Aphidius geranii sp. n. (Hymenoptera: Braconidae) from Southeast Europe – a new member of the Aphidius urticae s. str. group

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Aphidius geranii Tomanović and Kavallieratos, sp. n., is described as an additional member of the Aphidius urticae s. str. group from high-mountain habitats of Southeast Europe. The new species was reared from Amorphophora sp./Geranium coeruleatum associations. Parasitoid guilds associated with G. coeruleatum are discussed. Key for identification of Aphidius spp. on Geranium plants in Europe is given.

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1. Introduction

Aphidius Nees is the most diverse genus within the subfamily Aphidiinae (Hymenoptera: Braconidae) (Starý 1973, Achterberg 2004). It is also the most taxonomically problematical aphiidine genus, with over 100 species and at least 10 species groups having unresolved taxonomic status (Eady 1969, Pungerl 1986, Tomanović et al. 2003, 2007, Rakhshani et al. 2008). Aphidius species were characterized by a very limited number of reliable morphological characters relevant for species separation (Starý 1973, Pungerl 1986, Kambhampati & Mackauer 1988).

Tomanović et al. (2003, 2007) pointed out taxonomical importance of the number of palpo-
meres in the maxillary and labial palps within genus *Aphidius*.

The *Aphidius urticae* s. str. group parasitizes aphid hosts belonging to *Amphorophora*, *Macrosiphum*, and *Acythosiphon* lineages (Homoptera: Aphididae), mainly in forest and semi-forest habitats (Starý 1973, Kavallieratos et al. 2004). Within the *A. urticae* s. str. group there are several taxa of unresolved status (Starý 1962, 1973).

Here we present the description and diagnosis of an additional member of the *A. urticae* s. str. group from high-mountain habitats of Southeast Europe. The new member was collected from *Amphorophora* sp./*Geranium coeruleatum* Schur associations. Additionally, a key for the identification of *Aphidius* species that attack aphids on *Geranium* plants in Europe is provided.

2. Materials and methods

*Geranium coeruleatum* bearing both live and mummified aphids were collected from 2002–2005 near the Škrka lakes on Mt. Durmitor (43°10’31.48”; 19°01’14.67”; 1,700 m elevation) in Montenegro. Live aphids were preserved in 90% ethanol and 75% lactic acid in a ratio 2:1 (Eastop & van Emden 1972) for later identification. The remaining aphids were maintained in the laboratory until parasitoid emergence. Mummies, each attached to a small leaf piece, were placed separately in small plastic boxes with a circular opening covered with muslin on the lid and put inside a growth cabinet (22.5°C, relative humidity 65%, 16L:8D) (Kavallieratos et al. 2001). Since the host plants fed upon by at least two aphid species, *Acythosiphon malvae* (Mosley) and *Amphorophora* sp., with different parasitoid complexes, separation of mummies was necessary in order to confirm the host range of emerged parasitoids. The external structure of emerged parasitoids was studied using an Olympus SZX9 stereomicroscope. One female parasite specimen was gold-coated with a sputter coater and examined using a Jeol JSM – 6460LV scanning electron microscope.

The morphological terminology for Hymenoptera follows Sharkey and Wharton (1997) and Kavallieratos et al. (2001). Subdivisions of the flagellum are referred to as segments in order to remain consistent with other taxonomic works on *Aphidiinae*.

3. Parasitoid guild associated with aphid hosts, *Amphorophora* sp. and *A. malvae*, on *Geranium coeruleatum*

Here we present trophic relationships from two aphid hosts, *Amphorophora* sp. and *A. malvae*, on *G. coeruleatum* which is a high-mountain plant species endemic to Southeast Europe (Aedo et al. 1998) with an insular type of distribution. It inhabits mountain pastures and dry meadows. We reared *Aphidius geranii* sp. n. from aphid host *Amphorophora* sp. (probably an undescribed species) feeding on *G. coeruleatum*.

An additional aphid-parasitoid association occurring on *G. coeruleatum* involved *A. malvae*, which was parasitized by *Aphidius* cf. *pelargonii* Starý & Carver, *Aphidius avenae* Haliday, *Ephe- drus lacertosus* (Haliday), and *Monoctonus* sp. (probably also undescribed species).

Here we demonstrated importance of endemic plants for maintaining these specific trophic associations. The newly described species as well as the other members of the parasitoid guild on *G. coeruleatum* could be regarded as important for conservation aspects.

4. Description of *Aphidius geranii*

**Tomanović and Kavallieratos, sp. n.** (Figs 1 and 2)

Type individuals. Holotype female. Montenegro, Mt. Durmitor—Škrka lakes, Skakala, 03.VII. 2002, reared from *Amphorophora* sp. on *Geranium coeruleatum*, coll. Z. Tomanović & N. G. Kavallieratos. Holotype slide mounted and deposited in the collection of Institute of Zoology, Faculty of Biology, University of Belgrade.

Paratypes. 2♀, Montenegro, Mt. Durmitor – Škrka lakes, Skakala, 03.VII.2002: 3♀ 2♀, Montenegro, Mt. Durmitor – Škrka lakes, 22.VII.2004; 2♀ 1♂, Montenegro, Mt. Durmitor – Škrka lakes, 06.VIII.2005, reared from *Amphorophora* sp. on *Geranium coeruleatum*, coll. Z. Tomanović. Paratype slide mounted and
Description. Female. Head. Eyes oval, sparsely setose (Fig. 1a). Malar space equal to 0.37–0.42 times the longitudinal eye diameter. Clypeus oval, with about 12 long setae. Tentorial index (tentoriocular line/intertentorial line) 0.44–0.50. Antennae 16-segmented, filiform, moderately thickened at apex with semierect and adpressed setae shorter than the diameter of the segments. Flagellomere (F1 3.67–3.71 times as long as median width, without longitudinal placodes. F2 (Fig. 1b) is 3.11–3.29 times as long as median width, with 2–3 longitudinal placodes. F8 is 2.22–2.30 times as long as median width, with 4 longitudinal placodes. F1 little shorter than F2 (F1/F2 ~0.93–0.96) (Fig. 1b). Maxillary palp with four palpomeres, labial palp with two palpomeres.

