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The genus *Microdonophagus* Schauff (Hymenoptera: Eulophidae), with description of a new species

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Abstract

A second species of the hitherto monotypic genus *Microdonophagus* Schauff is described as *Microdonophagus levis* **sp. nov.** The species is described from material collected at La Selva Biological Research Station in Costa Rica. Unlike the previously described species, *Microdonophagus woodleyi* Schauff, it is described from females only and the biology is not known. The addition of a second species of *Microdonophagus* enhances the possibilities to assess the characters defining the genus, some of which are introduced as new here.

Key words: Chalcidoidea, Entedoninae, neotropical, La Selva, Costa Rica, taxonomy

Introduction

The type species of the genus *Microdonophagus*, *M. woodleyi* Schauff, is odd, in both its highly dimorphic male and its biology. The genus and species were both described by Schauff (1986) and until now *Microdonophagus* has contained only a single species. Hansson (2002) updated the distributional data of *M. woodleyi*, from Panama to Colombia, but no additional species had been found at that time.

The male of *Microdonophagus woodleyi* has a very peculiar appearance (see fig. 1 in Schauff, 1986). The small eyes, strongly swollen femora, and the reduced wings are unique features within the subfamily Entedoninae. Males of some species of *Melittobia* and *Tachinobia repanda* Bouček also have these characters but belong in Tetrastichinae (Eulophidae). Many males of fig-wasps (Agaonidae) have adaptations similar to those of males of *M. woodleyi* (e.g. Bouček 1988), including small eyes (missing in some species), short wings (missing in some species) and swollen femora. The scattered occurrence of these adaptations represents convergent evolution. The female also has several unique and presumably derived characters (see below), some of which are introduced as new here.

This is a remarkable genus also from a biological view. The specimens in the type series of *M. woodleyi* were reared from larvae of *Microdon* sp. (Diptera: Syrphidae) living in nests of the ant *Tapinoma fulvum* Wheeler (Hymenoptera: Formicidae) (Schauff 1986). The 41 females and five males in the type series of *M. woodleyi* were evidently reared from more than one host larva but no specific account of the number of wasps that emerged from each host-larva was given. However, in the description of *M. woodleyi*, Schauff stated that he had seen a single *Microdon* larva in alcohol with 60–70 specimens of *Microdonophagus* pupae on the inside of the larva. Clearly, as stated by Schauff, *M. woodleyi* is a gregarious parasitoid.

A second species of *Microdonophagus* from Costa Rica is described here. The inclusion of a second species improves the possibilities to assess the characters defining the genus. The description of the new species is based on females only. No males have been found, but if the biology of this second species is similar to *M. woodleyi* then males probably will be found only in ant nests. The description is based on females which were swept at La Selva Biological Research Station, a locality situated in premontane rainforest in Costa Rica.

