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Journal of Natural History

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/tnah20>

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Published online: 02 Dec 2010.

To cite this article: R. R. Askew, J. F. Gómez & J. L. Nieves-Aldrey (2007) On the parasitoid community of *Aulacidea laurae* (Hym., Cynipidae), with description of a new species of *Adontomerus* (Hym., Torymidae), *Journal of Natural History*, 41:29-32, 1765-1773, DOI: [10.1080/00222930701500092](https://doi.org/10.1080/00222930701500092)

To link to this article: <http://dx.doi.org/10.1080/00222930701500092>

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On the parasitoid community of *Aulacidea laurae* (Hym., Cynipidae), with description of a new species of *Adontomerus* (Hym., Torymidae)

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(Accepted 20 May 2007)

Abstract

An account is given of parasitoids (Hym., Chalcidoidea) reared from Spanish galls of *Aulacidea laurae* (Hymenoptera, Cynipidae) which develop in achenes of *Scorzonera laciniata* (Asteraceae). The parasitoid community includes *Adontomerus brevicaudatus* (Hym., Torymidae) which is described as new. Final instar larva of the new species is also described. The generic placement of *A. brevicaudatus* and the composition of the parasitoid community are discussed.

Keywords: *Adontomerus*, *Chalcidoidea*, *Cynipidae*, *Eupelmidae*, *parasitoid*, *Scorzonera*, *Torymidae*

Introduction

The aylacine cynipid gall wasp *Aulacidea laurae* Nieves-Aldrey was described from specimens collected by sweep-net in central Spain (Nieves-Aldrey 1992). Subsequently, it was reared from galls collected in the south of France (Nieves-Aldrey 1995) and later from further localities in central Spain (Nieves-Aldrey 2001a, 2001b). The gall is very distinctive. It develops in an achene of *Scorzonera* (= *Podospermum*) *laciniata* (Asteraceae) as a swelling of the stem, about 10 mm × 2 mm, between the achene and pappus. Galled achenes fall to the ground in mid-summer. *Aulacidea laurae* is univoltine.

In common with other Cynipidae inducing galls on herbaceous plants, *A. laurae* was found to support a chalcid parasitoid fauna, the most numerous member of which is a new species of Torymidae described below.

Adontomerus brevicaudatus Askew and Nieves-Aldrey, sp. nov.
(Figures 1–4)

Description

Female. Body green to blue-green, bronze tints very weak, head and thorax rather dull, gaster shining. Antenna with scape and pedicel metallic; flagellum dark brown.

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Figure 1. *Adontomerus brevicaudatus* n. sp., adult female, unless otherwise specified. (A) Head, anterior view; (B) head, posterior view; (C) antenna; (D) detail of pedicel and anellus; (E) adult male, detail of pedicel and anellus; (F) mesosoma, dorsal view.

Legs with coxae and most of femora with metallic reflections, concolorous with thorax; apices of all femora and more distal parts of legs testaceous to pale brown; meso- and metatibiae somewhat darkened medially; tarsi with last segments and pretarsi dark brown.

Figure 2. *Adontomerus brevicaudatus* n. sp. (A) Detail of sculpture and setae of mesosoma; (B) posterior half of mesosoma, dorsal view; (C) posterior leg; (D) metasoma of female, lateral view; (E) detail of venation of fore wing, male; (F) fore wing, female.

Wings clear; venation pale yellow; tegulae pale testaceous. Ovipositor dark brown. Length (including ovipositor) 3.0 mm.

