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Оригинални научни рад

NEW RECORD OF NEVRORTHIDAE (NEUROPTERA; NEUROPTERIDA) FROM SERBIA

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Abstract

Nevrorthidae is an old and peculiar family of Neuroptera considered as "living fossil" with immanent phylogenetic importance. Unlike most other neuropteran families, the nevrorthids have aquatic larvae, which prefer clean mountain rivulets. They also pupate under water, and adults could be found in the vegetation along these rivulets. Four genera with highly disjunct distribution are present. The European genus, *Nevrorthus* Costa, 1863 has four (or five) vicariant species, and it is considered as Mediterranean faunistical element. The species *Nevrorthus apatelios* H. Aspock, U. Aspock & Holzel, 1977 has the widest distribution and it is regarded as balkanopontomediterranean element. In Serbia, including Kosovo and Metohia there were only a few reported findings of nevrorthids, namely *N. apatelios*, and the most recent was back from 1986. During our research on the slopes of the Stara Planina Mountain, near the city of Pirot (southeastern Serbia), one nevrorthid larvae was found in the August 20, 2013 in the Dojkinci River. Due to lack of available taxonomic keys for larval nevrorthids, this specimen could not be identified to lower taxonomic level. Bearing in mind biogeography of this group and genus, it could be reasonable to assume that found larval specimen belongs to species *N. apatelios*. Nevertheless, this finding represents, beside a new locality of this rare taxon, also the only recent (XXI century) report regarding its presence in Serbia.

Key words: Nevrorthidae, new locality, recent findings, Dojkinci River, Serbia

Сажетак

Nevrorthidae су стара и необична група мрежокрилаца (Neuroptera) која се сматра „живим фосилом" велике филогенетске важности. Представници ове групе, за разлику од већине мрежокрилаца поседују ларву која се развија у воденој средини, обично у чистим планинским потоцима и рекама. У води се одвија и сама метаморфоза (пупација), а једини сувоземни стадијум су адулти, који се могу срести у близини њихових водених станишта. Четири рода ове групе одликује изразито дисјунктивно распрострањење. Европски род, *Nevrorthus* Costa, 1863, са четири (пет) викаријске врсте, сматра се медитеранским фаунистичким елементом. Врста *Nevrorthus apatelios* H. Aspock, U. Aspock & Holzel, 1977 која се води као балканопонтомедитерански елемент има најшире распрострањење. У Србији, укључујући Космет, присзство преставника ове групе је документовано веома оскудно. Последњи документовани налаз (врста *N. apatelios*) датира још из 1986. године прошлог века. У оквиру нашег истраживања на Старој планини код Пирота (југоисточна Србија), 20. августа 2013. године у Дојкиначкој реци, нађена је једна ларва групе Nevrorthidae. Због недостатка адекватних таксономских кључева за идентификацију ларви ове групе, јединка није могла бити прецизније одређена. Уколико имамо у виду биогеографију ове групе, односно рода *Nevrorthus*, може се са извесном дозом сигурности претпоставити да се ради о врсти *N. apatelios*. Овај налаз је значајан јер се ради о потпуно новом локалитету са присуством овог ретког и значајног

таксона, а сем тога представља и први савремени налаз (XXI век(којим се потврђује његово присуство у Србији.
Кључне речи: Nevrorthidae, нови локалитет, нови налаз, Дојкинци, Србија

Introduction

The Neuropterida, with about 6,500 described species, comprise three orders: Raphidioptera (241 described valid species in two families), Megaloptera (380 species in two families); and Neuroptera (6,000 species in 17 families) (Aspöck et al, 2015). Neuroptera fauna of the Balkan Peninsula is rather poor, and numbers 244 species (Popov and Letardi, 2010). Only about 20% of this "Balkan Neuroptera fauna" (54 species; Petrović, 2013) is present in Serbia, suggesting rather scarce knowledge of this insects in our country.

