A review of the West Palaearctic aphidiines (Hymenoptera: Braconidae: Aphidiinae) parasitic on *Uroleucon* spp., with the description of a new species

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Résumé – **Revue des Aphidiinae (Hymenoptera: Braconidae) Ouest Paléarctiques, parasites d'*Uroleucon* spp., avec la description d'une espèce nouvelle.** – Présentation d'une revue des Aphidiinae (Hymenoptera: Braconidae) qui parasitent les espèces d'*Uroleucon* dans la région Ouest Paléarctique. Onze espèces sont répertoriées et illustrées. De plus, une espèce nouvelle, *Praon nonveilleri* n. sp., parasite d' *Uroleucon inulicola* (Hille Ris Lambers) qui infeste *Inula ensifolia* L., est décrite. La diagnose de la nouvelle espèce, ainsi que son illustration photographique, sont présentées. Elle fait partie du groupe d'espèces "*dorsale-yomenae*" et fut collectée dans le canyon de Djetinja en Serbie-Monténégro. Les Aphidiinae présentés ont été identifiés parmi 97 taxa d'aphides qui apparaissent sur 236 taxa de plantes. Sont également répertoriées 361 associations originales parasitoide / aphide - hôte / plante - hôte, concernant les espèces mentionnées dans la clé. En outre, on a reconstruit les relations phylogénétiques du groupe d'espèces "*dorsale-yomenae*" et d'autres espèces voisines en utilisant des méthodes de distance cladistique.

Abstract – A review of aphidiine wasps (Hymenoptera: Braconidae) parasitizing the *Uroleucon* species in the West Palaearctic is presented. Eleven species are keyed and illustrated. In addition, a new hymenopteran parasitoid species: *Praon nonveilleri* n. sp. from *Uroleucon inulicola* (Hille Ris Lambers) infesting *Inula ensifolia* L., is described. The new species is diagnosed and illustrated. It belongs to the "*dorsale-yomenae*" species group and was collected from the Djetinja canyon in Serbia and Montenegro. The aphidiines presented in this work were identified from 97 aphid taxons occurring on 236 plant taxons. Furthermore, 361 original parasitoid – host aphid – host plant associations of the species mentioned in the key are presented. Finally, phylogenetic relationships inside the "*dorsale-yomenae*" species group and related species were reconstructed using cladistic distance methods.

In this paper we review 11 aphidiine wasps parasitizing *Uroleucon* species in the West Palaearctic (Mackauer & Starý 1967; Starý 1976; Völkl & Starý 1988; Mescheloff & Rosen 1990; Barczak 1993; Tomanović *et al.* 1998; Kavallieratos *et al.* 2001). An original key for the identification of the species is provided. The key and the descriptions include SEM and line drawings. Also, we provide original information about the population structure and host range pattern of aphid parasitoids infesting *Uroleucon* spp. from Southeastern Europe. We reconstructed the phylogeny of the *Praon* "*dorsale-yomenae*" group (Tremblay & Pennacchio 1985; Tremblay *et al.* 1986) and related species using cladistic distance methods based on 7 morphological characters.

In addition, a new species of the genus *Praon* Haliday, 1833 from the Djetinja canyon of Serbia and Montenegro infesting *Uroleucon inulicola* (Hille Ris Lambers) (Hemiptera: Aphidoidea) on *Inula ensifolia* L. (Asterales: Asteraceae) is presented. Description and diagnosis of the new species are given. Species presented in this work have been identified from 97 aphid taxons occurring on 236 plant taxons. We report 361 original parasitoid - host aphid - host plant associations. Although *Uroleucon* spp. are considered economically unimportant, these aphids and their primary parasitoids

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are important food sources for predators and hyperparasitoids, respectively, in agroecosystems (Völkl & Starý 1988). According to Horn (1984) and Völkl & Starý (1988) the presence of *Uroleucon* primary parasitoids in agroecosystems may reduce the rate of hyperparasitism on the primary parasitoids of the economically important aphid species.

Material and methods

Material. Specimens were collected during 1987-2002 in many localities in Southeastern Europe (a detailed list of localities, sampling dates and sex ratios is available from the authors). Samples from various host plants bearing aphid colonies, consisting of both live and mummified aphids, were collected. Furthermore, samples from *I. ensifolia* plants bearing aphid colonies consisting of both live and mummified aphids were collected from Djetinja canyon in western Serbia and Montenegro (locus typicus). The external structure of the emerged parasitoids was studied using an OLYMPUS SZX 9 stereomicroscope. Several specimens were gold coated with a sputter coater and examined using a Cambridge S 150 Scanning Electron Microscope. The holotype specimen of the new species was slide-mounted in balsam. One more specimen was gold coated with a sputter coater and examined using a Cambridge S 150 scanning electron microscope.

Diagnostic characters were used in the key as follows: number of segments of labial papli, number of antennal segments, length of first flagellomere (= F_1), width of F_1, colour of F_1, length of distal abscissa of R_1 (= metacarpus), length of Rs, degree of development and colour of Rs + M vein, colour of m-cu vein, degree of development of M + m-cu vein, enclosed $2R_1$ cell, pubescence of lateral lobes of mesonotum, areola of propodeum, pubescence of propodeum, prongs of terminal metasomal sternum, colour of mesosoma, colour of mummified aphids.

Material depository. Material examined in this study is deposited in the collection of the Belgrade Natural History Museum (Serbia and Montenegro), the Institute of Zoology, Faculty of Biology, University of Belgrade (Serbia and Montenegro) and the Laboratory of Agricultural Zoology and Entomology, Agricultural University of Athens (Greece). Terminology used in this paper regarding the diagnostic characters of the aphidiines is based on Kavallieratos *et al.* (2001).

Abbreviations. SER: Serbia, MNG: Montenegro, FYRM: The Former Yugoslav Republic of Macedonia, BOS: Bosnia and Herzegovina, BUL: Bulgaria, GRE: Greece, CRO: Croatia, TUR: Turkey

Cladistic analysis. A cladistic analysis by distance methods for the reconstruction of the phylogeny of *Praon* parasitic on *Uroleucon* aphids and related species was undertaken. Bootstrap values were calculated from 100 replicates. Species *Ephedrus persicae* Froggatt was used as an outgroup. Seven morphological characters were coded and are presented in table 1. Data matrix was analyzed using PAUP* version 4(10b) (Swofford 2003). Tree was visualized and printed using TREE VIEW (Page 1996).

Table 1 – Character matrix was used in cladistic analysis of the *Praon dorsale-yomenae* species group and related species with characters description. *Ephedrus persicae* was used as outgroup

Taxa	Characters						
	1	**2**	**3**	**4**	**5**	**6**	**7**
P. yomenae	1	1	1	2	0	1	1
P. longicorne	0	1	0	2	1	2	0
P. uroleucon	1	1	0	2	0	0	1
P. nonveilleri	1	1	0	2	0	1	1
P. athenaeum	1	0	0	1	0	1	1
P. absinthii	1	1	1	2	0	1	1
P. megourae	1	1	0	1	1	1	1
P. unitum	1	0	1	2	0	1	1
P. dorsale	0	1	1	2	1	1	0
E. persicae	0	0	0	0	0	?	1

Characters:
1. Forewing vein m-cu: (0) fully sclerotized and coloured; (1) colourless, partly sclerotized or partly effaced.
2. Forewing vein Rs + M: (0) partly sclerotized and coloured; (1) colourless.
3. Ovipositor sheath: (0) straight dorsaly; (1) dorsal margin clearly concave.
4. Conical apical spines: (0) absent; (1) one; (2) two.
5. Tergite I: (0) subquadrate, 1.1–1.3 time as long as wide at spiracles; (1) more elongated, about 1.5 time as long as wide at spiracles.
6. Number of multiporous plate sensilla (MPS) on second flagellar segment (F_2): (0) 4 and more; (1) 1-3; (2) 0.
7. Lateral lobes of mesonotum: (0) densely pubescent; (1) with large hairless areas.