Head in dorsal view only slightly broader than mesoscutum, $2.1 \times$ as broad as long; temples about one-third length of an eye; POL $2.4 \times$ OOL, posterior ocellus separated from orbit by about $2 \times$ its diameter. Head in front view (Figure 1A) $1.15 \times$ as broad as high; malar space about one-third the height of an eye; torulus far above level of lower orbit, separated from anterior margin of clypeus by about half of the distance separating it from anterior ocellus; scrobes shallow; white scale hairs on face relatively narrow, not

Figure 3. *Adontomerus brevicaudatus* n. sp., final instar larva. (A) Ventral view; (B) lateral view; (C) posterior leg; (D) mouthparts; (E) left mandible; (F) right mandible.

conspicuous. Occiput with a weak carina (Figure 1B), highly vaulted but flattened dorsally and not extending below level of top of foramen magnum. Antenna (Figure 1C, 1D) with scape not nearly reaching level of anterior ocellus, slightly more than $4\times$ as long as broad; length of pedicel plus flagellum $0.95\times$ head breadth; pedicel about $1.6\times$ as long as broad, slightly longer than anellus plus first funicle segment (F1), quite densely pilose; flagellum

Figure 4. *Adontomerus brevicaudatus* n. sp. (A) Adult male habitus; (B) adult female habitus; (C) larva inside a dissected gall; (D) host galls in achenes of *Scorzonera laciniata*; (E) galled achene.

stout, comprising one anellus, seven funicle segments and a three-segmented clava. Anellus and funicle segments transverse (Figure 1D); F1 distinctly broader than pedicel, about $2 \times$ as broad as long; F2 slightly broader and longer than F1, F3–F7 subequal in length but progressively broadening and F7 about $1.8 \times$ as broad as long; linear sensilla in a single, irregular, transverse row on each funicle segment; clava about as long as combined length of F5–F7, apically rounded without a spicule.

Mesosoma in dorsal view (Figure 1F) $1.5\times$ as long as broad; pronotum with dorsal surface rounded into anterior face; mesonotum with very fine, raised reticulate sculpture (Figure 2A); notauli complete, shallow; scutellum almost as broad as long; propodeum (Figure 2B) medially slightly more than $3\times$ as long as dorsellum, weakly reticulate and with very short longitudinal carinulae at anterior margin and a median carina which is shorter than dorsellum and hardly differentiated from the flanking carinulae, propodeal spiracle large, separated from metanotum by less than its diameter. Posterior leg (Figure 2C) with dorsal surface of coxa pilose to base; femur expanded, $2.5\times$ as long as broad with small crenulations on ventral margin just basal to the abrupt apical narrowing of the femur; tibia with inner spur $2\times$ as long as outer spur and $0.8\times$ as long as dorsal surface of basitarsus.

Fore wing basal cell (Figure 2F) with a row of hairs on upper surface behind submarginal vein, additional hairs at apex, and pilose basal and cubital veins, but the hairs are fine and inconspicuous; speculum moderately large, closed below; length of costal cell: marginal vein: stigmal vein: postmarginal vein as 94:40:15:26.

Gaster (Figure 2D) excluding ovipositor slightly longer than mesosoma (17:16); basal tergite with posterior margin weakly incised medially; tip of hypopygium at two-thirds gaster length; ovipositor sheath $0.5\times$ as long as rest of gaster, $0.9\times$ as long as metatibia.

Male. Colour as female. Length 2.2 mm. Gaster ovoid, as long as head plus mesosoma. Antenna (Figure 1E) with pedicel plus flagellum $0.85\times$ as long as breadth of head; pedicel as long as first three flagellar segments; funicle segments relatively shorter than in female with F1 anelliform and hardly longer than anellus, lacking linear sensilla, shorter and narrower than F2; clava as long as F4–F7. Fore wing length of costal cell: marginal vein: stigmal vein: postmarginal vein as 32:17:6:12 (Figure 2E).

Material

Holotype: ♀, Spain, Madrid, Dehesa de Arganda, $40^{\circ}17'087''\text{N}$, $003^{\circ}26'551''\text{W}$, 650 m, ex gall of *Aulacidea laurae* Nieves-Aldrey on *Scorzonera laciniata* (L.) collected 6 June 2004, emerged April 2005 (J. L. Nieves-Aldrey). Deposited in Museo Nacional de Ciencias Naturales (Madrid) (MNCN) (catalogue no. 9676). Allotype: ♂, data and depository as holotype. Paratypes: 4♂, 21♀, data as holotype. One male and two females of the type series were dissected for SEM observation, and one female was used for DNA extraction and sequenced for molecular analysis. Deposited in MNCN, The Natural History Museum (London) and Askew collection.

