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SOME RARE AND ENDEMIC APHID PARASITOID SPECIES (HYMENOPTERA: BRACONIDAE: APHIDIINAE) FROM THE BALKAN PENINSULA

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The great plant and habitat diversity of the Balkans has created a great species diversity of aphid parasitoid fauna. Recent, intensive investigations in the aphid parasitoid fauna of the Balkans, resulted in the discovery of a few new and rare or endemic species of aphidiine wasps. Furthermore, many useful new tritrophic associations of aphidiines were also observed. In this paper we are presenting the ecology and zoogeography of specific aphid parasitoid fauna of the Balkans.

KEY WORDS: Aphidiinae, endemism, biodiversity, zoogeography, Balkans

INTRODUCTION

The biodiversity of an area is conditioned by ecological characteristics combined with historical factors (DOLPHIN & QUICKE, 2001). Very compound ecology and zoogeography of the floras and faunas of the Balkan Peninsula and various recent climatical, geological, hydrological and pedological characteristics are being formed during dynamic historical processes in this area (MATVEJEV & PUNCER, 1989).

The Balkan Peninsula is one of the greatest centres of biodiversity in Europe. It is also the origin of many new species and the place where the European and Asian faunas meet. The great plant and habitat diversity of the Balkans has caused

a great species diversity of the aphid parasitoids fauna. However, only few papers about the fauna of aphidiine wasps of the Balkans have been published (GRAEFFE, 1908; FAHRINGER, 1924; VUKASOVIĆ, 1928). Recently, intensive investigations in the aphid parasitoid fauna of the Balkans, resulted in the discovery of several new and rare or endemic species of aphidiine wasps (STARÝ *et al*., 1998; KAVALLIERATOS & LYKOURESSIS, 1999-2000; TOMANOVIĆ, 2000; TOMANOVIĆ & BRAJKOVIĆ, 2000; TOMANOVIĆ & STARÝ, 2001; TOMANOVIĆ & KAVALLIERATOS, 2002). Furthermore, many new tritrophic associations (aphid parasitoid-host aphid-host plant) were also observed (TOMANOVIĆ *et al*., 1998; KAVALLIERATOS *et al*., 2001).

Updated research shows that aphid parasitoids fauna comprise about 120 species in the Balkans (ATANASSOVA, 1997; TOMANOVIĆ *et al*., 1998; TOMANOVIĆ, 2000; KAVALLIERATOS *et al*., 2001). Some of them are either endemic for the Balkans or recorded in only few localities outside.

In this paper we are presenting some rare and endemic aphid parasitoid species of the Balcans, their ecology and zoogeography.

MATERIAL AND METHODS

Samples from plants bearing aphid colonies consisting of both live and mummified aphids were collected in many localities of the Balkans (Serbia, Montenegro, Bosnia, Croatia, FYROM, Bulgaria and Greece) during 1989-2001. Live aphids were preserved in 90% ethyl-alcohol and 75% lactic acid 2:1 (EASTOP & VAN EMDEN, 1972). Remaining aphid colonies on host plants were put in covered transparent plastic containers, then transferred for rearing to the chamber for 20 days, on 20±1 ^{0}C and light regime 16L:8N, till the emergence of primary parasitoids. At the same time, a representative plant taxon was collected for identification. Slides were made in Canada balsam, with dissected parasitoids specimens for identification later on.

RESULTS

Ephedrus blattnyi Starý
Material: Mt. Durmitor- Mali Medjed (1800m) (Montenegro), 14. VII. 2000, *Pterocomma rufipes* (Hartig) on *Salix retusa*, 1 female, leg. O. Petrović; Mt Durmitor-Mali Medjed (1800m), 18. VII. 2000, *P. rufipes* on *S. retusa*, 1 male, leg. Ž. Tomanović.
Remarks. A very rare species, described in 1973 on the basis of 15 specimens collected in Vysoki Tatry (former Czechoslovakia) reared from *Pterocomma ringdahli* Wahlgren Š=*Pterocomma rufipes* (Hartig)Ć/*Salix caprea* associations (STARÝ & LECLANT, 1973). *Pterocomma* aphids are widely distributed in the

Holarctic on *Salix* and *Populus* host plants but apart from type material no sample of *E. blattnyi* was collected. On the basis of this fact, we can conclude that it is a species whose area is restricted to specific high mountain microhabitats where it parasitizes *Pterocomma* aphids.