TAXONOMY

Key to aphidiine wasps of *Uroleucon* aphids in the West Palaearctic (based on adult females)

1. Forewing with enclosed $2R_1$ cell (fig. 8). Mummified aphids black . . . . . ***Ephedrus niger*** Gautier, Bonnamour & Gaumont
– Forewing without enclosed $2R_1$ cell (figs. 4, 9-15). Mummified aphids not black 2
2. Rs + M vein present (figs. 4, 9-11) 3
– Rs + M vein absent (figs. 12-15) 7
3. Rs + M vein coloured in first quarter, gradually losing colour and erased in last quarter (fig. 11). Antenna 21-segmented ***Praon uroleucon*** Tomanović & Kavallieratos
– Rs + M vein visible throughout (figs 4, 9-10). Antenna 16-19 (20)-segmented 4
4. Lateral lobes of mesonotum densely pubescent (fig. 16) or with small hairless areas. Forewing m-cu vein coloured (fig. 9). Rs + M vein coloured at its first half (fig. 9). Antennae 17-18 (19)-segmented ***Praon volucre*** (Haliday)
– Lateral lobes of mesonotum with large hairless areas (fig. 17). Forewing m-cu vein colourless (figs. 4, 10). Rs + M vein colourless throughout (figs. 4, 10) or coloured basally. Antennae 16-19 (20) segmented 5
5. Antenna 18-19 (20)-segmented. Rs + M vein colourless throughout (Fig. 10) . . . . . ***Praon yomenae*** Takada
– Antenna 16-17-segmented. Rs + M vein colourless throughout (fig. 4) or coloured basally 6

6. F_1 6 x as long as wide. Forewing Rs + M vein coloured basally. Distal abscissa of R_1 subequal to the length of Rs. Propodeum with peripherally dense setae and medially sparse and scattered setae. F_1 yellowish at base, gradually darkening to brown at apex. Mesosoma yellowish to yellow. Parasitoid of *Macrosiphoniella sanborni* (Gillette) and *Uroleucon sonchi* (Geoffroy) . . . . . ***Praon unitum*** Mescheloff & Rosen
– F_1 5.5 x as long as wide (fig. 2). Forewing Rs + M vein colourless throughout (fig. 4). Distal abscissa of R_1 1.25 X as long as Rs vein (fig. 4). Propodeum densely pubescent (fig. 5). F_1 with basal 2/3 yellow and apical 1/3 light brown to yellow with a black ring at the apex. Mesosoma generally brown. Parasitoid of *Uroleucon inulicola* (Hille Ris Lambers) . . . . . ***Praon nonveilleri*** n. sp.
7. Forewing M + m-cu vein complete or incomplete (figs. 12-13) 8
– Forewing M + m-cu vein absent (figs. 14-15) 10
8. Forewing M + m-cu vein complete and fused (fig. 13). Propodeum areolated with pentagonal areola (fig. 18). Antenna 15-20-segmented 9
– Forewing M + m-cu vein incomplete (fig. 12). Propodeum smooth (fig. 19). Antenna 12-13-segmented . . . . . ***Lysiphlebus fabarum*** (Marshall)
9. Antenna (17) 18-19 (20)-segmented. Labial palpi 3-segmented . . . . . ***Aphidius funebris*** Mackauer
– Antenna 15-16-segmented. Labial palpi 2-segmented . . . . . ***Aphidius uroleuci*** Mescheloff & Rosen
10. Antenna 10-11-segmented. Terminal metasomal sternum with two prongs, both with 6-8 long hairs (fig. 20) . . . . . ***Binodoxys centaureae*** (Haliday)
– Antenna 13-15-segmented. Terminal metasomal sternum without prongs (fig.21) . . ***Diaeretiella rapae*** (M' Intosh)

The parasitoid-aphid-plant associations (Southeastern Europe)

Ephedrus niger Gautier, Bonnamour & Gaumont, 1929 (fig. 8)

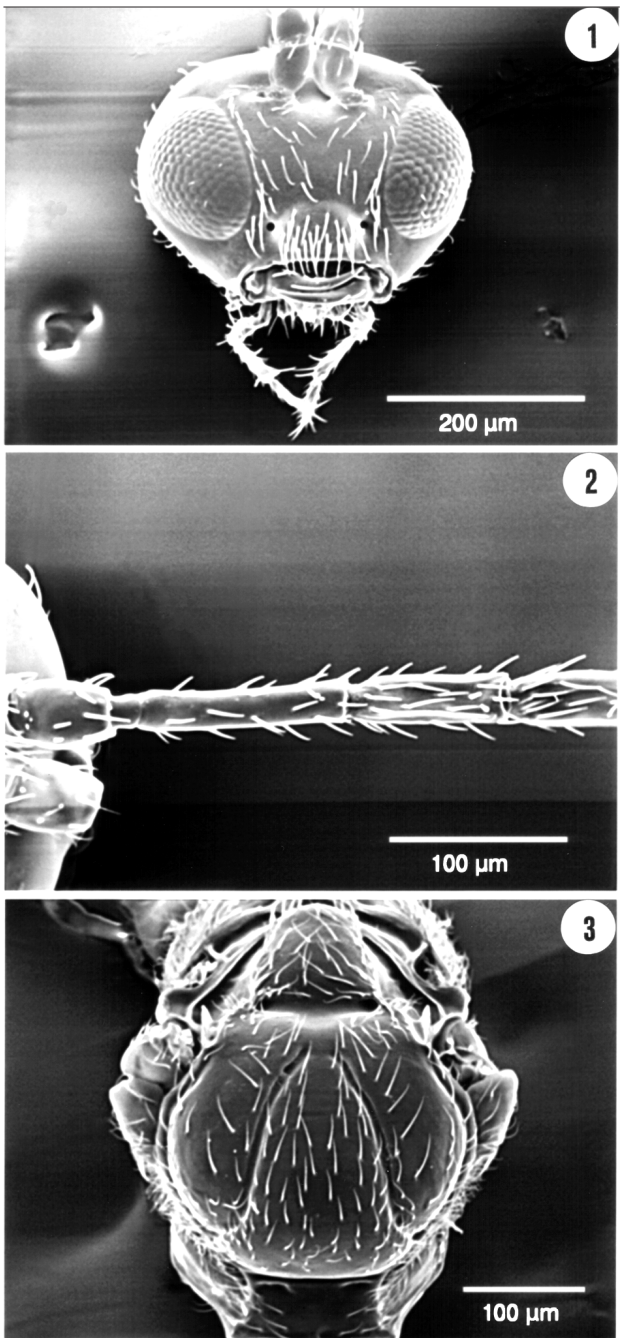
Ephedrus (Ephedrus) campestris Starý, 1962: 87.

Host records – ***Megoura viciae*** (Buckton) on *Lathyrus sativus* (MNG); ***Uroleucon cichorii*** Koch on *Cichorium intybus* (SER); ***Uroleucon inulae*** (Ferrari) on *Inula conyza* (GRE); ***Uroleucon murale*** (Buckton) on *Mycelis muralis* (SER).

Praon volucre (Haliday, 1833) (figs. 9, 16)

Praon pruni Ivanov, 1925: 2.

