

***Alishania*, a new genus with remarkable female terminalia from Taiwan, with notes on *Chrysotimus* Loew (Diptera: Dolichopodidae)**

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Abstract

Alishania elmohardyi gen. & sp. nov. (Diptera: Dolichopodidae) is described from montane forests near 2400 m on Taiwan. This monotypic genus has an unusual enlargement of the female terminalia to form a large, rounded and laterally expanded sclerotized cavity whose function is unclear. *Alishania* is probably derived from *Chrysotimus* Loew, based on head shape, thoracic and leg setation, antennal structure, and venation. The cosmopolitan genus *Chrysotimus* is reviewed and suggested to be paraphyletic.

Introduction

This brief paper describes a distinctive new monotypic dolichopodid genus, *Alishania*, all specimens of which were collected from near 2400 m in montane subtropical Taiwan. This genus has an unusual enlargement of the female terminalia, forming a rounded and laterally expanded sclerotised cavity.

The single included species, *Alishania elmohardyi*, is named in memory of D. Elmo Hardy in recognition of his work on the taxonomy of the Dolichopodidae, primarily as joint describer of 109 species of dolichopodids in his *Insects of Hawaii* (Hardy & Kohn, 1964). This new species has other connections to Hardy's work. It is part of the Oriental fauna, a focus of his taxonomic work on several fly families, as well as his scholarship as co-editor of *A Catalog of the Diptera of the Oriental Region*. Also, like much of the material Hardy studied, the specimens are part of the large holdings in the Bishop Museum, Honolulu.

Materials and Methods

This study is based on material housed at the Bishop Museum, Honolulu (BPBM) and the United States National Museum, Washington, D.C. (USNM). The morphological terminology follows McAlpine (1981). Measurements are in millimeters and were made on representative dry specimens. The position of features on elongate structures, such as leg segments, is given as a fraction of the total length, starting from the base. The relative lengths of the podomeres should be regarded as representative ratios and not measurements. The ratios for each leg are given in the following formula and punctuation: trochanter + femur; tibia; tarsomere 1/ 2/ 3/ 4/ 5. The following abbreviations and terms are used: I, II, III: pro-, meso-, metathoracic legs; C, coxa; T, tibia; F, femur; ac, acrostichal setae; ad, anterodorsal; av, anteroventral; dc, dorsocentral setae; dv, dorsoventral; hm, postpronotal setae; np, notopleural setae; pa, postalar setae; pd, posterodorsal; pm, presutural supra-alar setae; ppl, proepisternal setae; pv, posteroventral; sa, postsutural supra-alar setae; sr, presutural intra-alar setae.

Genus *Alishania* Bickel gen. n.

Etymology: *Alishania* is derived from Alishan, a locality in Taiwan where all specimens of the single included species were collected. The gender is feminine.

Type species: *Alishania elmohardyi* Bickel, sp. n.