Diaeretellus palustris Starý
Material: Mt. Vlasina (Serbia), 22. VII. 1990, *Rhopalosiphum nymphaeae* (Linnaeus) on *Ranunculus aquatica*, 2 males, leg. Ž. Tomanović.
Remarks. There are no other records of this species apart from the typical locality in Germany (STARÝ, 1971), and more recently from Mt. Vlasina (*R. nymphaeae*/*R. aquatica*). It seems that this species is characteristic of montane swamps habitats.

Praon athenaeum Kavallieratos et Lykouressis
Material: Athens, Attica (Greece), 21. V. 1995, *Hyperomyzus (Hyperomyzus) lactucae* (Linnaeus) on *Sonchus oleraceus*, 1 female, leg. N. Kavallieratos; Ehinos, Xanthi (Greece), 6. VI. 1999, *H. lactucae* on *S. oleraceus*, 3 females, leg. N. Kavallieratos.
Remarks. This species is characteristic of urban environment in Greece recorded only from the *H. lactucae/S. oleraceus* association.

Praon retusae Tomanović et Kavallieratos
Material: Mt. Durmitor- Mali Medjed (1800m) (Montenegro), 6. VII. 1998, *Acyrthosiphon* sp. on *Salix retusa*, 1 female, leg. Ž. Tomanović; Mt. Durmitor - Mali Medjed (1800m) (Montenegro), 14. VII. 2000, *Acyrthosiphon* sp. on *Salix retusa*, 1 male, leg. Ž. Tomanović.
Remarks. The host plant *S. retusa* is distributed in high-montane areas in central and southern Europe (the Pyreneans, Alps, Dinarids, Carpathians and Mt. Rila). *Praon retusae* is a high-montane faunistic element with expecting insular type of distribution in central and southern Europe.

Praon staryi Kavallieratos et Lykouressis
Material: Gravia, Phokis (Greece), 25. IX. 1995, *Myzus (Nectarosiphon) nicotianae* Blackman Š= *Myzus (Nectarosiphon) persicae* (Sulzer)Ć on *Nicotiana tabacum*, 1 female, leg. N. Kavallieratos; Tithorea, Fthiotis (Greece), 20. VIII. 1997, *M. nicotianae* on *N. tabacum*, 1 male, leg. N. Kavallieratos; Tithorea, Fthiotis, 1. VII. 1996, *M. nicotianae* on *N. tabacum*, 1 female, leg. N. Kavallieratos; Agrinion, Aitoloakarnania (Greece), 14. VIII. 1996, *M. nicotianae* on *N. tabacum*, 1 female, leg. N. Kavallieratos; Aghia Marina, Fthiotis (Greece), 1. VIII. 1997, *M. nicotianae* on *N. tabacum*, 1 female, leg. N. Kavallieratos; Tithorea, Fthiotis (Greece), 29. VIII. 1997, *M. nicotianae* on *N. tabacum*, 2 females, leg. N. Kavallieratos; Agrinion, Aitoloakarnania (Greece), 25. VIII. 1997, *M. nicotianae* on *N. tabacum*, 1 male, leg. N. Kavallieratos.
Remarks. This species inhabits fields in lowlands and foot of mountains in Greece and it is recorded only from the *M. persicae/N. tabacum* association.

Aphidius artemisicola Tizado et Nunez
Material: Belgrade-Tošin bunar (Serbia), 1. VIII. 2000, *Macrosiphoniella* sp. on

Artemisia vulgaris, 1 male, leg. Z. Tomanović.
Remarks. This species was recently described from the Iberian Peninsula from the association *Titanosiphon artemisiae* (Koch)/*Artemisia* sp. (TIZADO & NUNEZ, 1994). Our finding is the second in southern Europe from a new host aphid: *Macrosiphoniella* sp.

