

AREOPRAON LEPELLEYI (WATERSTON)
(HYMENOPTERA: BRACONIDAE: APHIDIINAE),
A PARASITOID OF ERIOSOMATINAE
(HOMOPTERA: APHIDOIDEA: PEMPHIGIDAE)
NEW TO IRAN

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Abstract

The occurrence of *Areopraon lepelleyi* (Waterston), a specific parasitoid of leaf-curling *Eriosoma* aphids, was evidenced in Iran in association with *Eriosoma lanuginosum* / *Ulmus carpinifolia* var. *umbraculifera*. This is the first record of this wasp's genus for central Asia, which represents a connecting area between the eastern Mediterranean, the Caucasus and Kashmir. *Areopraon lepelleyi* is re-described, morphological characters are illustrated and morphological variability of its examined populations is discussed.

KEY WORDS: *Eriosoma lanuginosum*, Iran, *Areopraon lepelleyi*, re-description

Introduction

Aphidiinae are solitary obligatory endoparasitoids of aphids (STARÝ, 1970), many species of which have been considered as potential biocontrol agents (HUGHES, 1989; HAGVAR & HOFVANG, 1991; STARÝ, 2006). STARÝ *et al.* (2000) reviewed the aphidiine species from Iran and listed 49 species; since then this number has increased to a total of 59 recognized species (RAKSHANI *et al.*, 2005, 2006, 2007, 2008; STARÝ *et al.*, 2005; TOMANOVIĆ *et al.*, 2007). The aphidiine tribe Praini is represented in Iran only by the genus *Praon* Haliday (STARÝ *et al.*, 2000; RAKSHANI *et al.*, 2007), whose species are known to have a specific pupation under the parasitized aphid hosts (STARÝ, 1970, 1975, 1981, STARÝ & GHOSH, 1983). Here we report the presence of a second aphidiine genus from Iran, *Areopraon*, and redescribe its species we found, *A. lepelleyi* (Waterston). The territory of Iran is a crossroads between the eastern Mediterranean area and the Oriental region, which contain elements of different fauna (STARÝ, 1979; RAKSHANI *et al.*, 2008).

Materials and Methods

Samples of leaf-gall aphids on smoothleaf elm trees (*Ulmus carpinifolia* var. *umbraculifera*) were collected during 2007-2008 from the north-eastern part of Iran. The galls were dissected *in situ* in order to inspect the activity of parasitoids. If present, the colonies of both live and mummified aphids were collected and subsequently maintained in the laboratory until parasitoid emergence. The collected material was placed separately in small plastic boxes ventilated on the lid by a circular opening covered with muslin and put at room temperature. Aphids were preserved in 75% ethanol for subsequent identification. The external structure of parasitoids was studied using a NIKON SMZ645 stereomicroscope and illustrated using an OLYMPUS BH2 Phase-contrast microscope. The morphological terminology used in this paper follows SHARKEY & WHARTON (1997).

Results

Areopraon lepelleyi (Waterston, 1926) - Redescription

Praon lepelleyi Waterston, 1926

Areopraon lepelleyi is characterized by having 13-14 segmented antennae (females) (Fig. 2). Other *Areopraon* species have antennae with more than 15 segments [see TOMANOVIĆ *et al.* (2009) for a key to European species of this genus].

Female (Fig. 11)

Head. Malar space equal to 0.21-0.23 of longitudinal eye diameter. Clypeus oval, with 18-20 long setae. Eyes oval, slightly converging toward clypeus, with sparse setae at outer margin. Tentorial index about 0.25. Maxillary and labial palps with four and three palpomeres, respectively (Fig. 1). Antennae 13-14 segmented, filiform (Fig 2), with semierect setae that are shorter than half of the segment diameter. Flagellomere 1 (F_1) cylindrical, 2.55-2.65 times longer than wide, without longitudinal placodes (Fig. 2). Flagellomere 2 (F_2) cylindrical, 1.90-2.10 times longer than wide, with 3-4 longitudinal placodes (Fig. 2). F_1 1.30-1.35 times longer than F_2 (Fig. 2).

Mesosoma. Pronotum (Fig. 3) densely setose at dorso-lateral surface. Mesoscutum (Fig. 4) with central lobe densely covered by long setae. Lateral lobes of mesoscutum with large areas without setae. Notauli complete

and distinct. Scutellum with dense lateral setae surround a bare central area that is divided by one row of long setae. Propodeum (Fig. 6) densely setose, with almost completed narrow central areola, surrounded by prominent postero-lateral carinae, antero-lateral carinae pointed at upper margin of the segment. Lateral carinae of propodeum weakly developed.

Forewing. Stigma triangular, 2.60-2.80 times longer than wide and 1.35-1.55 times longer than R1 distal abscissa (Fig. 5). Rs+M vein nebulous, only visible at forepoint.