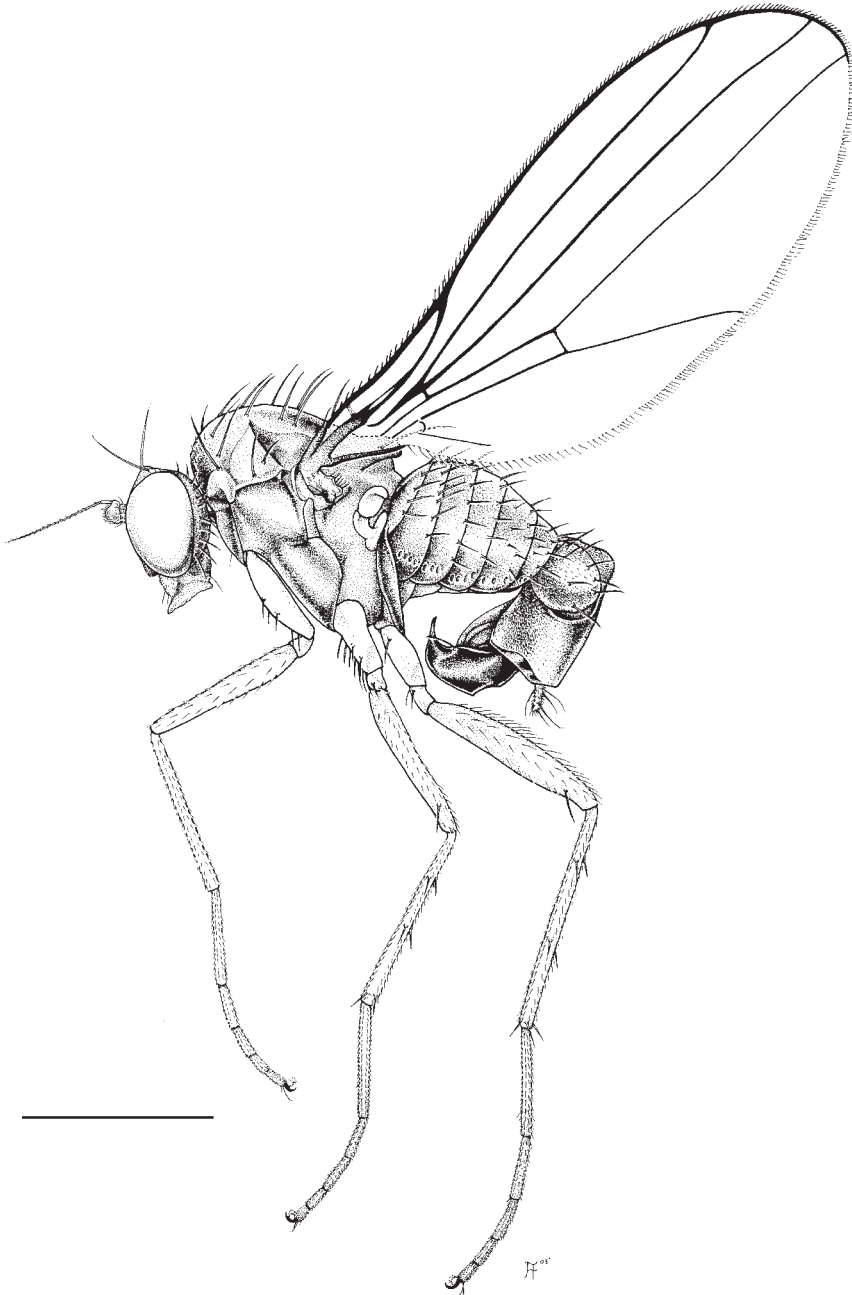


Figure 1. *Alishania elmohardyi* sp. n., male, habitus. Scale line = 1.0 mm.

Diagnosis: Length: 2.2–2.4; major head, thoracic and leg setae yellow; dorsal postcranium distinctly convex; face and clypeus wide with sides parallel; pedicel short subtriangular; mesonotum anterior of scutellum distinctly flattened; ac absent; lateral scutellar setae absent; legs yellow; FII and FIII with strong anterior subapical seta; wing distinctly longer than body; crossvein h present only as trace; R_{4+5} and M parallel to apex; M without *bosse alaire*; surstylus massive and curved, apically pointed with some short setae; female terga 3 and 4, and most stern yellow; tergum 8 greatly enlarged and laterally expanded, forming large hollow sclerotised chamber, externally glabrous.

Alishania elmohardyi Bickel **sp.n.**

(Figs. 1–3)

Type material. Holotype ♂ (BPBM 16, 512), Paratypes, 47 ♂, 43 ♀: **Taiwan:** Alishan, Chiayi Hsien, 2400 m, 12–16.vi.1965, T Maa & K.S. Lin (BPBM).

Additional material. Taiwan: ♂, “Arisan [sic.], Formosa”, 4.vi.1932, J.L. Gressitt (USNM).