Aphidius sussi Pennachio et Tremblay
Material: Mt. Durmitor-Crno jezero (Montenegro), 2. VII. 1998, *Delphiniobium junackianum* Karsch on *Aconitum toxicum*, 2 females, leg. Ž. Tomanović; Mt. Durmitor-Crno jezero, 15. VIII. 1998, *D. junackianum* on *A. toxicum*, 1 female, leg. Ž. Tomanović; Mt. Kopaonik-Metodje, 18. VIII. 1998, *D. junackianum* on *A. toxicum*, 29 females 9 males, leg. O. Petrović; Mt Kopaonik-Metodje, 20. VII. 1999, *D. junackianum* on *A. toxicum*, 1 female, leg. O. Petrović; Mt. Durmitor-Crno jezero, 19. VII. 2000, *D. junackianum* on *A. toxicum*, 14 females and 17 males, leg. Ž. Tomanović; Mt. Kopaonik-Konaci, 23. VIII. 2000, *D. junackianum* on *A. pentheri*, 9 females and 4 males, leg. Ž. Tomanović; Biogradska gora (Montenegro), 26. VII. 2001, *D. junackianum* on *A. toxicum*, 1 male, leg. Ž. Tomanović.
Remarks: Except for quoted specimens from Serbia and Montenegro, only few typical specimens are known from Italy (PENNACCHIO & TREMBLAY, 1989). This species is restricted to high – montane areas, reared only from the *D. junackianum*/*Aconitum* spp. association.

Aphidius linosiphonis Tomanović et Starý
Material. Mt. Tara – Derventa Canyon (Serbia) (type locality), 31. V. 1998, *Linosiphon galiophagum* (Wimshurst) on *Galium silvaticum*, 5 females and 11 males, leg. Ž. Tomanović.
Remarks. *Aphidius linosiphonis* is probably a monophagous parasitoid, specialized in the parasitoid guild of *L. galiophagum*. This species was found in the Czech and Slovak Republic and probably has a much wider distribution according to its host aphid distribution (HEIE, 1994).

Aphidius galii Tomanović et Kavallieratos
Material: Mt. Durmitor - Crno Jezero Lake (1400m) (Montenegro), 30. VI. 2001, *Linosiphon* sp. on *Galium lucidum*, 6 females and 5 males, leg. Ž. Tomanović.
Remarks. *Linosiphon* aphids are distributed in most European countries (HEIE, 1994; REMAUDEIRE & REMAUDIERE, 1997), but the host plant, *Galium lucidum* is a Sub-Mediterranean floristic element, prevalently distributed over hills and mountains of southern Europe. We assume that *A. galii* is restricted to south European submontane and montane areas.

Lysiphlebus balcanicus Starý
Material: Mt. Vlasina, 21. VII. 1990, *Aphis (Aphis) psammophila* Szelegiewicz on *Jasione dentata*, 3 females, leg. O. Petrović; Mt. Vlasina-Čemernik, 30. VII. 1996, *A. psammophila* on *J. dentata*, 3 females, leg. Ž. Tomanović.
Remarks. Only six specimens of this species were collected in the period from 1990 to 1996 on Mt. Vlasina (Serbia). Recently, a few specimens were collected

in Andora (SANCHIS *et al*., 1999). This species is a specialized parasitoid of the root aphid *A. psammophila* on *J. dentate*. Since only females were found in the samples, it is supposed that it has thelytokous reproduction like some other *Lysiphlebus* species.

Trioxys chaetosiphonis Starý
Material: Mt. Kopaonik – Samokovska reka (Serbia), 8. VII. 2000, *Longicaudus trirhodus* (Walker) on *Thalictrum aquilegifolium*, 2 females, leg. Ž. Tomanović.
Remarks. Found in several mountain localities in France in associations of *Chaetosiphon (Chaetosiphon) chaetosiphon* (Nevsky)/*Rosa* sp. (STARÝ *et al*., 1971) and *Longicaudus trirhodus*/*Rosa* sp. (STARÝ *et al*., 1977). *Trioxys chaetosiphonis* is probably characterized by insular tip distribution in the mountains of the west Palaearctic.