Host records – ***Acyrthosiphon lactucae*** (Passerini) on *Lactuca serriola* (SER, GRE); ***Acyrthosiphon malvae*** (Mosley) on *Geranium* sp. (SER, MNG); ***Acyrthosiphon pisum*** (Harris) on *Lathyrus cicera* (GRE), *Medicago arabica* (GRE), *Medicago sativa* (SER, GRE), *Pisum sativum* (SER), *Vicia narbonensis* (GRE), *V. sativa* ssp. *amphicarpa* (GRE); ***Amphorophora rubi*** (Kaltenbach) on *Rubus caesius* (SER), *R. fruticosus* (GRE); ***Aphis craccivora*** Koch on *Ipomoea batatas* (GRE), *Ipomoea* sp. (GRE), *Melilotus sulcata* (GRE); ***Aphis crepidis*** (Börner) on *Crepis biennis* (SER); ***Aphis fabae*** Scopoli on *Amaranthus retroflexus* (SER), *Beta vulgaris* (SER), *Conium maculatum* (TUR), *Galium aparine* (GRE), *Papaver somniferum* (SER), *Phaseolus vulgaris* (SER),



Figures 1-3
Praon nonveilleri n. sp., female. – 1, head. – 2, flagellomere 1, 2. – 3, mesonotum.

Pittosporum tobira (GRE), *Rumex crispus* (GRE, TUR), *R. hydrolapathum* (BUL, TUR), *Vicia faba* (GRE); ***Aphis fabae cirsiiacanthoides*** Scopoli on *Carduus australis* (GRE), *Carlina corymbosa* (GRE, BUL), *Cirsium creticum* (TUR), *Onopordum illyricum* (TUR), *Silybum marianum* (GRE); ***Aphis fabae solanella*** Theobald on *Solanum nigrum* (GRE); ***Aphis gosypii*** Glover on *Citrus aurantium* (GRE), *C. deliciosa* (GRE), *Viburnum tinus* (GRE); ***Aphis spiraephaga*** (Müller) on *Spiraea* sp. (SER); ***Aphis umbrella*** (Börner) on *Malva neglecta* (GRE); ***Aphis viticis*** Ferrari on *Vitex agnus-castus* (GRE); ***Aphis* sp.** on unknown plant (GRE); ***Aulacorthum solani*** (Kaltenbach) on *Cirsium vulgare* (GRE), *Citrus aurantium* (GRE), *Malva neglecta* (GRE), *Sonchus oleraceus* (GRE), *Urtica pilulifera* (GRE), *U. urens* (GRE); ***Brachycaudus cardui*** (L.) on *Carduus pycnocephalus* (GRE); ***Brachycaudus helichrysi*** (Kaltenbach) on *Carduus crispus* (GRE), *Chrysanthemum coronarium* (GRE), *Onopordum illyricum* (GRE), *Prunus cerasifera* (SER), *Vicia sativa* (GRE); ***Brevicoryne brassicae*** (L.) on *Brassica oleracea* (SER); ***Capitophorus elaeagni*** (del Guercio) on *Carduus crispus* (GRE); ***Corylobium avellanae*** (Schrank) on *Corylus avellana* (GRE); ***Hyadaphis foeniculi*** (Passerini) on *Lonicera* sp. (SER); ***Hyalopterus amygdali*** (Blanch.) on *Prunus dulcis*; ***Hyalopterus pruni*** (Geoffrey) on *Phragmites australis* (GRE, TUR), *Prunus cerasifera* (SER), *P. domestica* (SER, BOS, GRE); ***Hyperomyzus lactucae*** (L.) on *Rumex crispus* (GRE), *Ribes nigrum* (SER), *R. rubrum* (SER), *Sonchus asper* (GRE, TUR), *S. oleraceus* (SER, GRE), *S. palustris* (GRE); ***Macrosiphum euphorbiae*** (Thomas) on *Citrus aurantium* (GRE), *Solanum tuberosum* (SER, GRE), *Sonchus oleraceus* (GRE), *Leucanthemum vulgare* (GRE), *Linum capitatum* (MNG), *Lycopersicon esculentum* (GRE); ***Macrosiphum daphnidis*** (Börner) on *Daphne mezereum* (SER, MNG); ***Macrosiphum rosae*** (L.) on *Rosa arvensis* (GRE), *R. canina* (GRE), *Rosa* spp. (SER, MNG, GRE); ***Metopolophium dirhodum*** (Walker) on *Avena sterilis* (GRE), *Hordeum murinum* (SER), *Triticum aestivum* (SER, MNG, BOS), *Zea mays* (SER); ***Microlophium carnosum*** (Buckton) on *Urtica dioica* (SER), *U. pilulifera* (GRE), *U. urens* (SER, GRE); ***Myzocallis castanicola*** Baker on *Castanea sativa* (GRE); ***Myzus ligustri*** (Mosley) on *Ligustrum vulgare* (SER); ***Myzus persicae*** (Sulzer) on *Antirrhinum majus* (GRE), *Citrus aurantium* (GRE), *Ipomoea batatas* (GRE), *Nicotiana tabacum* (GRE, FYRM), *Prunus cerasifera* (SER), *P. persica* (SER, GRE), *Solanum tuberosum* (SER), *Urtica urens* (GRE); ***Myzus varians*** Davidson on *Clematis vitalba* (SER, GRE); ***Ovatus crataegarius*** (Walker) on *Mentha spicata* (GRE); ***Phorodon humuli*** (Schrank) on *Prunus cerasifera* (SER); ***Rhopalomyzus lonicerae*** (Siebold) on *Lonicera* sp. (SER); ***Rhopalosiphum padi*** (L.) on *Hordeum murinum* (GRE), *Piptatherum miliaceum* (GRE), *Triticum durum* (GRE), *Zea mays* (SER); ***Schizaphis graminum*** (Rondani) on *Avena sativa* (SER); ***Sitobion avenae*** (Fabricius) on *Triticum aestivum* (SER, MNG, BOS, GRE), *T. durum* (GRE); ***Sitobion fragariae*** (Walker) on *Bromus madritensis* (GRE), *Dactylis glomerata* (SER), *Hordeum murinum* (SER); ***Toxoptera auranti*** (Boyer de Fonscolombe) on *Citrus aurantium* (GRE); ***Uroleucon aeneum*** (Hille Ris Lambers) on *Carlina corymbosa* (GRE, TUR); ***Uroleucon cichorii*** (Koch) on *Cichorium intybus* (SER); ***Uroleucon sonchi*** (L.) on *Sonchus oleraceus* (GRE), *S. palustris* (GRE).

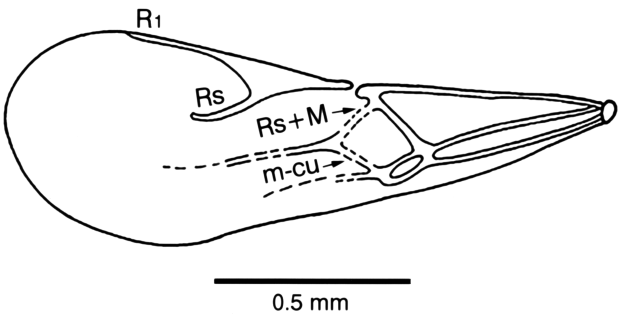
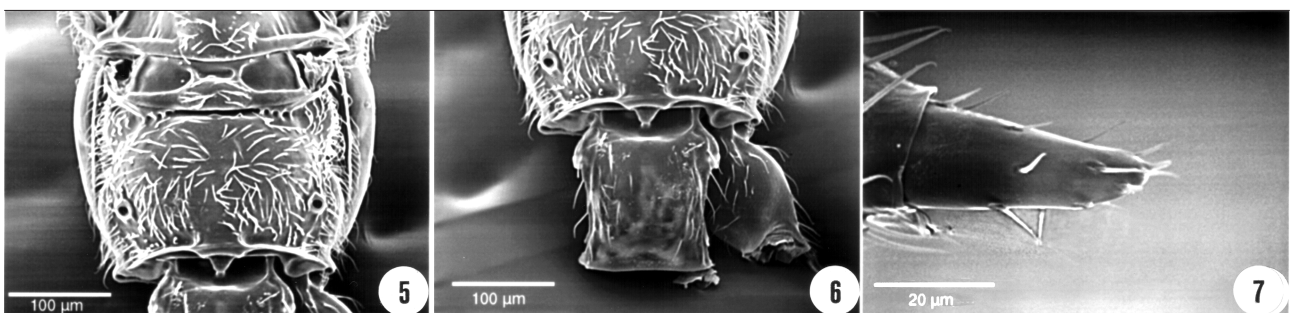


Figure 4
Praon nonveilleri n. sp., female. – 4, forewing.