Description. Male (Fig. 1): length: 2.2–2.4; wing: 2.6×1.2 .

Head: vertex, frons, and face metallic blue-green and covered with dusting of grey pruinosity; major setae yellowish; strong verticals and strong diverging ocellars present; 2 short postverticals present on dorsal postcranium; dorsal postcranium distinctly convex, so that head appears free from thorax; 7–8 postorbitals present; eye facets of uniform size; face and clypeus wide with sides parallel, and eyes distinctly separated; palp yellow with whitish pruinosity; proboscis brown; antenna dark brown; postpedicel short subtriangular; arista dorsal, and slightly longer than head height.

Thorax: mostly metallic green with dusting of grey pruinosity, except brownish adjacent to coxa II, and metepimeron mostly brownish but infuscated dorsally; setae yellow; posterior mesonotum anterior of scutellum distinctly flattened; ac absent; 6 strong dc present; 1 pa, 2 sa, 2 sr, 2 npl, 1 hm, 1 pm present; median scutellars strong, laterals absent.

Legs: coxae and remainder of legs yellow; setae yellow; CI and CII with yellow anterior hairs, and CIII with lateral seta; I: 3.0; 3.0; 1.5/ 0.7/ 0.5/ 0.5/ 0.4; leg I without outstanding hairs or setae; II: 3.5; 3.7; 2.0/ 0.8/ 0.5/ 0.3/ 0.4; FII with strong anterior subapical seta and weak av seta just distad, and no posterior subapical seta present; TII with offset ad-pd setal pairs at 1/4, and 2/5, and subapical av and pv setae; III: 3.5; 4.2; 1.8/ 1.0/ 0.6/ 0.4/ 0.4; FIII with strong anterior subapical seta and weaker av seta both at 4/5, but no posterior subapical setae present; TIII with offset ad-pd setal pairs near 1/4 and 2/3.

Wing: hyaline with veins yellow; Sc fusing with R_1 ; crossvein h present only as pale trace; R_{2+3} long, joining costa in distal sixth of wing; R_{4+5} and M parallel to apex; M without *bosse alaire*; anal vein short; CuAx ratio: 0.2; lower calypter yellow with fan of yellow setae; halter yellow.

Abdomen: preabdomen metallic green with short yellowish vestiture; segment 7 short; sternum 8 forming cap over rather small hypopygial foramen, which is left lateral in position; hypopygium (Figs. 3a,b) dark brown, massive; epandrium subrectangular; hypandrium curved and with distal rough surface; aedeagus with curved pointed projections, and asymmetrical in ventral view (Fig. 3b); surstylus massive and curved, apically pointed with some short setae, and asymmetrical, with right surstylus distinctly larger than left; cercus short and blunt.

Female: (Fig. 2) similar to male except as noted: distinctly larger, wing length 2.9×1.2 ; face only slightly wider; abdominal terga 1 and 2 metallic green, although tergum 2 yellow laterally; terga 3 and 4 yellow; sterna 1–6 yellow; 5–7 dark brown-metallic green; segment 8 (Figs. 3c, d) greatly enlarged and laterally expanded, forming large hollow sclerotized chamber, externally dark brown and glabrous; tergum 9 forming downflexed extension of tergum 8, and with long setae; cercus short.

Remarks. *Alishania* is a monotypic genus comprising *A. elmohardyi*, sp. n., known only from the type locality at 2400 m in Alishan, Taiwan. Hsieh *et al.* (1997) provided a summary of the montane forest vegetation of Taiwan, and Alishan at 2400 m is probably within the upper *Quercus* zone, a moist montane evergreen broadleaf forest. *Alishania* is possibly endemic to Taiwan.