DISCUSSION

Zoogeography. According to Starý's classification of the faunistic complexes of aphid parasitoids (STARÝ, 1968), rare and endemic Balkan species belong mostly to the faunistic complex of the Boreal Europe. These species are as follows: *E. blattnyi*, *D. palustris, A. sussi, A. galii, A. linosiphonis, L. balcanicus* and *T. chaetosiphonis*. *Praon retusae* belongs to the Holarctic forest tundra faunistic complex. This species inhabits stone places on high-montane areas with obscure vegetation. All these species have insular type distribution, with restricted areal to Balkan mountains and montane areas of southern European or other European mountains. Furthermore, they are probably of preglacial origin with restricted distribution to high-montane or canyon habitats, where they avoid competition of recent fauna. Most host plants and host aphids, are restricted to the Balkans or southern Europe. We assume that the species *A. galii* and *P. retusae* are probably endemic for the Balkans, according to their host plants and host aphids distribution.

The species *P. athenaeum, P. staryi* and *A. artemisicola* belong to the Eurasian Steppes faunistic complex, which is phylogenetically young. Judging from the update extensive research of their distribution, they are hot weather species with southern European distributions (KAVALLIERATOS & LYKOURESSIS, 1999-2000; TIZADO & NUNEZ, 1994; TOMANOVIĆ, 2000). *Praon athenaeum* and *P. staryi* are endemic for Greece.

Biocontrol potential of specific Balkan aphid parasitoids fauna. Host range patterns of the Balkan aphid parasitoid specific fauna are mostly restricted to a single, two or more host species of the same aphid genus (STARÝ, 1981). These species are specialized on a small number of aphid hosts in very restricted and specific habitats. Their aphid hosts are mostly economically non-important. However,

diversity of tritrophic associations (host plant - host aphid - aphid parasitoid) in various natural ecosystems is much wider than in agroecosystems.

The species *P. athenaeum* and *P. staryi* are involved in agroecosystems. *Praon staryi* parasitizes *M. persicae* in tobacco fields while *P. athenaeum* parasitizes *H. lactucae* on the common weed *S. oleraceus*, in agroecosystems. *Myzus persicae* is considered to be an important pest on tobacco as well as on several other crops since it reduces directly both yield and quality of the products and also acts indirectly as a vector of viruses (**LAMPERT**, 1989; SEMTNER, 1984; HUREJ & PREISS, 1997; BLACKMAN & EASTOP, 2000). *Hyperomyzus lactucae* is considered to be a vector of virus diseases (AESCHLIMANN & VITOU, 1985; BLACKMAN & EASTOP, 2000).

The impact of these natural aphid parasitoid populations, which parasitize specific non-pest aphids as well as pest aphids, on the biological pest control, is unknown. Subsequently, research is carried out towards this direction by the authors.

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НЕКЕ РЕТКЕ И ЕНДЕМИЧНЕ ВРСТЕ ПАРАЗИТСКИХ ОСА (HYMENOPTERA: BRACONIDAE: APHIDIINAE) БАЛКАНСКОГ ПОЛУОСТРВА

NICKOLAS G. KAVALLIERATOS и Жељко Томановић

И з в о д

У раду је дат преглед досадашњих истраживања паразитских оса (Hymenoptera, Aphidiidae) на Балканском полуострву. Наведени су оригинални подаци о трофичким заједницама, типовима станишта и зоогеографским карактеристикама за следеће ретке и ендемичне врсте паразитских оса Балканског полуострва: *Ephedrus blattnyi* Starý, *Diaeretellus palustris* Starý, *Praon athenaeum* Kavallieratos et Lykouressis, *Praon retusae* Tomanović et Kavallieratos, *Praon staryi* Kavallieratos et Lykouressis, *Aphidius artemisicola* Tizado et Nunez, *Aphidius sussi* Pennacchio et Tremblay, *Aphidius linosiphonis* Tomanović et Starý, *Aphidius galii* Tomanović et Kavallieratos, *Lysiphlebus balcanicus* Starý, *Trioxys chaetosiphonis* Starý. У раду је такође дат осврт на потенцијал специфичне балканске фауне као биоконтролних агенаса.

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