Praon unitum Mesheloff & Rosen, 1988

Parasitoid of *Uroleucon sonchi* and *Macrosiphoniella sanborni* reported from Israel (Mescheloff & Rosen 1988).



Figures 5-7
Praon nonveilleri n. sp., female. – 5, propodeum. – 6, tergite 1. – 7, lateral view of ovipositor sheath.

Praon uroleucon
Tomanović & Kavallieratos, 2003 (fig. 11)

Host records – ***Uroleucon* sp.** on *Carduus acanthoides* (MNG).

Praon yomenae Takada, 1968
(figs. 10, 17)

Praon dorsale auct.

Host records – ***Uroleucon aeneum*** (Hille Ris Lambers) on *Carduus australis* (GRE), *C. tmoleus* ssp. *armatus* (GRE), *Carlina corymbosa* (GRE), *Cirsium creticum* (GRE); ***Uroleucon cichorii*** (Koch) on *Cichorium intybus* (SER, MNG), *Crepis biennis* (GRE); ***Uroleucon cichorii grossum*** on *Crepis biennis* (SER); ***Uroleucon doronici*** (Börner) on *Doronicum columnae* (GRE); ***Uroleucon jaceae*** (L.) on *Carlina corymbosa* ssp. *graeca* (GRE); ***Uroleucon sonchi*** L. on *Sonchus asper* (GRE), *S. oleraceus* (TUR), *S. palustris* (GRE, BUL); ***Uroleucon* sp.** on *Lactuca sativa* (SER), *Rhagadiolus stellatus* (MNG).

Praon nonveilleri
Tomanović & Kavallieratos n. sp. (figs. 1-7)

Type material – **Holotype female**, Serbia and Montenegro, Djetinja canyon (350m), 26/VII/1999, reared from *Uroleucon inulicola* (Hille Ris Lambers) on *Inula ensifolia* L., coll. Ž. Tomanović. The holotype specimen was slide-mounted in balsam and deposited in the Belgrade Natural History Museum (slide number 38/99). – **Paratypes**, 1 female and 12 males, same data as holotype. Seven male paratypes are deposited in the Belgrade Natural History Museum (dry mounted). One female and five males are deposited in the collection of the Laboratory of Agricultural Zoology and Entomology, Agricultural University of Athens (Greece).

Additional material: Serbia and Montenegro, Mt Goć (1,000 m), 23/X/1999, 1 female reared from *U. inulicola* on *Inula helenium* L. (Asteraceae), coll. O. Petrović.

Diagnosis – *P. nonveilleri* resembles *P. yomenae* but it is immediately distinguished from it by its 16-17-segmented antenna instead of 18-19 (20) in *P. yomenae*, the absence of longitudinal placodes (or sometimes the presence of one) on F_2 instead of 2 in *P. yomenae*, its longer and colourless middle third of M vein whereas in *P. yomenae* it is shorter and coloured throughout (fig. 10), its coloured Cu vein just prior to the m-cu vein joint whereas in *P. yomenae* it is coloured throughout, its slightly concave apical margin of ovipositor sheath whereas in *P. yomenae* it is concave (Takada 1968; Tremblay & Pennacchio 1985; Kavallieratos & Lykouressis 1999-2000; Kavallieratos *et al.* 2001; Tomanović *et al.* 2003). *Praon nonveilleri* resembles *P. unitum* but it is immediately distinguished from it by its different proportion between length and width of flagellomere 1 (5.5 x as long as wide in *P. nonveilleri* instead of 6 in *P. unitum*), its longer distal abscissa of R_1 than Rs vein whereas in *P. unitum* distal abscissa of R_1 is subequal to Rs, its colourless Rs + M whereas in *P. unitum* it is coloured basally, its denser and more uniform pubescence of the propodeum whereas in *P. unitum* propodeum has peripherally dense setae and medially sparse and scattered setae, its different colouration of flagellomere 1 (basal 2/3 yellow, apical 1/3 light brown to yellow with a black ring at the apex whereas in *P. unitum* it is yellowish at base, gradually darkening to brown at apex), its generally dark brown mesosoma whereas in *P. unitum* it is yellowish to yellow and its different host range (*P. nonveilleri* is a parasitoid of *U. inulicola* whereas *P. unitum* is a parasitoid of *M. sanborni* and *U. sonchi*) (Mescheloff & Rosen 1988). *P. nonveilleri* resembles *P. uroleucon* but it is immediately distinguished from it by its 16-17-segmented antenna instead of 21 in *P. uroleucon*, its different proportion between length and width of flagellomere 1 (5.5 x as long as wide in *P. nonveilleri* instead of 5 x in *P. uroleucon*), its different proportion between length and width of F_2 (3.5 x as long as wide in *P. nonveilleri* instead of 3 x in *P. uroleucon*), its large hairless areas instead of small ones in *P. uroleucon*, its different proportion between stigma and Rs vein length (1.88 in *P. nonveilleri* instead of 1.33 in *P. uroleucon*), its longer and colourless middle third of M vein whereas in *P. uroleucon* it is shorter and coloured throughout, its coloured Cu vein just prior to the m-cu vein joint whereas in *P. uroleucon* it is coloured throughout, its colourless Rs + M vein whereas in *P. uroleucon* it is coloured in the first quarter gradually loosing colour and erased in the last quarter, its colourless m-cu vein whereas in *P. uroleucon* it is erased in the second half, its slightly concave apical margin of the ovipositor sheath whereas in *P. uroleucon* it is linear, its 2 conical spines on the round apex of the ovipositor sheath instead of 1 in *P. uroleucon* and its different colouration of flagellomere 1 (basal 2/3 yellow, apical 1/3 light brown to yellow with a black ring at the apex whereas in *P. uroleucon* it is yellow with a dark ring at the apex) (Tomanović *et al.* 2003).

Description – Female: Body length about 1.84 mm.

Head. (fig. 1). Eyes oval, medium sized, convergent towards clypeus, sparsely haired. Malar space equal to about 1/4 of longitudinal eye diameter. Clypeus oval, with about 22 long hairs, separated from face by a shallow arched groove, with deep tentorial pit. Labrum with 8 long hairs. Face with sparse hairs. Tentorial index (tentoriocular line/intertentorial line) about 0.30. Maxillary palpus 4-segmented, labial palpus 3-segmented. Antenna 16-17-segmented, filiform, not thickened at apex with semierected,

adpressed and few erected setae which are a little longer than the half segment diameter. Flagellomere 1 (= F_1) (fig. 2) about 5.5 X as long as median width. F_2 (fig. 2) about 3.5 X as long as median width. F_1 about 1.5 X as long as F_2. Middle flagellomere (F_9 and F_{10}) about 3 X as long as median width. F_1 without longitudinal placodes. F_2 without or sometimes with one longitudinal placode.