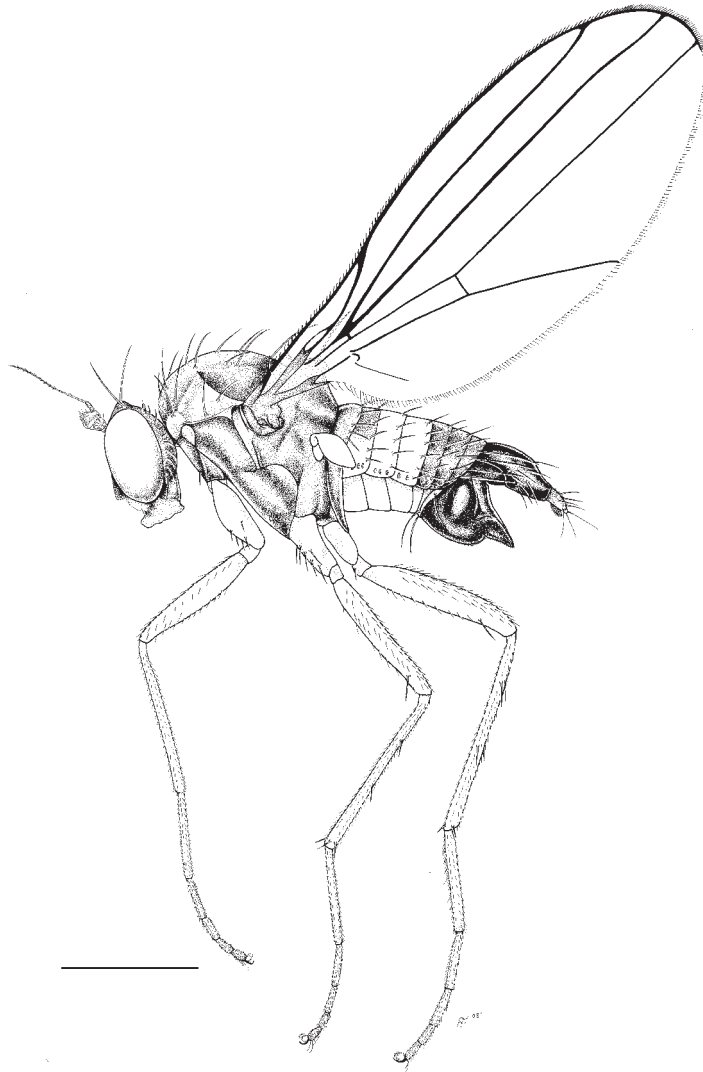


Figure 2. *Alishania elmohardyi* sp. n. female, habitus. Scale line = 1.0 mm.

