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On the distribution of *Aradus* species associated with conifers in Bulgaria (Heteroptera: Aradidae)

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Abstract

The present paper is an attempt to summarize the available data about the distribution of some species of the genus *Aradus* associated with conifers in the Bulgarian fauna. The first record of *Aradus aterrimus* FIEBER, 1864 and *Aradus pictus* BAERENSPRUNG, 1859 from Bulgaria is reported. Most of these species have been rarely collected and the reasons are also discussed.

Key words: Heteroptera, Aradidae, *Aradus*, conifers, Bulgaria

Introduction

Nearly all species of the genus *Aradus* feed mostly on fungi developing on dead trees e.g. *Polyporaceae* (KIRITSHENKO, 1913, KIRITSHENKO, 1951, KIRITSHENKO, 1957, STARK, 1933, TAMANINI, 1956). It has also been observed, that some of them have preferences for one tree species.

So far, only two species associated with conifers have been reported from Bulgaria: *Aradus lugubris* FALLÉN, 1807 on *Picea abies* (L.) H. KARST from the Balkan mountains (JOSIFOV, 1974b) and incorrectly from Rila Mt. (SIMOV, 2003) and *A. cinnamomeus* PANZER, 1806 on *Pinus nigra* J. F. ARNOLD, *Pinus peuce* GRISEB. and *Pinus sylvestris* L., occurring throughout the country (JOSIFOV, 1964, JOSIFOV, 1974a, JOSIFOV, 1974b, JOSIFOV 1990). Other species known to be preferably found on conifers as *Aradus obtectus* VÁSÁRHELYI, 1988 (referred to *Aradus pictus* BAERENSPRUNG, 1859 before VÁSÁRHELYI, 1988) were collected on deciduous trees (JOSIFOV, 1964) as *Aradus betulinus* FALLÉN, 1807 and *Aradus erosus* FALLÉN, 1807 and no published information is available (JOSIFOV, 1969, JOSIFOV, 1993).

The present paper is an attempt to summarize the recent data about the distribution of *Aradus* – species associated with conifers and their records in Bulgaria.

Material and methods

The intensive forest industry which leaves no dead residual wood in the forests is characteristic for most of the countrys territory. This is an obstacle for the development of bracket fungi. For this reason the research has been done mostly in protected areas with old coniferous forests (age 150 – 500 years) where the succession process is very alike the natural one. Also some areas affected by windfalls and fires were investigated, because there was plenty of dead wood. The *Aradus* species have been searched under the bark of

the different parts of the dead trees (inhabited or not by bracket fungi). The fruiting bodies of the fungi were also subject of investigation. *Aradus cinnamomeus* who feeds on living pines was mainly found under the bark of the branches or of young trees. Data collected by using modified Moericke traps (LANGOUROV, 2001) or by beating branches are also included. The collection of Heteroptera of the Institute of Zoology – BAS was reviewed. New species for the Bulgarian fauna are marked with *. The position of the localities is given in UTM code (UTM Zones 34, 35). The material is deposited in the collections in the National Museum of Natural History and in the Institute of Zoology.

Results

The following material was collected or revised:

* *Aradus aterrimus* FIEBER, 1864

1 ♀ Bulgaria GM 03, Northern Pirin Mts., 1100m, Ravno Bore Site, on a trunk of *Abies borisii-regis* Mttf., 07.05.2004, leg. N. Simov

Aradus betulinus FALLÉN, 1807

1 ♂ + 1 ♀ Bulgaria LG 01, Western Rhodopes Mts., 1900m, Snezhanka Peak, under the bark of *Picea abies*, 05.08.1982, leg. Julius Ganev.

The species is known from the Western Rhodopes Mts., Chudnite mostove (JOSIFOV, 1964).

Aradus cinnamomeus PANZER, 1806

2 ♀ Bulgaria LG 52, Western Rhodopes Mts. 1240m, near Dospatska River near Sarnitza Vill., on *Juniperus communis communis* L. near *Pinus sylvestris* / *Picea abies* forest, 11.08.2002, leg. N. Simov; 1 ♀ Bulgaria FN 86, Western Balkan Mts. 900m, near Breze Vill., on *Juniperus communis communis* near *Pinus sylvestris* forest, 21.07.2002, leg. N. Simov; 1 ♀ Bulgaria GL 09, Southern Pirin Mts. 460-510m, Sveti Iliya Hill near Kalimantsi Vill., modified Moericke traps on *Quercus coccifera* L., 22.06.-06.08.2002, leg. D. Chobanov.

The species is distributed all over the country mostly on *Pinus sylvestris* and rarely on *Pinus nigra* in its natural habitats and plantations. It frequently occurs in young plantations of *Pinus sylvestris* and *Pinus nigra* grown in inappropriate habitats for those tree species. The abovementioned records are reported here as the hostplants are atypical. Obviously some specimens were flying from the nearby pine trees (the *Quercus coccifera* trees are at about 0,5 km away from a small *Pinus nigra* plantation). Most probably the migration and the active flight of *Aradus cinnamomeus* in Bulgaria takes place in July and in the beginning of August.