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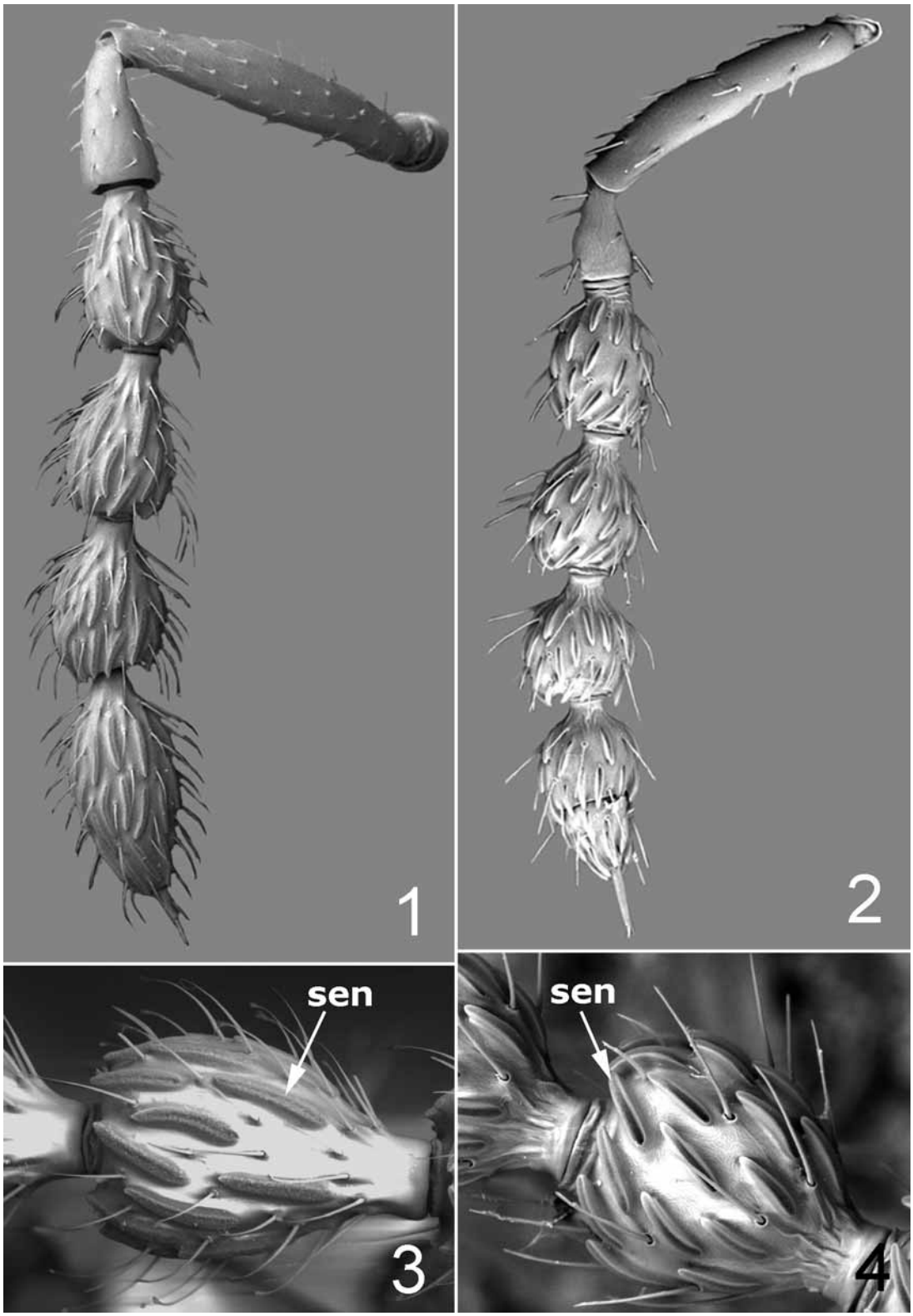
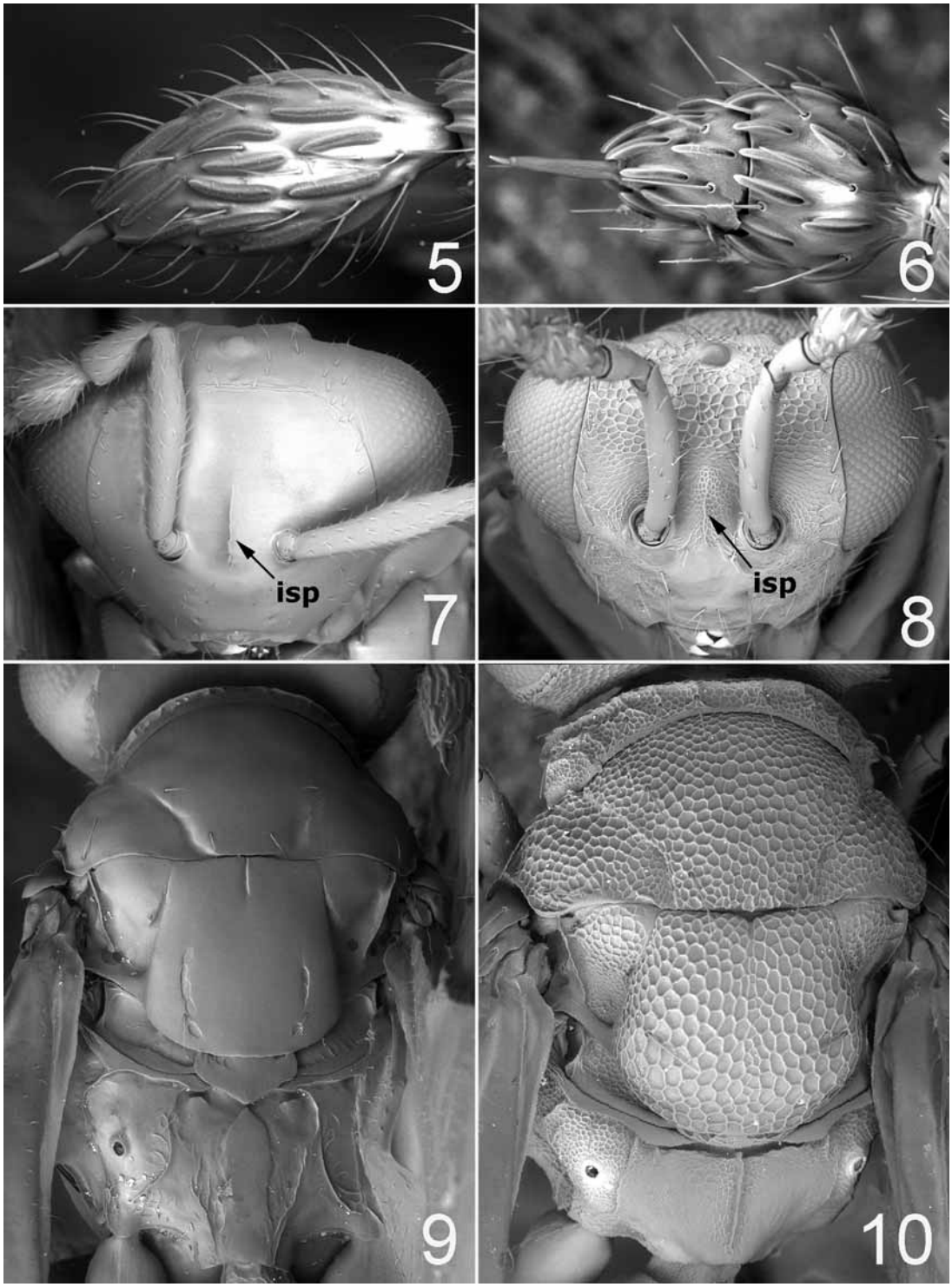
The morphological terms used in this article follow the nomenclature accounted for in Gibson et al. (1997).