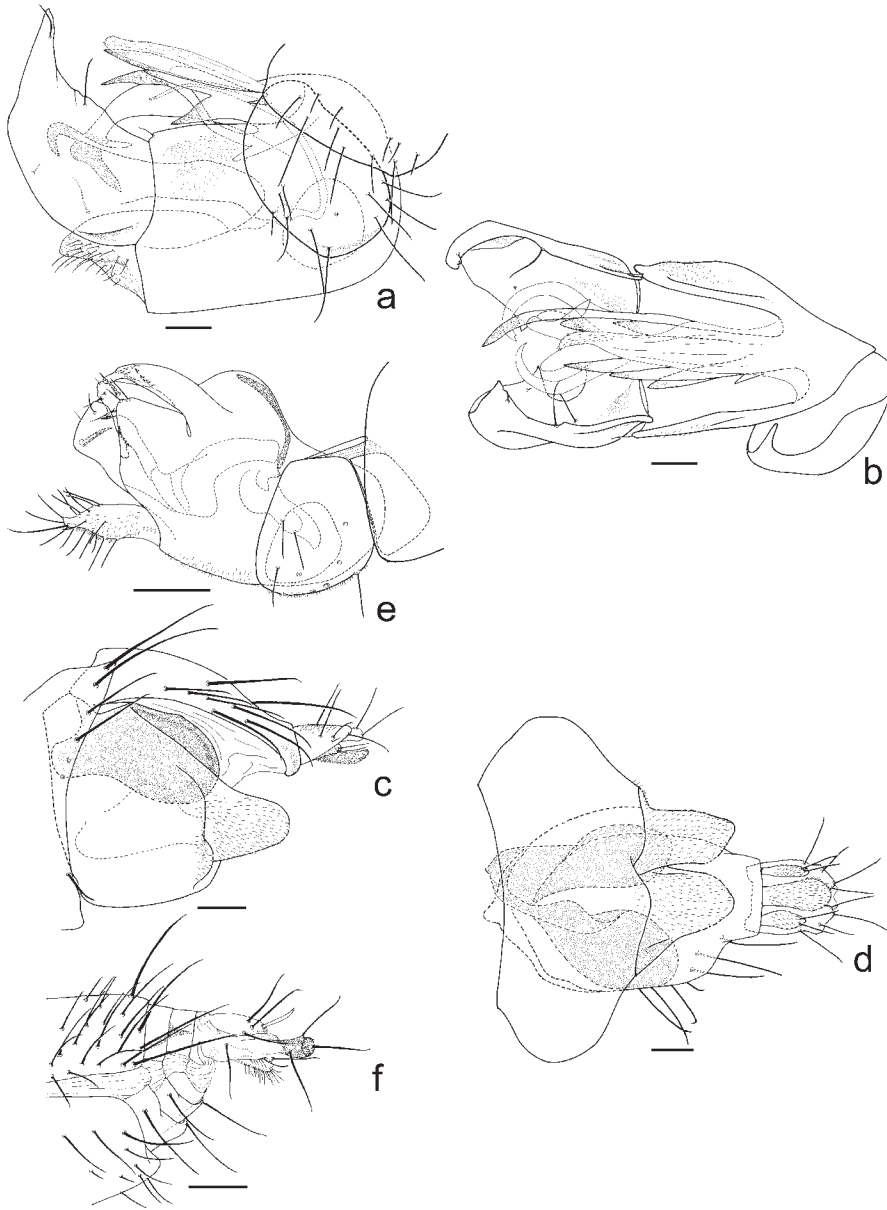


Figure 3. *Alishania elmohardyi* sp. n.: **a.** hypopygium, left lateral; **b.** hypopygium, ventral; **c.** female oviscapt, left lateral; **d.** female oviscapt, ventral. *Chrysotimus pusio* Loew: **e.** hypopygium, left lateral; **f.** female oviscapt, left lateral. Scale line = 0.1 mm.

The female terminalia of *Alishania* requires discussion. Although the male hypopygium is rather large, other dolichopodid taxa (e.g., some Dolichopodinae, some Sciapodinae, *Babindella*) also have developed enlarged hypopygia (sometimes almost equal in size to the preabdomen), without any corresponding modification of the female terminalia. In female *Alishania*, the greatly enlarged and laterally expanded sclerotised chamber formed by segment 8 is striking (Fig. 2). What is the function of this chamber? Is it solely for receiving the large hypopygium during mating, or might it have a possible brooding function? These questions cannot be answered without study of the species' biology. However, the extreme morphology of the *Alishania* female terminalia almost brings to mind a "hopeful monster" explanation for this modification.

Phylogenetic Relationships

What are the phylogenetic relationships of *Alishania*? Apart from the enlarged male hypopygium and the highly modified female terminalia, it shares many characters with the cosmopolitan genus *Chrysotimus* Loew, and probably is directly derived as a local endemic from this genus (see below for a discussion of the genus *Chrysotimus* and its paraphyly).