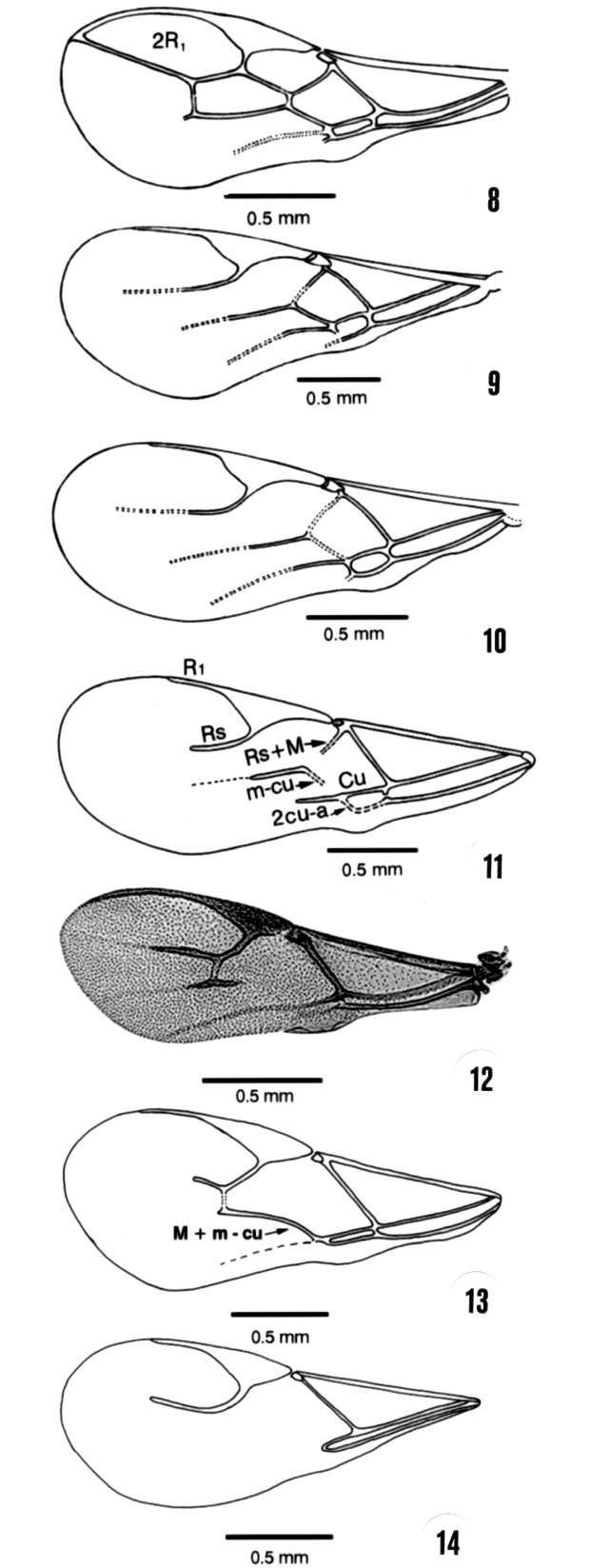
Mesosoma. Mesonotum (fig. 3) with central lobe densely covered with long setae. Lateral lobes of mesonotum with large hairless areas. Notaulices deep and distinct throughout. Propodeum (fig. 5) smooth, densely pubescent except for small upper and lower central parts which are hairless.

Forewing. (fig. 4). Stigma about 3.5 X as long as wide and 1.5 X as long as distal abscissa of R_1 (= metacarpus). Distal abscissa of R_1 1.25 X as long as Rs vein. Stigma 1.88 X as long as Rs vein. m-cu and Rs + M veins colourless throughout. M vein long, pigmented in the first and last third and colourless in the middle.

Metasoma. Metasomal tergum 1 (fig. 6) about 1.3 X as long as wide at the level of the spiracles, the distance between spiracles and apex less than the width at spiracles level, convex in profile with long sparse setae close to hind corners which have weak wrinkles. Ovipositor sheath (fig. 7) elongate with the apical margin slightly concave. Round apex, with 2 conical spines on its upper and lower edge.

Colouration. Head dark brown to black, face somewhat paler, eyes black, clypeus light brown to yellow, mandibles light brown except for dark apices, maxillary and labial palpi yellow. Scape light brown to yellow, pedicel dorsally light brown to brown, ventrally yellow. F_1: basal 2/3 yellow, apical 1/3 light brown to yellow with a black ring at the apex, remainder of antenna dark brown. Propleuron light brown to yellow, pronotum yellow, mesopleuron: apical 1/2 light brown, basal 1/2 light brown to yellow, metapleuron brown to light brown. Propodeum: central part dark brown, peripheral part brown to light brown. Scutellum, postscutellum, lateral lobes of mesonotum, metanotum dark brown. Wings hyaline with light brown venation. Legs yellow, apices of tarsi dark brown. Metasomal tergum 1 light brown to yellow. Metasomal tergum 2 and 3 light brown. Rest of metasoma brown to dark brown. The cocoon is brownish.

Male. Body length: 1.17-1.41 mm. Antennae 17-19 (20)-segmented. Head dark brown, eyes black, clypeus brown, maxillary and labial palpi yellow, mandibles light brown except for



Figures 8-14
8, forewing of female *Ephedrus niger* Gautier, Bonnamour & Gaumont, 1929. – 9, forewing of female *Praon volucre* (Haliday, 1833). – 10, forewing of female *Praon yomenae* Takada, 1968. – 11, forewing of female *Praon uroleucon* Tomanović & Kavallieratos, 2003. – 12, forewing of female *Lysiphlebus fabarum* (Marshall, 1896). – 13, forewing of female *Aphidius funebris* Mackauer, 1961. – 14, forewing of female *Binodoxys centaureae* (Haliday, 1833).

dark apices. Antenna dark brown to black. Propleuron, pronotum brown. Mesopleuron, metapleuron, propodeum, scutellum, postscutellum, lateral lobes of mesonotum, metanotum dark brown. Legs brown to light brown with darker apices. Metasomal tergum 1, 2, 3 brown. The rest of metasoma dark brown to black.

Etymology – The new species is named in honour of the late Professor Guido Nonveiller, famous Serbian expert in taxonomy and faunistics of some groups of cleptoparasitic wasps (Hymenoptera: Mutillidae) and various Coleoptera.

Comments – Over the period 1995-2001 intensive research of aphid parasitoid guilds in Southeastern Europe revealed many new plant - aphid - parasitoid associations and new aphid parasitoid species (Starý *et al.* 1998; Tomanović *et al*. 1998; Kavallieratos & Lykouressis 1999-2000; Kavallieratos *et al*. 2001; Tomanović & Kavallieratos 2002; Kavallieratos *et al.* 2003). This is in accordance with the great plant diversity and the geological history of this area.

Regarding its host range and morphological characters, *P. nonveilleri* belongs to the "*dorsale-yomenae*" species group (Marshall 1891; Takada 1968; Tremblay & Pennacchio 1985; Tremblay *et al.* 1986; Mescheloff & Rosen 1988; Tomanović *et al.* 2003). The host aphid, *U. inulicola* is holocyclic and monoecious on *Inula* plants. This species is distributed throughout the West Palaearctic (Heie 1995). The host plant *I. ensifolia* is a submediterranean-pontic floristic element (Gajić 1975). The distribution of the host plant is restricted to the Southeastern Europe, Northern Italy, Austria, Hungary and southern parts of Russia. *Uroleucon* aphids are parasitized by three other *Praon* species in the West Palaearctic: *P. yomenae* (Takada 1968; Tremblay & Pennacchio 1985; Tomanović *et al.* 2003), *P. unitum* (Mescheloff & Rosen 1988) and *P. uroleucon* (Tomanović *et al.* 2003). *Praon yomenae* has a Palaearctic distribution and it is oligophagous parasitizing *Uroleucon*, *Macrosiphoniella* and sometimes *Acyrthosiphon* species (Tremblay & Pennacchio 1985; Kavallieratos *et al.* 2001; Tomanović *et al.* 2003). In contrast, *P. unitum* is restricted to Israel parasitizing *U. sonchi* and *M. sanborni* whereas *P. uroleucon* to the submediterranean area of Serbia and Montenegro parasitizing *Uroleucon* sp. *P. nonveilleri* is monophagous on *U. inulicola* and it is found in refugial canyon with strong Mediterranean influences in West Serbia. It is a good example of sympatric speciation by adaptive divergence towards different host aphids and host plants (Tremblay & Pennacchio 1988).