Mesosoma. Mesonotum with notaulices distinct in the fore part, slightly crenulated, with two rows of setae. Notauli effaced on the disc (Fig. 1c). Propodeum areolated with narrow central pentagonal areola (Fig. 1d). Upper lateral areola with five setae and lower lateral areola with four setae.

Fore wing. Stigma elongate, 5.05–5.14 times as long as wide and 1.20–1.29 times as long as distal abscissa of R1 (=metacarpus); R1 vein 4.00–4.21 times longer than stigma width (Fig. 2a).

Metasoma. Petiole elongate, 3.88–4.00 times as long as wide at spiracles (Fig. 2b), with 8–10 costulae on its anterolateral area (Fig. 2c) and with moderately prominent mediadorsal carina. Ovipositor sheath slightly concave in its dorsal margin (Fig. 2d).

Colour. Head dark brown to black. Mouthparts light brown. Scape and pedicel light brown. F1 with narrow yellow ring at the base, remaining part of antennae brown. Petiole light brown, remaining part of metasoma black. Legs brownish
with dark apices. Rest of body black.

Body length. 2.0—2.3 mm.

Male. Antennae 18 segmented. Flagellomere 1 with 5–6 longitudinal placodes. Petiole about 3 times as long as wide at spiracles level. Body generally darker than female, with brown legs and mouthparts.

Diagnosis. The host range pattern and long R1 vein put *A. gerani* sp. n. in the *A. urticae* s. str. group, but it differs from other species within the *A. urticae* group in labial palps with two palpomeres (all other species within the *A. urticae* group have labial palps with three palpomeres) and an elongate stigma (*A. gerani* sp.n. has a stigma length/width ratio of 5.0–5.2 vs. 3.2–4.0 in all other species of the *A. urticae* group).

The new species is distinguished from all other *Aphidius* species by the synopsis of the following characters: 16-segmented antennae, labial palps with two palpomeres, and a very elongate stigma. *Aphidius gerani* sp.n. resembles *Aphidius sonchi* Marshall in the number of antennal segments and partially in wing venation, but it differs from *A. sonchi* in the stigma length/width ratio (5.0–5.2 in *Aphidius gerani* sp.n. vs. 3.5–4.0 in *A. sonchi*), the petiole length/width ratio (3.9–4.0 in *Aphidius gerani* sp.n. vs. 2.8–3.5 in *A. sonchi*), and the host range pattern (*A. sonchi* is a widely distributed parasitoid of *Hyperomyzus* aphid hosts throughout the Palaearctic).

Etymology. The new species takes its name from the host plant.

5. Key to *Aphidius* spp. reared from *Geranium* plants in Europe

Numbers in parentheses in the key indicate uncommon conditions.

1. Stigma length/width ratio of 5.05–5.14 (Fig. 2a); petiole length/width ratio 3.88–4.00 (Fig.
Aphidius geranii sp. n.

- Stigma length/width ratio of 3.2–3.9; petiole length/width ratio 2.8–3.4; labial palpus with three palpomeres

2. Anterolateral area of petiole rugose (Fig. 3a).

Antennae (17)18–19(20)-segmented

Aphidius ervi

- Anterolateral area of petiole costate or costulate. Antennae 16–17(18)-segmented

3. Anterolateral area of petiole costate (Fig. 3b).

Body dark brown to black Aphidius avenae

- Anterolateral area of petiole costate (Fig. 3c). Body brown to light brown Aphidius cf. pelargonii

6. Discussion

6.1. Taxonomy

On the basis of its elongate R1 and host range pattern, Aphidius geranii sp. n. belongs to the Aphidius urticae s. str. group (Starý 1973). The Aphidius urticae s. str. group consists of several Palaeartic species (A. urticae Haliday, A. galii Tomanovic & Kavallieratos, A. cf. pelargonii, while A. rubi Starý and A. silvaticus Starý are with unclear taxonomic status) (Starý 1962, 1973, Tomanovic & Kavallieratos 2002). Its labial palps with two palpomeres, elongate stigma, and petiole represent apomorphic characters in A. geranii sp. n., while the long distal abscissa of R1 and short first flagellomere are plesiomorphic characters.

6.2. Parasitoid guild

Aphid hosts belonging to the cosmopolite genus Amphorophora are parasitized by A. urticae, E. lacertosus, Praon longicorne Marshall, and P. volucre (Haliday) (Starý 1962, 2006; Kavallieratos et al. 2004). Parasitoid guilds of species belonging to this aphid genus are relatively well known because some species, e.g., A. rubi (Kaltenbach 1843), are pests on Rubus spp. (Rosaceae) that are distributed almost worldwide. Although Geranium plants are not commonly fed upon by Amphorophora aphids, there is an evidence of this behaviour in the literature: Amphorophora tuberculata Brown & Blackman is known from Geranium macrorrhizum L. in England and Bulgaria; Amphorophora coloutensis Smith & Knowlton is known from Geranium spp. and Amphorophora geranii Gillette & Palmer from Geranium richardsonii Fisch. & Trautv in the USA (Blackman & Eastop 2006).
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