I. Characters shared by *Alishania* and *Chrysotimus* (not necessarily derived).

- Postpedicel subrectangular with dorsal arista.
- Postcranium strongly convex
- Face subequal and parallel sided in both sexes.
- Posterior mesonotum strongly flattened
- Lateral scutellar setae reduced to tiny setae or absent.
- Legs without strong male secondary sexual characters
- Leg I without major setae, and tibia I without distal ad serration of short setae.
- Femora II and III with anterior preapical setae
- Tibiae II and III with ad and pd setae, often as offset pairs.
- Wings very long, least one-quarter longer than body length in both sexes (apart from many hydrophorine genera and *Campsicnemus* spp., in most Dolichopodidae, wing and body length are subequal).
- R₄₊₅ and M and distinctly parallel.
- M straight, without any trace of flexion or *bosse alaire*.
- Humeral crossvein (h) very faint reduced to lost.
- With very long distal CuA (CuAx ratio very low).
- Abdomen often with two or more bright yellow terga, especially in females, which are sometimes also present in conspecific males.
- Females distinctly larger than males.

II. Autapomorphies of *Alishania* (with respect to *Chrysotimus*)

- Hypopygium greatly enlarged with massive curved surstyli
- Aedeagus, asymmetrical with curved pointed projections.
- Female terminalia with greatly enlarged and laterally expanded sclerotised chamber formed by segment 8.

Notes on the *Chrysotimus* Loew and related genera

Diagnosis: Genus *Chrysotimus*: rather small (1.8–3.2 mm wing length) and stout bodied flies with wings distinctly longer than body; major head, thorax and leg setae often yellow or brownish with yellow reflections.

Head : spheroidal, not much higher than wide; dorsal postcranium convex; vertex not excavated; scape dorsally bare; face bare of setae; eye not strongly ovate, but almost circular; face parallel sided, and of subequal width in both sexes; arista dorsal to apical on subtriangular postpedicel.

Thorax: metallic green; rather broad, not elongate; posterior mesonotum distinctly flattened and slightly depressed between dc setae, and distinct from curved anterior mesonotal surface; ac biserrate or absent; scutellum with one pair marginal setae only, or sometimes with short weak lateral setae.

Legs. often mostly yellow in color; tibia I without ad setal serration; femora II and III with anterior preapical setae, and with weaker preapical pv setae; tibia II and III with ad and pd setae, often as off-set pairs.

Wing; at least one-quarter longer than body length in both sexes; wing rather broad, and rectangular in shape; R_{4+5} and M each straight and distinctly parallel; M without any trace of flexion or *bosse alaire*.

Abdomen. often with two or more bright yellow terga, especially in females, which are sometimes also present in conspecific males.

Male hypopygium (Fig. 1e, *C. pusio* Loew, type species of genus) either encapsulated or slightly pedunculate; abdominal segment 7 (peduncle) with distinct tergum and sternum, never greatly prolonged; sternum 8 large, ovate, covering hypopygial foramen on left side; hypopygial foramen left lateral in position and small, almost circular; epandrium rather massive; hypandrium fused to capsule at base; surstyli broad and fused to epandrium, and with medially directed setae and projections; cercus short, digitiform.

Female (Fig. 1f, *C. pusio*, type species); tergum and sternum unmodified, bare; tergum 9 split medially into two hemitergites, and with long setae and pale blade-like seta as shown; cercus elongate and digitiform, with setae as shown.

Remarks. Most *Chrysotimus* species are less than 2.0 mm long, usually without prominent male modifications, and are often overlooked or relegated to some small-sized “*Chrysotus*-like” residue. Additionally, the tendency of specimens to collapse when dry mounted has not increased their attractiveness to being studied. Apart from commonly being included with *Chrysotus* in collections, *Chrysotimus* has been mistaken for, and even described as *Thrypticus* Gerstäcker (Medeterinae) primarily because of its often yellow setae, depressed posterior mesonotum, and bright metallic green color.