Lysiphlebus fabarum (Marshall, 1896)
(figs. 12, 19)

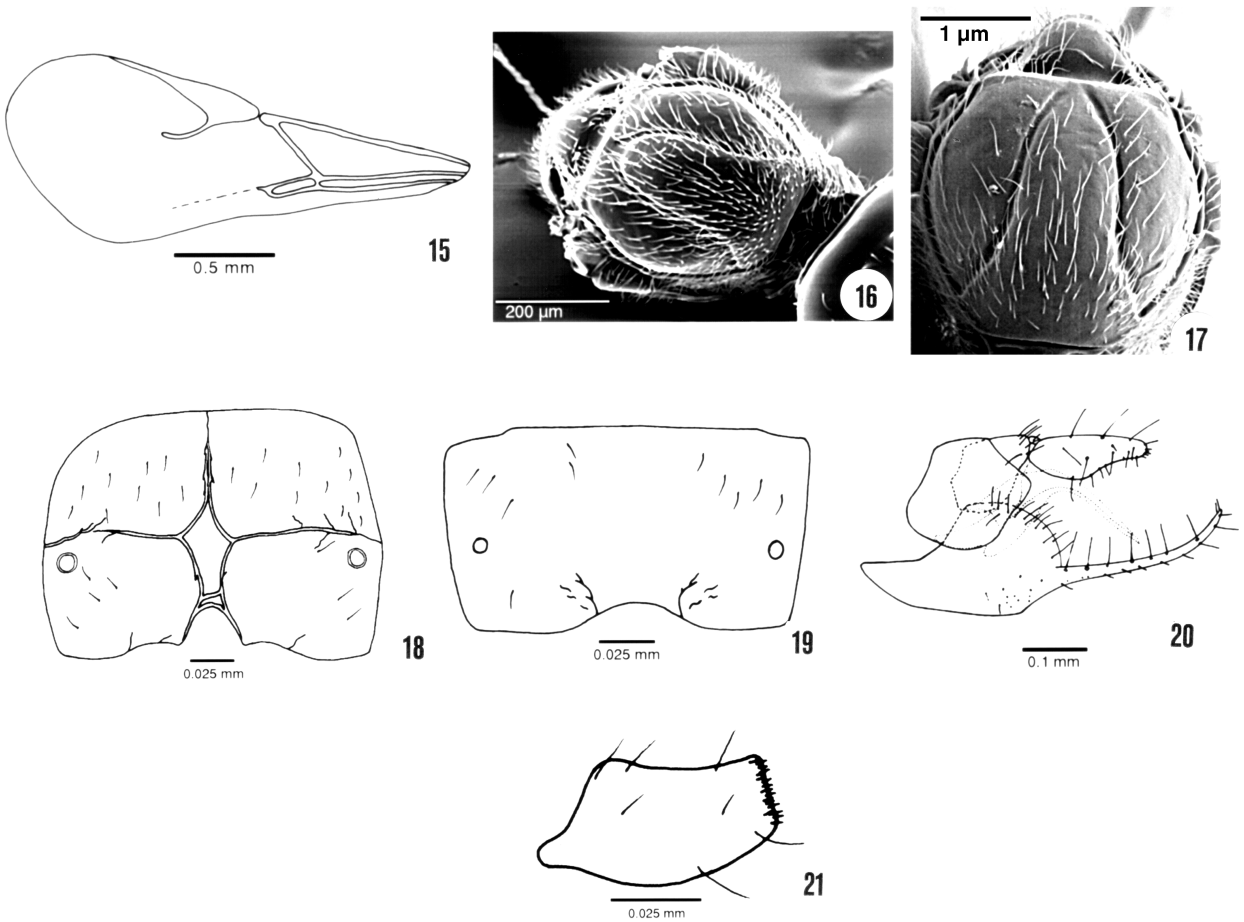
Lysiphlebus moroderi Quilis, 1931: 43.

Host records – ***Anoecia corni*** (Fabricius) on *Triticum aestivum* (SER); ***Aphis* spp.** on *Crepis biennis* (SER), *Clematis* sp. (SER), *Epilobium* sp. (SER), *Galium aparine* (SER), *Lamium* sp. (SER), *Lilium* sp. (SER), *Lycopus europaeus* (SER), *Mentha aquatica* (SER), *Nepeta nuda* (SER), *Pittosporum tobira* (CRO), *Rubus* sp. (SER), *Rumex obtusiformis* (SER), *Salvia verticillata* (SER), *Spartium junceum* (CRO), *Symphytum officinale* (SER), *Tordylium maximum* (SER), *Tragopogon* sp. (SER); ***Aphis afinis*** De Guer on *Mentha aquatica* (SER, GRE); ***Aphis balloticola*** Szelegiewicz on *Ballota nigra* (SER, MNG); ***Aphis carlinae*** (Börner) on *Carlina acaulis* (SER); ***Aphis celastrii*** Matsumura on *Centaurea* sp. (SER); ***Aphis confusa*** Walker on *Knautia dipsacifolia* (MNG); ***Aphis craccivora*** Koch on *Atriplex patula* (SER), *A. tatarica* (SER), *Cardaria draba* (GRE), *Dorycnium herbaceum* (SER), *Medicago disciformis* (GRE), *M. lupulina* (SER), *M. sativa* (SER), *Melilotus alba* (GRE), *M. neapolitana* (GRE), *M. officinalis* (SER, GRE), *M. sulcata* (GRE), *Phaseolus vulgaris* (SER), *Robinia pseudacacia* (SER, GRE), *Trigonella procumbens* (SER); ***Aphis crepidis*** (Börner) on *Crepis biennis* (SER); ***Aphis davletshinae*** Hille Ris Lambers on *Althaea officinalis* (SER); ***Aphis fabae*** Scopoli on *Althaea officinalis* (SER), *Ammi majus* (GRE), *Arctium lappa* (SER), *Amaranthus retroflexus* (SER), *Beta vulgaris* (SER), *Carduus acanthoides* (SER), *Chenopodium album* (SER, GRE), *C. bonus-henricus* (GRE), *Cirsium eriophorum* (SER), *C. lanceolatum* (SER), *Coreopsis verticillata* (SER), *Erigeron annuus* (SER), *Evonymus europaeus* (SER), *Galium aparine* (GRE), *G. mollugo* (GRE), *G. verticillatum* (GRE), *Heracleum sphondylium* (SER), *Levisticum officinale* (SER), *Matricaria inodora* (SER), *Papaver somniferum* (SER), *Pastinaca sativa* (SER), *Phaseolus vulgaris* (SER), *Rumex acetosella* (SER), *R. crispus* (GRE), *R. pulcher* (GRE), *R. obtusifolius* (GRE), *Solanum nigrum* (SER), *Tanacetum parthenium* (SER), *Torilis arvensis* (GRE), *Urtica urens* (SER), *Zea mays* (SER); ***Aphis fabae cirsiiacanthoidis*** Scopoli on *Carduus australis* (GRE), *Cirsium arvense* (SER, MNG), *C. creticum* (GRE), *Ptilostemon strictus* (GRE), *Silybum marianum* (GRE); ***Aphis fabae solanella*** Theobald on *Solanum nigrum* (GRE); ***Aphis gentianae*** (Börner) on *Gentiana asclepiadae* (SER); ***Aphis gossypi*** Glover on *Chaenomeles japonica* (GRE), *Chrysanthemum* sp. (SER), *Citrus aurantium* (GRE), *Cucumis sativus* (SER), *Hibiscus mutabilis* (GRE), *Lapsana communis* (GRE), *Lonicera alpigena* (GRE), *Malva sylvestris* (GRE), *Nerium oleander* (GRE); ***Aphis farinosa*** Gmelin on *Salix cinerea* (SER); ***Aphis frangulae*** Koch on *Rhamnus fallax* (MNG); ***Aphis idaei*** van der Goot on *Rubus idaeus* (SER, GRE); ***Aphis nasturtii*** Kaltenbach on *Punica granatum* (SER); ***Aphis newtoni*** Theobald on *Iris germanica* (SER); ***Aphis oenotherae*** Oestlund on *Oenothera biennis* (SER); ***Aphis pomi*** De Geer on *Malus domestica* (SER); ***Aphis ruborum*** Börner on *Rubus idaeus* (SER), *R. hirtus* (GRE), *R. ulmifolius* (GRE); ***Aphis salviae*** Walker on *Salvia nemorosa* (SER); ***Aphis sanguisorbie*** Schrank on *Sanguisorba minor* (SER, MNG); ***Aphis serpylli*** Koch on *Thymus* sp. (SER); ***Aphis spiraecola*** Patch on *Chaenomeles japonica* (GRE), *Senecio bicolor* ssp. *cineraria* (GRE); ***Aphis taraxicicola***