FIGURES 1–4. *Microdonophagus* spp. 1. *M. levis*, antenna, female. 2. *M. woodleyi*, antenna, female. 3. *M. levis*, second funicular segment, female. 4. *M. woodleyi*, second funicular segment, female. Abbreviation: *sen* = longitudinal sensillum.



FIGURES 5–10. *Microdonophagus* spp. 5. *M. levis*, antennal clava, female. 6. *M. woodleyi*, antennal clava, female. 7. *M. levis*, head frontal, female. 8. *M. woodleyi*, head frontal, female. 9. *M. levis*, thoracic dorsum, female. 10. *M. woodleyi*, thoracic dorsum, female. Abbreviation: *isp* = interantennal crest.

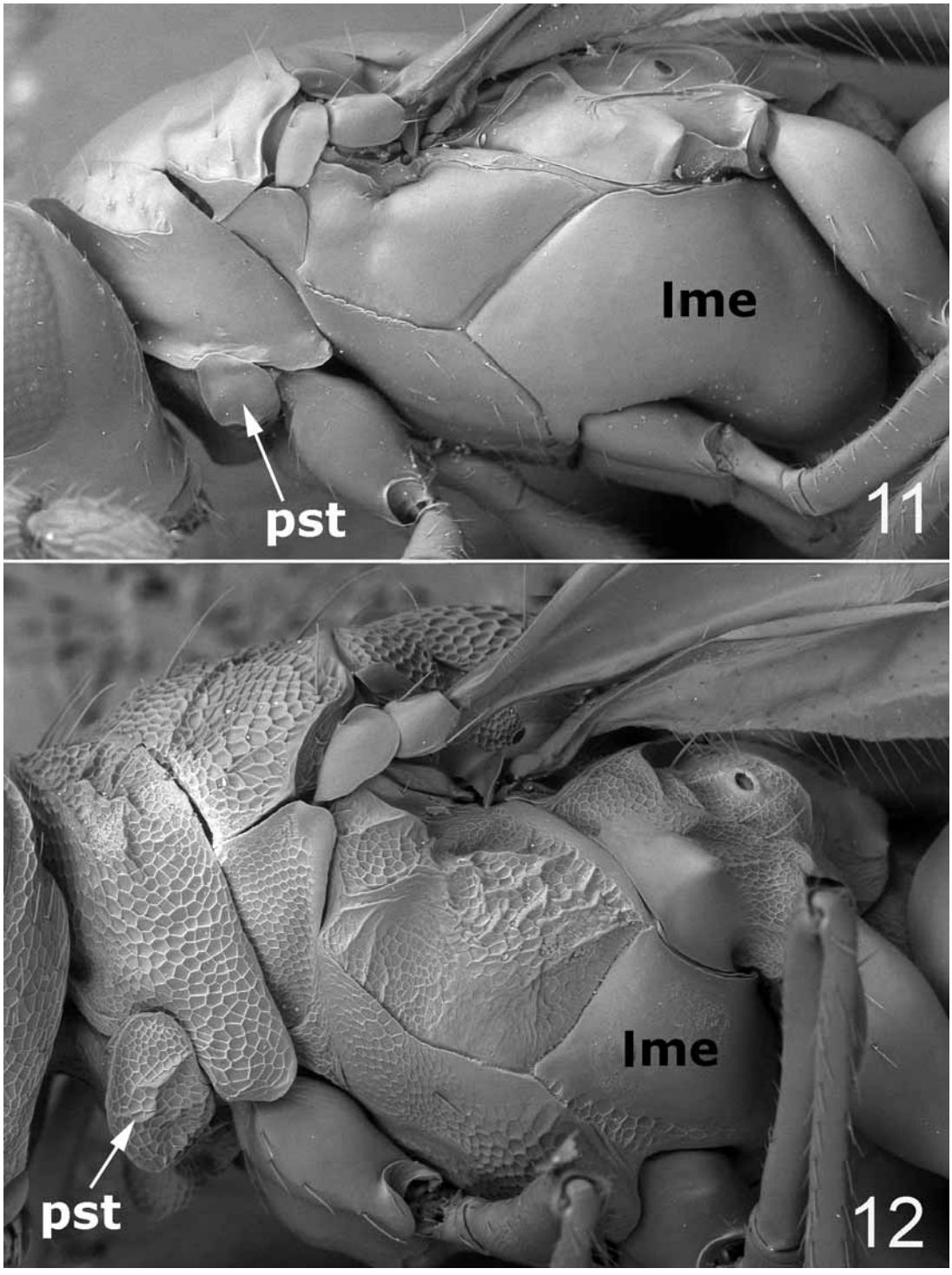
***Microdonophagus levis* sp. nov.**
(Figs 1, 3, 5, 7, 9, 11)