Additional material. Madrid, Rivas Vaciamadrid (El Campillo), 13 June 2004, 12 final instar larvae in galled achenes of *S. laciniata* (J. L. Nieves-Aldrey). Two larvae were dissected for SEM examination.

Comment

The generic placement of *A. brevicaudatus* is questionable because of the uncertain distinction between *Adontomerus* Nikol'skaya and *Idiomacromerus* Crawford (Grissell 1995). We put the new species in *Adontomerus* because of the single antennal anellus in the female (two in the male if the absence of linear sensilla on the second flagellar segment is regarded as diagnostic of an anellus), presence of an occipital carina and swollen metafemur. In a key to *Adontomerus* and *Idiomacromerus* species associated with cynipid galls (Askew et al.

2004), *A. brevicaudatus* runs to *Adontomerus* (couplet 2) but differs from the two other species found in cynipid galls, *A. crassipes* (Bouček) and *A. impolitus* (Askew and Nieves-Aldrey), in not having an infusate fore wing spot (faint in *A. impolitus*) and in having a green to blue-green instead of bronze body. Also the metafemur of *A. brevicaudatus*, at $2.5\times$ as long as broad, is less swollen than that of *A. crassipes* ($2.2\times$ as long as broad) but stouter than that of *A. impolitus* ($2.8\times$ as long as broad). The relatively short ovipositor sheath of *A. brevicaudatus*, only half the length of the rest of the gaster, distinguishes it from all other Microdontomerini known to be associated with cynipid galls except *Idiomacromerus semiaenea* (Szelényi). From the latter, *A. brevicaudatus* is easily distinguished by its metallic and not yellow gaster, and the absence of conspicuous bands of white scale hairs on the face.

Final instar larva

Description. Body length, measured in ventral view from anterior margin of first body segment to the posterior margin of the last body segment: 1.8 mm (range 1.4–2.7; $n=15$); body width, measured at the widest part of body in ventral view: 0.9 mm (range 0.7–1.1; $n=15$). The final instar larva is hymenopteriform (Clausen 1940), without appendages, its body consisting of 13 segments (three thoracic T1–3 and 10 abdominal A1–10) following the head. Body (in ventral view, Figure 3A) extended fusiform, slightly broadest at segments A2–A3 and tapering gradually towards anal segment (A10) which is broader than long; body in lateral view (Figure 3B) ventrally curved, more or less U-shaped; ventral margin of most body segments wedge-shaped in profile. Intersegmental dorsal protuberances visible between segments T3 and A5 (Figure 3B). Colour yellow. Integument mostly smooth, but with weak blister-like sculpture on the genae and rugosity on frons and vertex. Body with many long erect setae on all body segments, the setae being usually longer than a body segment; setae more numerous on thoracic than on abdominal segments, the abdominal segments each usually bearing a single transverse row of setae that are relatively widely spaced, especially ventrally.

Head (anterior view, Figure 3C) more or less rectangular, with mouthparts protruding; head 1.2 times as wide as high, with anterior margin of vertex straight and medial area of vertex slightly depressed. Head, like the body, strongly setose with many extra setae in addition to the five to seven pairs usually present in larvae of Chalcidoidea. Frons depressed, prolonged ventrally into a wide groove medially separating two light brown stripes composed of relatively closely spaced setae. Vertex with three pairs of long erect setae, the longest pair being as long as length of first body segment, in addition to some shorter setae; antero-medial setae of antennal area situated clearly above antennae, their length almost half the distance between antennae. Antennal area conspicuous, with relatively long and prominent antennae (Figure 3C); antennae situated about midway between top of vertex and clypeus; pair of lateral clypeal setae situated above the pair of clypeal setae; genal setae very long, reaching ventral margin of labium. Ventral margin of clypeus straight. Labrum rectangular and undivided. Maxillae small, undifferentiated; labium deeply concave, usually collapsed (Figure 3D); maxillary and labial palps inconspicuous. Mandibles simple, covered by the labrum and not visible in anterior view of face (Figure 3D), with a single acute tooth (Figure 3E, 3F) sharp and slender; ratio between width at base and tooth length about 0.5; angle separating inner edge of tooth and base of mandible obtuse ($>90^\circ$); outer margin of tooth almost straight; tooth of left mandible (Figure 3E) slightly curved at apex, but tip of right mandibular tooth straight (Figure 3F).