Börner on *Taraxacum officinale* (SER); ***Aphis origani*** Passerini on *Nepeta nuda* (SER, MNG); ***Aphis umbrella*** Börner on *Malva neglecta* (GRE), *M. sylvestris* (SER); ***Aphis urticata*** Gmelin on *Urtica dioica* (SER, GRE); ***Aphis verbasci*** Schrank on *Verbascum* sp. (SER); ***Aphis viburni*** Scopoli on *Viburnum opulus* (SER); ***Brachycaudus cardui*** L. on *Arctium lappa* (GRE), *Carduus acanthoides* (SER, GRE), *C. australis* (GRE), *C. crispus* (GRE), *Cirsium eriophorum* (SER), *C. italicum* (GRE), *C. lanceolatum* (SER), *Onopordum acanthium* (GRE), *Prunus cerasifera* (MNG); ***Brachycaudus schwartzi*** (Börner) on *Prunus persica* (SER); ***Brachycaudus helichrysi*** (Kaltenbach) on *Cirsium vulgare* (GRE), *Ptilostemon strictus* (GRE), *Prunus dulcis* (GRE), *P. persica* (SER); ***Brachycaudus lychnidis*** (L.) on *Lychnis coronaria* (GRE); ***Hyalopterus pruni*** (Geoffrey) on *Phragmites australis* (SER), *Prunus cerasifera* (SER); ***Hyperomyzus picridis*** (Börner and Blunck) on *Picris hieracioides* (SER, MNG); ***Myzus cerasi*** (Fabricius) on *Prunus avium* (GRE); ***Myzus persicae*** (Sulzer) on *Capsicum annuum* (SER, GRE), *Nicotiana tabacum* (GRE), *Polygonum aviculare* (SER); ***Phorodon humuli*** (Schrank) on *Prunus cerasifera* (SER); ***Semiaphis dauci*** (Fabricius) on *Daucus carota* (SER); ***Rhopalosiphum maidis*** (Fitch) on *Triticum durum* (GRE); ***Sitobion avenae*** (Fabricius) on *Lolium italicum* (SER); ***Toxoptera aurantii*** (Boyer de Fonscolombe) on *Citrus aurantium* (GRE); ***Uroleucon jaceae*** (L.) on *Carlina corymbosa* ssp. *graeca* (GRE).

Aphidius funebris Mackauer, 1961
(figs. 13, 18)

? *Aphidius eriophori* Mackauer *In*: Mackauer & Starý, 1967: 57.



Figures 15-21
15, forewing of female *Diaeretiella rapae* (M'Intosh, 1855). – 16, mesonotum of female *Praon volucre* (Haliday, 1833). – 17, mesonotum of female *Praon yomenae* Takada, 1968. – 18, propodeum of female *Aphidius funebris* Mackauer, 1961. – 19, propodeum of female *Lysiphlebus fabarum* (Marshall, 1896). – 20, ovipositor sheath of female *Binodoxys centaureae* (Haliday, 1833). – 21, ovipositor sheath of female *Diaeretiella rapae* (M'Intosh, 1855).

Host records – ***Uroleucon aeneum*** (Hille Ris Lambers) on *Carduus australis* (GRE), *C. crispus* (GRE), *C. pycnocephalus* (GRE), *C. tmoleus* ssp. *armatus* (GRE), *Carlina corymbosa* (GRE), *Cirsium vulgare* (GRE); ***Uroleucon chondrillae*** (Nevsky) on *Reichardia intermedia* (GRE); ***Uroleucon cichorii*** (Koch) on *Cichorium intybus* (SER); ***Uroleucon cichorii grossum*** (Hille Ris Lambers) on *Crepis biennis* (SER); ***Uroleucon doronici*** (Börner) on *Doronicum austriacum* (SER), *D. columnae* (GRE); ***Uroleucon jaceae*** (L.) on *Carlina corymbosa* ssp. *graeca* (GRE), *Centaurea* sp. (SER); ***Uroleucon murale*** (Buckton) on *Mycelis muralis* (MNG); ***Uroleucon solidaginis*** (Fabricius) on *Solidago virgaurea* (SER); ***Uroleucon sonchi*** (L.) on *Sonchus arvensis* (SER, MNG), *S. asper* (GRE), *S. oleraceus* (SER, GRE), *Sonchus* sp. (GRE); ***Uroleucon* spp.** on *Campanula rapunculus* (SER), *Carduus acanthoides* (MNG), *C. crispus* (GRE), *Centaurea jacea* (SER), *Cichorium intybus* (SER), *Crepis biennis* (SER, MNG), *C. neglecta* (GRE), *Crepis* sp. (SER, MNG), *Mycelis muralis* (MNG).

Aphidius uroleuci Mescheloff & Rosen, 1990

Parasitoid of *Uroleucon* spp. reported from Israel (Mescheloff & Rosen, 1990).

Binodoxys centaureae (Haliday, 1833) (figs. 14, 20)

Host record: ***Macrosiphoniella artemisiae*** Boyer de Fonscolombe on *Artemisia vulgaris* (SER); ***Macrosiphoniella* sp.** on *Achillea millefolium* (SER); ***Uroleucon cichorii*** (Koch) on *Crepis biennis* (GRE); ***Uroleucon cichorii grossum*** Hille Ris Lambers on *Crepis biennis* (SER); ***Uroleucon murale*** Buckton on *Mycelis muralis* (SER, MNG); ***Uroleucon* sp.** on *Crepis* sp. (SER).