Metasoma. Petiole (Fig. 7) elongate, 1.37-1.39 times as long as its maximum width at spiracle level, and 1.65-1.70 times longer than its minimum width after the spiracles, strongly prominent dorsally, covered with dense setae. A pair of prominent and weak longitudinal carinae extended on dorso-lateral part of petiole. Dorsal carinae weakly developed. Ovipositor sheaths (Fig. 8) elongated, weakly concave dorsally, densely setaceous at distal half.

Coloration. Head blackish brown. Scape and pedicel brown to light brown. F₁ yellow, F₂ and remaining part of antennae brown. Mouthparts and clypeus yellow. Mesosoma brown to black. Legs yellow. Petiole light brown, remaining metasomal segments brown, gradually darker to tip. Ovipositor sheaths black.

Body length. 2.4-2.8 mm

Male (Fig. 12)

Antennae 18-19-segmented, filiform. Mouthparts light brown to yellow. F₁ yellow to light brown at base. Mesosoma dark brown. Legs yellow. Petiole light brown to brown, other metasomal segments brown.

Examined material: Iran: Shirvan, 18.05.2008, 84♂, 51♀ reared from *Eriosoma lanuginosum* (Hartig) on *Ulmus carpinifolia* var. *umbraculifera*. Deposited in coll. of University of Zabol, Iran and collection of Institute of Zoology, Faculty of Biology, University of Belgrade, Serbia.

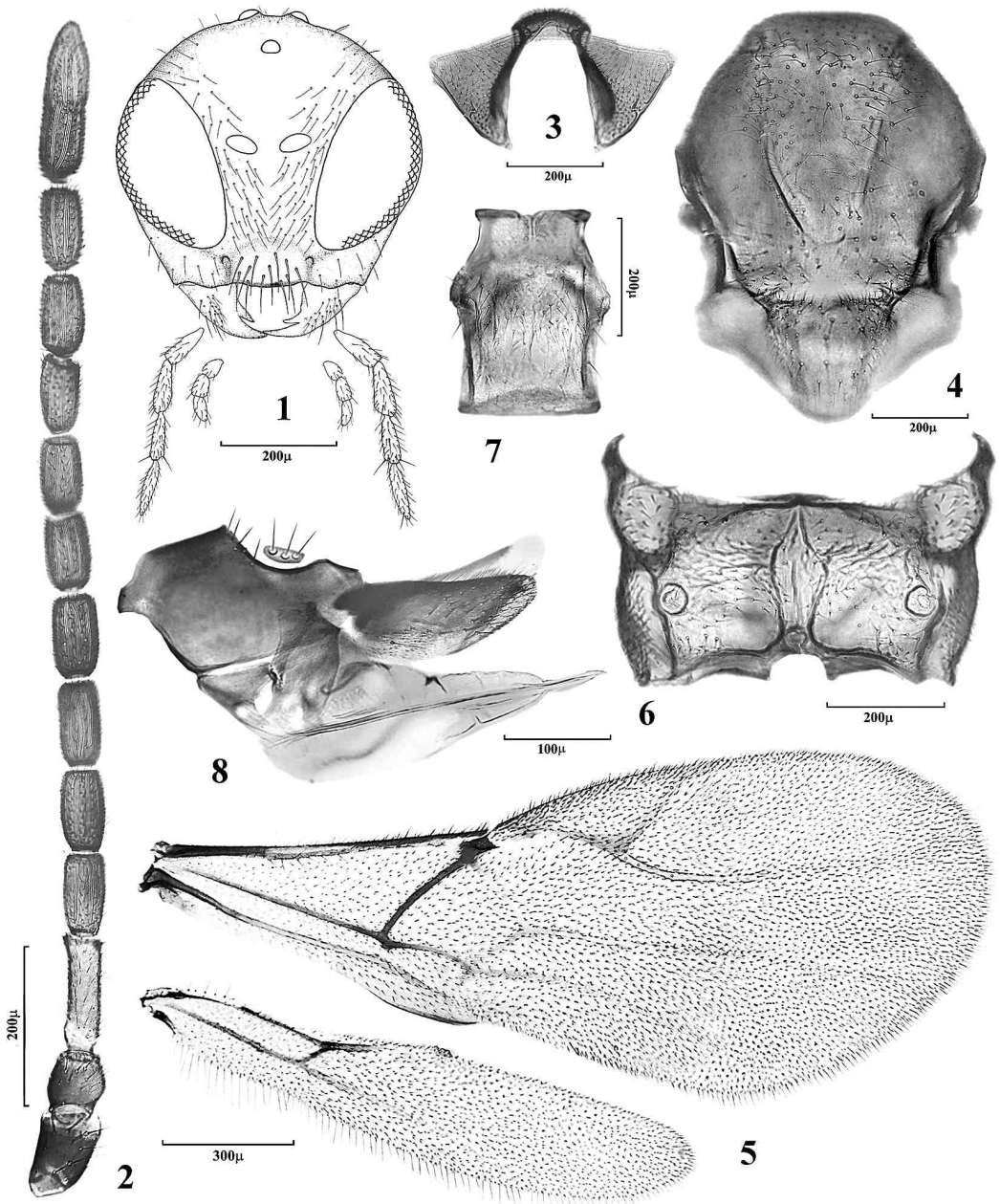
Colonies of *E. lanuginosum* (Fig. 9) were found heavily parasitized by *A. lepelleyi* (Fig. 10). Both types of pupation, i.e. that of *Praon*-type and of *Aphidius*-type were detected.