Diagnosis. Differs from *M. woodleyi* in several characters, but the most distinctive feature is females have the head and mesosoma smooth and shiny (Figs 7, 9, 11), wheras those of *M. woodleyi* have the head and

mesosoma strongly reticulate (Figs 8, 10, 12); also the strongly enlarged lower mesepimeron is a very distinct feature of *M. levis* (Fig. 11).

Description. *Female*. Length 1.4 mm.

Scape yellowish-brown, pedicel and flagellum pale brown. Head and body including gaster dark brown and shiny. Coxae pale brown; femora, tibiae and tarsi yellowish-brown. Wings hyaline.



FIGURES 11–12. *Microdonophagus* spp. 11. *M. levis*, mesosoma lateral, female. 12. *M. woodleyi*, mesosoma lateral, female. Abbreviations: *lme* = lower mesepimeron; *pst* = prosternum.

Flagellum without anelli, with three funicular segments and a two-segmented clava (the claval segments are partly to completely fused) (Figs 1, 5). Frons smooth and shiny (Fig. 7), without antennal scrobes and frontal suture, with a narrow and sharp process (interantennal crest) between toruli. Vertex smooth and shiny. Occipital margin sharp. Eyes with scattered short hairs. Ratios of height of eye/length of malar space/width of mouth 1.6/1.0/1.0; distances between posterior ocelli/between posterior ocelli and eyes/between posterior ocelli and occipital margin 5.1/3.3/1.0; width of head/width of thorax 1.3.

Mesoscutum smooth and shiny (Fig. 9); midlobe with two pairs of setae; notauli as wide grooves in posterior half, not visible in anterior half. Scutellum smooth and shiny (Fig. 9); with one pair of setae; with a distinct groove in anteromedian one-fifth; with sublateral grooves in posterior half. Propodeum with a wide and flat median carina that has anterior part pointed (Fig. 9); with wide sublateral grooves; lateral to grooves with two complete longitudinal carinae, one inside and one outside the spiracle; propodeal callus with six setae; propodeal surface smooth. Forewing with 2–3 setae on dorsal surface of submarginal vein; costal cell bare; speculum closed below; postmarginal vein not visible. Ratios of length of wing/length of marginal vein/height of wing 1.8/1.0/1.0.

Petiole as long as wide, dorsal surface with strong sculpture. Gaster circular; gastral tergites smooth and slightly shrivelled. Ratio of length of mesosoma/length of gaster 1.3.

Male. Unknown.

Material examined. Holotype female COSTA RICA, Heredia, La Selva Biological Research Station, 1026'N, 8401'W, 75 m, 27–28.ii.2003, J.S. Noyes, in the Natural History Museum, London. Paratype: A female from same locality as holotype but collected 23–24.ii.2004, in Instituto Nacional de Biodiversidad in Costa Rica.

Biology. Unknown.

Distribution. Costa Rica.