Aradus lugubris FALLÉN, 1807

1 ♀ Bulgaria KG 57, Western Rhodopes Mts., Belovo Vill., leg. Julius Milde. There is no date on the label. Most probably the material was collected in 1900 when Julius Milde had been working as a forester in Belovo Village.

The species is known from the Balkan mountains on *Picea abies* (JOSIFOV, 1974b) and from the surroundings of Sofia (JOAKIMOV, 1922).

Aradus obtectus VÁSÁRHELYI, 1988

1 ♀ + 2 juv. Bulgaria GM 08, Rila Mts. 1200m, above Beli Iskar Village, under the bark of a trunk of *Picea abies*, 05.07.2002, leg. N. Simov; 1 ♀ + 2 juv. Bulgaria FN 81, Vitosha Mts. 1600m, near the hut Zvezditz, under the bark of *Picea abies* dead trees with *Fomitopsis pinicola*, 30.08.2003, leg. N. Simov; 2 ♂ + 5 juv. Bulgaria FN 81, Vitosha Mts. 1600m, near the hut Zvezditz, under the bark of *Picea abies* dead trees with *Fomitopsis pinicola*, 12.08.2004, leg. N. Simov;

The species is also known from Pirin mountains, Popina luka on *Fagus sylvatica* L. (JOSIFOV, 1964 as *A. pictus*).

* *Aradus pictus* BAERENSprung, 1859

1 ♂ + 1 ♀ + 2 juv. Bulgaria FM 96, Rila Mt. 1590m, Nature Park "Rilski Manastir", near Ochova river, under the bark of a dead *Pinus sylvestris*, 26.08.2001, leg N. Simov.

Discussion

Totally there are 7 species of *Aradus* associated with conifers recorded to date in Bulgaria (Table 1).

Compared with countries of Central – and Northern Europe the species diversity of *Aradus* species associated with conifers is considerably poorer in the Bulgarian fauna (HEISS, 2001, KIRITSHENKO, 1913, STARK, 1933, STEHLIK & HEISS, 2000, TAMANINI, 1956). Apart from *Aradus cinnamomeus* the other species are very rarely found despite the the presence of conditions favorable for their development: old coniferous forests with enough dead or decaying wood and bracket fungi (there are 52 species of bracket fungi on conifers in Bulgaria and 30 of them are very rare known only from single localities (STOYCHEV, 1990)).

One explanation might be the fact that some of the conifer forests (*Picea abies* and *Abies alba* MILL.) of the Balkan Peninsula as well as in Bulgaria reach there their southern range of distribution. The same is valid for the decreasing species variety of their heteropterous fauna (JOSIFOV, 1974b; JOSIFOV, 1984; JOSIFOV, 1990). Furthermore during this research no species of the genus *Aradus* were found on trees infested by bark beetles.

In contrast to habitats in Central - and Northern Europe, in Bulgaria some species of the Coleoptera - family Scolitidae develop 2-3 generations annually (for example, *Ips sexdentatus*, *I. typographus* (EPPO/CABI, 1996, GRÜNE, 1979, KARAMAN, 1971, ROSNEV, 2002) and colonize faster dead trees. That leads to a destruction of the habitats and decreasing of the feeding source for the *Aradus* species. The bark beetles change the substrate beneath the bark which prevents the access for the fungal hyphae into the wood and consequently the further development of bracket fungi there. On the other side it is of interest that there is an antagonism reported between blue steinfungi associated with conifer-infesting bark beetles [*Tomicus piniperda* (LINNAEUS) is associated with *Leptographium wingfieldii* MORELET; *Ips sexdentatus* (BÖRNER) with *Ophiostoma brunneociliatum* MATH.-KÄÄRIK; *I. typographus* (LINNAEUS) with *Ceratocystis polonica* (SIEMASZKO) C. MOREAU, *Ophiostoma bicolor* R.W. DAVIDSON & D. WELLS, and *Ophiostoma penicillatum* (GROSMANN) SIEMASZKO (PAINE et al., 1997)] and bracket fungi (CROAN & HIGHLEY, 1996).

These indications might explain the rare records of *Aradus* - species on conifers in Bulgaria (except *Aradus cinnamomeus*) and the fact that they have not been found in areas affected by fires and windfalls where there is plenty of dead wood and usually one expects to find them.

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Table 1. List of the Bulgarian *Aradus* species associated with conifers. The tree species and the fungi on which they were collected are also indicated.

Species	Tree species	Bracket fungi species
<i>Aradus aterrimus</i>	<i>Abies borisii-regis</i>	?
<i>Aradus betulinus</i>	<i>Picea abies</i>	?
<i>Aradus cinnamomeus</i>	<i>Pinus nigra</i> , <i>Pinus peuce</i> , <i>Pinus sylvestris</i> , <i>Juniperus communis</i> , <i>Quercus coccifera</i>	Feeds on living pines
<i>Aradus lugubris</i>	<i>Picea abies</i>	?
<i>Aradus obtectus</i>	<i>Picea abies</i> , <i>Fagus sylvatica</i>	<i>Fomitopsis pinicola</i>
<i>Aradus pictus</i>	<i>Pinus sylvestris</i>	?