Variability of *A. lepelleyi* populations

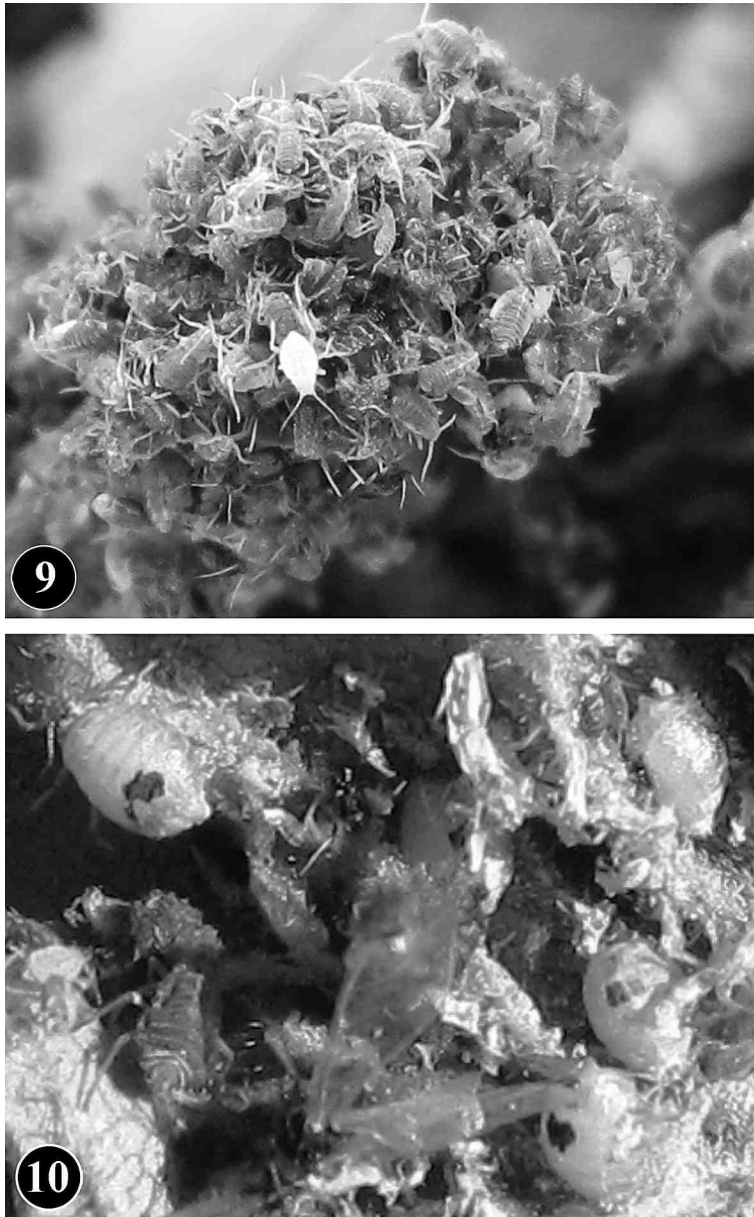
Comparison of the Iranian population of *A. lepelleyi* associated with *Eriosoma lanuginosum* / *Ulmus carpinifolia* var. *umbraculifera* and of conspecific populations of *A. lepelleyi* from Italy, Czech Republic, France, Georgia and Sweden resulted in several observations: 1) the Iranian population was characterized by both types of pupation behaviour occurring simultaneously, i.e., internal (within the host aphid) and external (under the host aphid) type, but with dominant internal pupation behaviour (Fig. 10). Other analyzed populations shared both types of pupation behaviour equally (STARY, 1976); 2) Flagellomere 1 is equal to flagellomere 2 in Iranian specimens, while it is longer in European specimens (Fig. 13); 3) Clypeus is more setaceous in Iranian specimens (Fig. 13) and 4) Propodeum in Iranian specimens shows almost closed narrow areola and indistinct ramified lateral carinae, while propodeum of European specimens manifests open wide areola and distinct divergent lateral carinae (Fig. 13).