Comment. The larva of the new species is similar to the larva of *Idiomacromerus silybi* Askew, a recently described species (Askew et al. 2004), but differs from it in having larger and more prominent antennae, and paler, not so conspicuous frontal patches, with setae less dense.

Biology. The larva of *Adontomerus brevicaudatus* (Figure 4B) is a solitary ectoparasitoid of the larva of *Aulacidea laurae* Nieves-Aldrey (Hym., Cynipidae), a cynipid species that induces galls in achenes of *Scorzonera laciniata* L (Asteraceae) (Figure 4C, 4D) (Nieves-Aldrey 1995, 2001b). Galls drop to the ground in late spring and the parasitoids overwinter inside them as fully grown larvae. The larvae pupate in the following year, and adults emerge when new plants and galls are available. The life cycle is univoltine and synchronized with the life cycle of the host cynipid.

The parasitoid community of *Aulacidea laurae*

Rather few galls of this recently discovered species of gall-wasp have yet been sampled, but so far three species of chalcidoid parasitoid have been found. Emergences from *A. laurae* galls collected at three locations, two French and one Spanish, include two species of Eupelmidae, *Eupelmus microzonus* Förster and *E. (Macroneura) seculatus* (Ferrière), in addition to *Adontomerus brevicaudatus* (Table I). The dominance in the community of a species of *Adontomerus* is a feature shared with communities in galls of *Aulacidea acroptilonica* (Tyurebaev) on *Acroptilon repens* (Russian Knapweed) and *A. tragopogonis* (Thomson) on *Tragopogon* species (Goat’s-beard). The two latter species of gall-wasp suffer considerable mortality from *Adontomerus impolitus* (Askew et al. 2006). All three species of Cynipidae are gall-formers on Asteraceae.

Eupelmidae associated with cynipid galls are usually extremely polyphagous. *Eupelmus microzonus* has been reared from galls of species of *Aulacidea* (including *A. acroptilonica* and *A. tragopogonis* as well as *A. laurae*), *Aylax*, *Barbotinia*, *Isocolus*, *Liposthenes*, *Neaylax*, and *Phanacis* on herbaceous plants, and from *Diplolepis* on *Rosa*. *E. seculatus* has also been recorded from galls of *Aulacidea acroptilonica*, and from *Timaspis* and *Xestophanes* (Askew et al. 2006).

Acknowledgements

This study was supported by a grant to R.R.A. from the European Community’s Programme Structuring the European Research Area under SYNTHESYS, facilitating research at the Museo Nacional de Ciencias Naturales, Madrid. We are grateful to Laura Tormo for technical assistance in preparing the SEM photographs. Financial support was provided by the Spanish Ministry of Education and Science, research project CGL2005-01922/BOS to J.L.N.-A.

Table I. Insects reared from three samples of galls of *Aulacidea laurae*.

	Gard, France	Hérault, France	Madrid, Spain
<i>Aulacidea laurae</i>	3♂ 7♀	8♂ 9♀	–
<i>Adontomerus brevicaudatus</i>	–	–	5♂ 23♀
<i>Eupelmus microzonus</i>	–	–	4♂ 1♀
<i>Eupelmus seculatus</i>	–	–	2♀

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