Diaeretiella rapae (M'Intosh, 1855) (figs. 15, 21)

Diaeretus aphidum Mukerji & Chatterjee, 1950: 193

Host records – ***Aphis cadiva*** Walker on *Silene vulgaris* (MNG); ***Aphis craccivora*** Koch on *Cardaria draba* (GRE); ***Aphis gossypii*** Glover on *Citrus aurantium* (GRE), *C. deliciosa* (GRE); ***Aphis nerii*** Boyer de Fonscolombe on *Nerium oleander* (GRE); ***Aphis spiraecola*** Patch on *Viburnum tinus* (GRE); ***Aphis umbrella*** (Börner) on unknown plant (GRE); ***Aulacorthum solani*** (Kaltenbach) on *Malva neglecta* (GRE); ***Brachycaudus amygdalinus*** (Schouteden) on *Prunus dulcis* (GRE); ***Brachycaudus cardui*** (L.) on *Calendula arvensis* (GRE), *Carduus australis* (GRE), *C. crispus* (GRE), *C. pycnocephalus* (GRE); ***Brachycaudus helichrysi*** (Kaltenbach) on *Carduus crispus* (GRE), *Carlina corymbosa* ssp. *graeca* (GRE), *Chrysanthemum coronarium* (GRE), *Leucanthemella serotina* (GRE), *Cirsium creticum* (GRE), *C. tuberosum* (GRE), *C. vulgare* (GRE), *Leucanthemum vulgare* (GRE), *Onopordum illyricum* (GRE), *Rumex acetosella* (SER), *Stellaria media* (GRE); ***Brachycaudus helichrysi*** var. ***warei*** (Theobald) on *Melilotus sulcatus* (GRE); ***Brevicoryne brassicae*** L. on *Brassica oleracea* (SER), *Brassica oleracea* var. *botrytis* (GRE), *Brassica oleracea* var. *capitata* (GRE), *Raphanus sativus* (SER), *Ruta graveolens* (SER); ***Diuraphis noxia*** (Kurdjumov) on *Hordeum vulgare* (SER), *Hordeum* sp. (FYRM); ***Hayhurstia atriplicis*** (L.) on *Chenopodium album* (SER); ***Hyadaphis foeniculi*** (Passerini) on *Lonicera* sp. (SER); ***Lipaphis lepidii*** (Nevsky) on *Cardaria draba* (GRE); ***Lipaphis erysimi*** (Kaltenbach) on *Erysimum graecum* (GRE), *Sisymbrium orientale* (GRE); ***Myzus persicae*** Sulzer on *Antirrhinum majus* (GRE), *Capsicum annuum* (SER), *Cardaria draba* (GRE), *Chamomilla recutita* (GRE), *Chrysanthemum coronarium* (GRE), *C. segetum* (GRE), *Citrus aurantium* (GRE), *C. sinensis* (GRE), *Brassica nigra* (GRE), *Malva neglecta* (GRE), *Nicotiana tabacum* (GRE), *Phacelia tanacetifolia* (GRE), *Prunus persica* (GRE), *Sisymbrium irio* (GRE), *S. orientale* (GRE), *Urtica urens* (GRE); ***Pseudobrevicoryne leclanti*** Petrović & Remaudière on *Arabis alpina* (MNG); ***Rhopalosiphum maidis*** (Fitch) on *Hordeum distichon* var. *nudum* (GRE), *Hordeum vulgare* (GRE), *Triticum durum* (GRE); ***Rhopalosiphum padi*** (L.) on *Bromus ramosus* (GRE), *Hordeum murinum* (GRE), *H. vulgare* (GRE), *Triticum durum* (GRE); ***Toxoptera aurantii*** (Boyer de Fonscolombe) on *Citrus aurantium* (GRE).

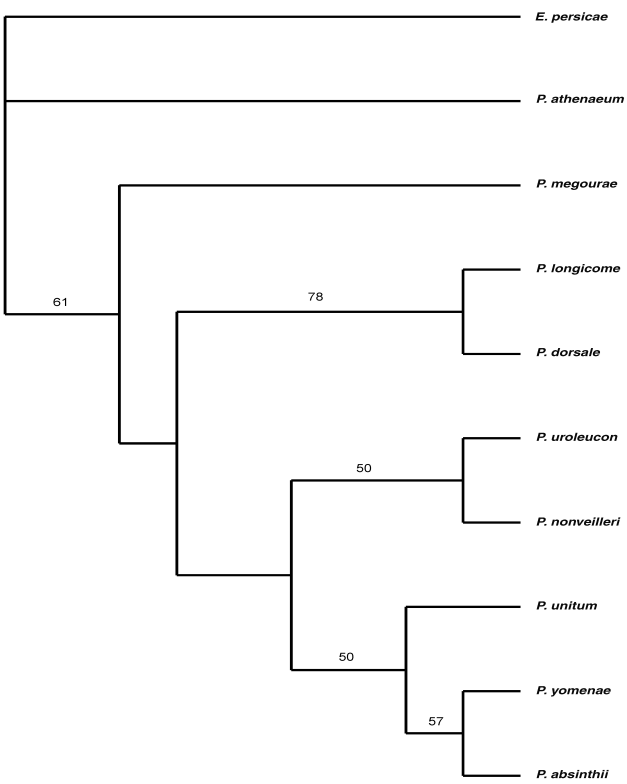


Figure 22
A cladistic analysis by distance methods of the internal phylogeny of "*dorsale-yomenae*" group and related species. *E. persicae* was used as outgroup. Bootstrap values was calculated from 100 replicates. Bootstrap values > 50% are shown.

PHYLOGENETIC INFERENCE

Mackauer (1961) synonymized *Praon longicorne* Marshall with *Praon dorsale* (Haliday). Tremblay & Pennacchio (1985) re-examinated the British Museum types specimens of *P. longicorne* and *P. dorsale* and established them as separate taxa (Tremblay *et al.* 1986). Tremblay & Pennacchio (1985) based on wing venation, shape of ovipositor sheath and pubescence of mesonotum synonymized *P. dorsale* parasitic on *Uroleucon* aphids with Japanese species *P. yomenae*. "True" *P. dorsale* is restricted to parasitize *Coryllobium avellanae* (Schrank) and it was referred as rare species (Marshall 1891; Tremblay & Pennacchio 1985; Tremblay *et al.* 1986). New established taxonomic and host range status of *P. yomenae, P. dorsale* and *P. longicorne* (= *grossum*?, Starý 1971) need full revision with representative material from different regions worldwide. Recently, Mescheloff & Rosen (1988) described *P. unitum* parasitic on *U. sonchi* and *M. sanborni* in Israel. Also, Tomanović & Kavallieratos in Tomanović *et al.* (2003), described *P. uroleucon* parasitic on *Uroleucon* sp. from the submediterranean part of Montenegro. Close relations, based on morphology, between the "*dorsale-yomenae*" group and *Praon absinthi* Bignell, *Praon megourae* Starý and *Praon athenaeum* Kavallieratos & Lykouressis were pointed out by Mackauer (1959), Starý (1971), Kavallieratos & Lykouressis (1999-2000) and Tomanović *et al.* 2003.

Tree in figure 22 shows reconstructed internal phylogenetic relationships inside the "*dorsale-yomenae*" species group and related species including *P. nonveilleri* n. sp. described here using cladistic distance methods. As shown in fig. 22 *P. athenaeum* is the sister to the remaining species of the group. This species has retained many plesiomorphic characters such as: forewing vein Rs + M partly sclerotized and coloured; ovipositor sheath straight dorsaly; tergite I subquadrate. In one clade are *Praon* parasitic on *Uroleucon* spp. and *Macrosiphoniella* spp. (*P. uroleucon, P. nonveilleri* + *P. unitum, P. yomenae* and *P. absinthii*). *P. nonveilleri* n. sp. and *P. uroleucon* composed a distinct clade with bootstrap support of 50%. Both species are parasitic on *Uroleucon* aphids in submediterannean areas of Serbia and Montenegro. All five species share the following synapomorphies: colourless, partly sclerotized or partly effaced m-cu vein; two conical apical spines on ovipositor sheath and lateral lobes of mesonotum with large hairless areas. More basal lineage is *P. longicorne* and *P. dorsale* clade with bootstrap support of 78%. Both species retain plesiomorphic characters as fully sclerotized and coloured forewing vein m-cu and lateral lobes of mesonotum densely pubescent.

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