Discussion

Aphids of the genus *Eriosoma* are widely distributed throughout Palaearctic, with rare and peculiar complexes of associated parasitoids. *Areopraon lepelleyi* is the only known Aphidiinae parasitoid on *Eriosoma* aphids (see STARY, 1976, 2006). We also examined materials reared from *E. lanuginosum* (Hartig)

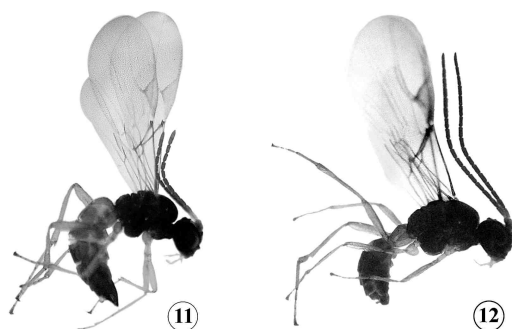


Figures 1-8. The external morphology of *Areopraon lepellei*: head and mouth parts (1), antenna (2), dorso-lateral aspect of pronotum (3), mesoscutum (4), right wings (5), propodeum (6), petiole (7) and female genitalia (8).



Figures 9 & 10. Colony of *Eriosoma lanuginosum* within the dissected leaf galls on *Ulmus carpinifolia*: live aphids, dominated by nymphs (9) and mummified aphid, parasitized by *Areopraon lepellei* (10).

– Italy, from *E. patchiae* (Börn. and Blunck) – France, Sweden, Georgia, and from *E. ulmi* (L.) – Czech Republic, France, and Georgia. The other *Areopraon* species manifest other specific associations (*Chaitophorus*, *Periphyllus*) (STARÝ, 1976; TOBIAS & KYRIAC, 1971; TOMANOVIĆ *et al.*, 2006; TOMANOVIĆ *et al.*, 2009). This paper represents the first record of the *A. lepelleyi* in Iran and extends the distribution area of this species in the Palaearctic. The newly supplemented geographic distribution range of the species thus covers Europe, the Caucasus, Iran, and Kashmir up to the Russian Far East (BHAGAT, 1982; STARÝ & GHOSH, 1983, STARÝ *et al.*, 1998; TOMANOVIĆ *et al.*, 2006; DAVIDIAN, 2007).



Figures 11 & 12. Adult specimens of *Areopraon lepelleyi* emerged from *Eriosoma lanuginosum*: female (11) and male (12).

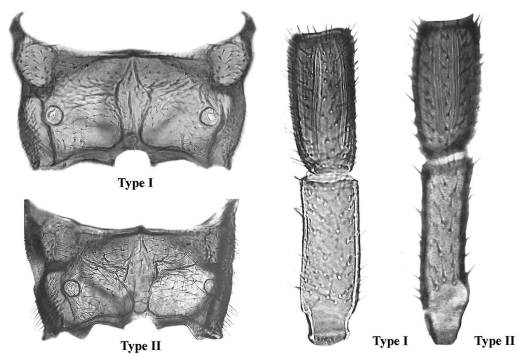


Figure 13. Variability in propodeal areolation and flagellomeres 1 and 2 in Iranian and European specimens of *A. lepelleyi* (Type I – Iranian specimen; Type II – European specimens).

Areopraon lepelleyi apparently shows significant population variability, in pupation behaviour and external morphology. Further research using molecular markers will clarify the taxonomic status of the *A. lepelleyi* populations from Iran.

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**AREOPRAON LEPELLEYI (WATERSTON)
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ПАРАЗИТОИД ПОТФАМИЛИЈЕ ERIOSOMATINAE
(HOMOPTERA: APHIDOIDEA: PEMPHIGIDAE)
НОВА ВРСТА ЗА ИРАН**

СЕДИГЕХ КАЗЕМЗАДЕХ, ЕХСАН РАКШАНИ, ЖЕЉКО ТОМАНОВИЋ, ПЕТР СТАРИ И АНЂЕЉКО ПЕТРОВИЋ

Извод

Присуство врсте *Areopraon lepelleyi* (Waterston), која је специфичан паразитоид ваши рода *Eriosoma*, је забележено у Ирану у асоцијацији *Eriosoma lanuginosum* / *Ulmus carpinifolia* var. *umbraculifera*. Истовремено ово представља први налаз рода *Areopraon* за простор централне Азије, која повезује источни Медитеран са Кавказом и Кашмиром. Дат је ревидиран опис врсте са илустрованим морфолошким карактерима и продискутована је морфолошка варијабилност различитих популација *A. lepelleyi*.

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