Chrysotimus is almost cosmopolitan, and occurs primarily in temperate and upland tropical moist forests. In tropical Costa Rica, for example, *Chrysotimus* is known only from forests above 1500 m (the occurrence of *Alishania* in montane forests near the Tropic of Cancer in Taiwan is not inconsistent with being derived from *Chrysotimus*). The genus is particularly diverse in the southern hemisphere temperate forests of Australia/ Tasmania, New Zealand, New Caledonia, and Patagonia, where large numbers are often collected in yellow pans and Malaise traps. However, these southern *Chrysotimus* faunas are poorly known. To date, 37 *Chrysotimus* species have been described, a fraction of the true number: Australasia (13), Orient (2), Afrotropics (0), Palearctic (8), Nearctic (7), and Neotropical (7). I have also seen undescribed species of this genus in Baltic Amber inclusions.

Although *Chrysotimus* had been placed in the Sympycninae, Robinson (1970) referred it to the Peloropecinae, a subfamily that comprises a number of small-sized genera that mostly share a flattened posterior mesonotum, veins R_{4+5} and M parallel, and with anterior preapical setae present on femora II and III. However, the male postabdomen of included genera display varied morphology, suggesting the subfamily is a heterogeneous assemblage.

As discussed above, *Chrysotimus* is the most probable ancestor and therefore paraphyletic with respect to *Alishania*. In addition, *Chrysotimus* is probably paraphyletic with respect to several other genera of limited distribution. Such paraphyly must be accepted, and indeed it often is, at least tacitly, for many large complex insect genera. *Chrysotimus* is a cosmopolitan genus with a rich but poorly known fauna that dates to at least the geological period of Baltic Amber (Eocene-Oligocene). It therefore is not surprising that such a genus has served as a paraphyletic “mother taxon.” Many complex cosmopolitan genera are likely to be paraphyletic with respect to derived daughter taxa in just such a matter. At this stage it is premature to split *Chrysotimus* for several reasons, not the least of which is retaining the overall internal unity that allows the genus to be recognized and keyed.

The following genera are allied to *Chrysotimus*:

1. *Alishania* gen. nov, a monotypic genus restricted to montane Taiwan (described above).
2. *Nanomyia* Robinson. This monotypic genus comprises *N. barbata* (Aldrich), known from marine littoral habitats in eastern USA, the Caribbean, and Pacific Mesoamerican coast. It has a row of setae near clypeus in both sexes (autapomorphy).
3. *Fedshenkomyia* Stackelberg, a monotypic genus restricted to Turkistan. I have not seen specimens of this genus, but Negrobov (1968) illustrated the hypopygium of *F. chrysotimiformis* Stackelberg.
4. *Guzeriplia* Negrobov, a genus with two species restricted to the Caucasus. I have seen a male paratype (USNM) of *G. chlorina* Negrobov, and although the specimen is collapsed, it has the overall habitus and characters of *Chrysotimus*, including long pale yellow setae on the head and thorax, biseriate ac, and scutellum with strong median seta and short side hairs. It is distinguished by a rather bulbous hypopygium with elongate surstyli and cerci, as figured in Negrobov (1968). *Guzeriplia* is within the range of variation in *Chrysotimus*, and probably needs to be placed in synonymy.

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Literature Cited

- Hardy, D.E & M.A. Kohn.** 1964. Family Dolichopodidae Latreille. *Insects of Hawaii* **11**: 13–256.
- Hsieh, C.F., W.C. Chao, C.C. Liao, K.C. Yang, & T.H. Hsieh.** 1997. Floristic composition of the evergreen broad-leaved forests of Taiwan. *Natural History Research, Special Issue* **4**: 1–16. Chiba, Japan.
- McAlpine, J.F.** 1981. Morphology and terminology, p. 9–64. *In*: McAlpine, J. F. *et al.* (coordinators), *Manual of Nearctic Diptera*. Volume 1. Agriculture Canada, Ottawa.
- Negrobov, O.** 1968. A new genus and species of the Dolichopodidae (Diptera). *Zoologicheskii Zhurnal* **47**: 470–473. [In Russian.]
- Robinson, H.** 1970. The subfamilies of the family Dolichopodidae in North and South America (Diptera). *Papeis Avulsos de Zoologia, São Paulo* **23**(6): 53–62.