Etymology. Named for the smooth and shiny head and body: *levis*, Latin for smooth.

Microdonophagus woodleyi Schauff

(Figs 2, 4, 6, 8, 10, 12)

Microdonophagus woodleyi Schauff, 1986:170–172 Holotype female in the United States National Museum of Natural History, Washington, D.C.

Remarks. The material of *M. woodleyi* used for the SEM photos in this article is the non-type female from Colombia mentioned in Hansson (2002).

Discussion

Schauff (1986) gave tentative synapomorphies for *Microdonophagus* and Hansson (2002) suggested some additional apomorphies as follows:

1) Stigmal vein strongly reduced with sensillae arranged in a Y (Schauff).

2) Lower mesepimeron (posterior mesepimeron according to Schauff (1986)) enlarged and meeting between the mid- and hindcoxae (Schauff).

3) Propodeum with single (median) longitudinal carina (Schauff).

4) Prosternum expanded, with an anteroventral carina (Schauff).

5) Head with a genal carina running from edge of mouth opening up to middle of eye (Hansson).

6) Forewing with submarginal and marginal veins fused, without a break between them (Hansson).

With the addition of *M. levis* in *Microdonophagus* this list must be altered. Number 1 is still valid, and similar in both species. Number 2 is also still valid but the lower mesepimeron is much more strongly enlarged backwards in *M. levis* (Fig. 11) than in *M. woodleyi* where it is only moderately enlarged (Fig. 12). Number 3 is still valid but the appearance of the median carina is very different between the two species. In *M. woodleyi* the median carina is narrow and distinctly raised above the surface of the propodeum (Fig. 10), whereas in *M. levis* it is wide, flat and hardly raised above the surface of the propodeum (Fig. 9). The appearance of the propodeum in *M. levis*, with a median carina and submedian grooves to either side of the median carina, is similar to the state in the genera *Horismenus* Walker, *Paracrias* Ashmead, and some species of *Pediobius* Walker. It is possible that this character state is a synapmorphy for these groups, and that the state in *M. woodleyi*, which is significantly different from *M. levis*, has been derived from this. However, such a hypothesis must be based on further analyses including other morphological data and perhaps also molecular data. Number 4 is still valid with the prosternum similar in both species apart from being reticulate in *M. woodleyi* (Fig. 12) and smooth in *M. levis* (Fig. 11). Numbers 5 and 6 are present only in *M. woodleyi* and hence useful only on the species-level.

Apart from the above-mentioned apomorphies, females of *Microdonophagus* have some additional apomorphies on the antennal flagellum. The female flagellum has three funicular segments and a two-segmented clava (the claval segments are partly to completely fused in *M. levis*) (Figs 1–2), which is a common state within the subfamily, however, the sensilla on the flagellomeres differ from other Entedoninae. Apart from trichoid sensilla (i.e. setae functioning as mechanoreceptors) there is only one type of sensillum present and this differs from sensilla found in other Entedoninae. The sensillum appears to be a kind of longitudinal sensillum (multiporous plate sensillum (MPS) sensu Barlin and Vinson (1981)), but differ from other Entedoninae in having the outer surface concave (Figs 1–6). The MPS in other Entedoninae have the outer surface convex. The concavity is strongest in *M. woodleyi* (Fig. 4); it is weaker but still discernible in *M. levis* (Fig. 3). Other Entedoninae also have a third type of sensillum, a capitate peg sensillum (e.g. Ryan 2002), which is a sensillum situated in a pit, with a stem and with apical part expanded as a sphere or with the sphere drawn-out. *Microdonophagus* lacks capitate peg sensilla. Furthermore, on the antennal clava the border between the terminal spine (spicula) and the clava is continuous in other entedonines, wheras in *Microdonophagus* the spicula is distinctly delimited from the clava (Figs 5–6). In other Entedoninae the seta at the apex of the spicula appears ordinary (more or less thin and long) but in *Microdonophagus* it is short and stout (Figs 5–6). These features of the female antenna are probably derived and because they are unique for *Microdonophagus* they likely are autapomorphies that should be added to the list of apomorphies that define the genus, as follows:

- Longitudinal sensillum (MPS) on the flagellomeres with outer surface concave (Figs 1–6).
- Capitate peg sensillum on the flagellomeres missing (Figs 1–6).
- Spicula distinctly delimited from antennal clava (Figs 5–6).
- Apical seta on spicula short and stout (Figs 5–6).

Also, females of both species of *Microdonophagus* have an interantennal crest on the frons (Figs 7–8), and this is an apomorphy. This apomorphy also occurs in some species of *Horismenus* (Hansson 2009).

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