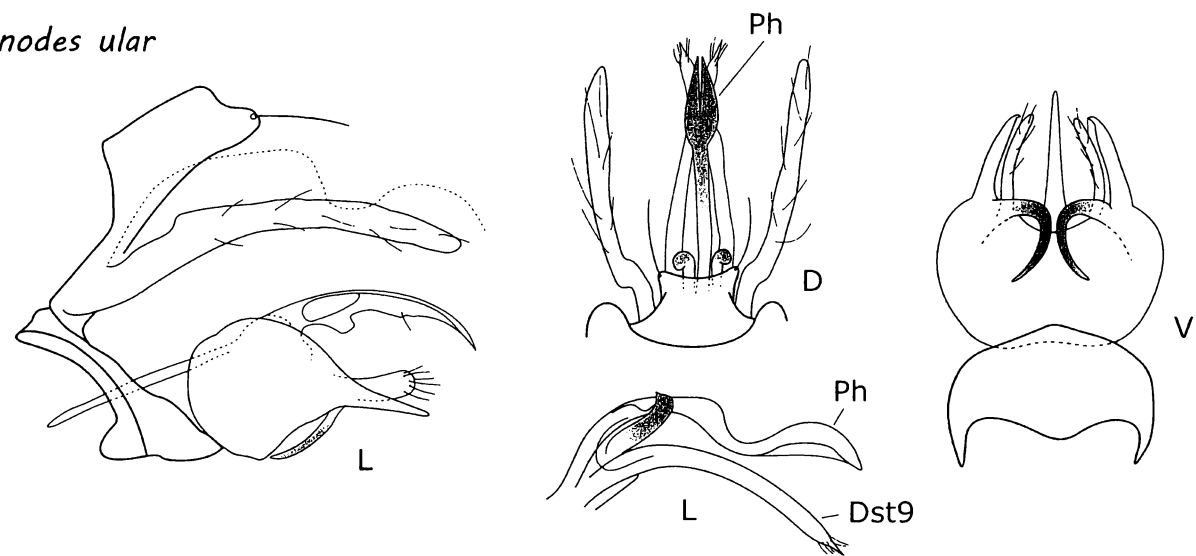


Tinodes tongariuanus*Tinodes tanatorajaensis**Tinodes pelengensis*

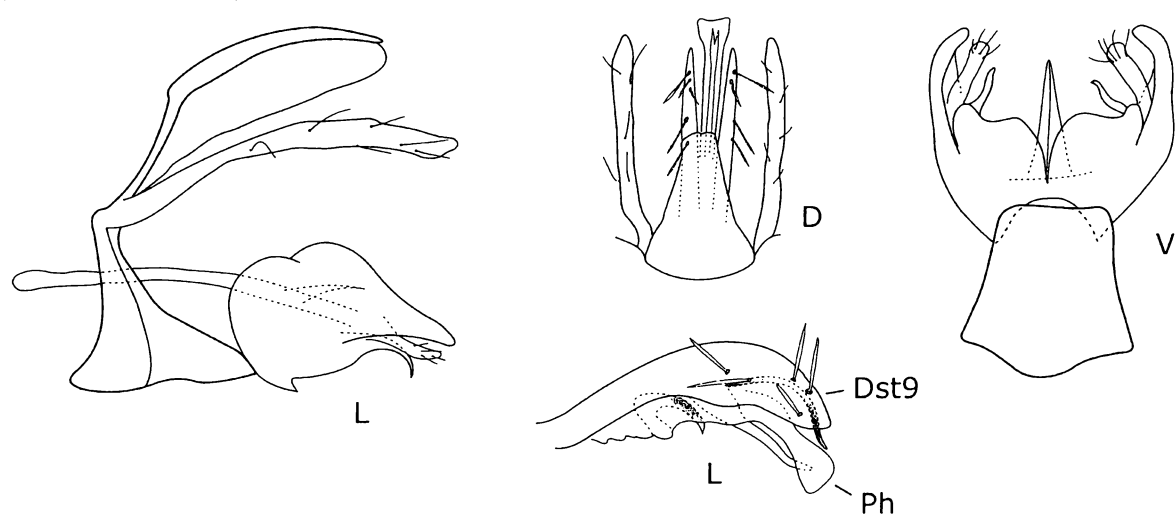
Tinodes saluopanus



Tinodes ular



Tinodes dendensis



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