The family Nevrorthidae, the most "mysterious" neuropteran lineage (Liu et al. 2014), contains 17 described species in four genera: *Nevrorthus* Costa, 1863, *Nipponeurorthus* Nakahara, 1958, *Austroneurorthus* Nakahara, 1958 and *Sinoneurorthus* Liu et al., 2012; with highly disjunct distribution (Randolf et al, 2014). Unlike most other neuropteran families, the Nevrorthidae have aquatic larvae, which even pupate in water (Malicky 1984). Extremely slender and agile larvae (Beutel et al, 2010) of this family live in clean mountain rivulets between stones, and capture their prey with jaws in form of sucking tubes, as a peculiarity of neuropteran larvae (Aspöck & Aspöck 2010). The adults are often found under overhanging twigs and leaves of the vegetation along such waters (Aspöck & Aspöck 2010). Nevrorthids are rarely collected and appear to be very locally distributed, as Jones and Devetak stated (2009). This is especially true in the case of its larvae. The first (known) larvae were collected by Zwick (1967) in the Rio Picocca in Sardinia (Italy). This finding was particularly important because of found larval peculiarity and the dissimilarity with the larvae of the supposedly closely related genus *Sisyra*, *Nevrorthus* was removed from Sisyridae, into a brend new family Neurorthidae Nakahara, 1915 (Zwick, 1967), The "relictual" distribution of known nevrorthids and their great morphological similarity, both in the adult and larval stages, suggest its "antiquity" among Neuroptera, so some prominent authors (Aspöck & Aspöck, 1994) consider Nevrorthidae to be "living fossiles" positioned at the base of Neuroptera.The four (or five; Monserrat and Gavira, 2014) species of the genus *Nevrorthus,* which are present in the Mediterranean also show a vicariant distribution (Aspöck & Aspöck 2007; Gavira et al. 2012). Among these species *Nevrorthus apatelios* H. Aspock, U. Aspock & Holzel, 1977, which was considered as Balkano-ponto-mediterranean endemit (Aspöck et al, 2001; Devetak and Jakšić, 2003) has the widest distribution. The more so, according to the newest findings from the south-eastern Alps (Letardi et al, 2006; Jones and Devetak, 2009) and Carpathian Mountains (Aspöck & Aspöck 2010) its range appears to be even wider. Unlike the other thermophilous Pontomediterranean taxa, it is a unique stenotopic inhabitant of cold mountain rivers at an altitude of 900–1000 m, as is stated in Popov (2002). Despite being rare and stenotopic, members of nevrorthids are not on the IUCN red list, although in Bulgaria *N. apatelios* is assessed as "vulnerable" (Golemanski et al, 2011).In Serbia, including Kosovo and Metohija, to date, there were only a few reported findings of Nevrorthidae, namely *N. apatelios*, and the most recent was back from 1986 at the Šar-planina Mountain (the Prizrenska Bistrica River) (Devetak and Jakšić, 2003).

This paper presents the first finding of larval Nevrorthidae in Serbia, as well as the only report of this taxon in recent times (XXI century) in our country.

Material and Methods

Aquatic macroinvertebrate research was done in the August 2013, covering the Nišava River and some of its tributaries in the Pirot Municipality (eastern Serbia) at the Stara Planina Mountain. Sampling was performed by standard benthological net (25x25 cm, 500 μm), multi-habitat sampling procedure (Hering et al, 2004) and AQEM protocol (AQEM, 2002) were applied. The samples were preserved by using 70% ethanol and further processed in the laboratory of the Department of hydroecology and water protection of Institute for biological research "Siniša Stanković" (IBRSS). A binocular magnifier Carl ZeissStemi 2000-C (75 x magnifications) with digital camera AxioCamERc 5s and ZEN 2011 software were used for manipulation and photographing of material. The all material, including found specimen, was deposited in the hydrobiological collection of the same institution (IBRSS).

Results and Discussion

During the research covering the Nišava River and its tributaries and streams at the Stara Planina Mountain, near the city of Pirot (eastern Serbia), in the August 2013 one larval specimen of family Nevrorthidae was found in the sample from the Dojkinci River (upstream Dojkinci). The locality is situated at the 975 m.a.s.l., with coordinates of 43°15'31.23"N and 22°46'28.27"E (Google Earth™ mapping service. 2012). The Dojkinci River is typical hilly stream in region, with rich macroinvertebrate community and dominance of EPT (Ephemeroptera, Plecoptera and Trichoptera) taxa (unpublished data). The river bed substrate at the locality of finding is composed mainly from large fractions of red sandstones (figure 1). Because of absence of noticeable anthropogenic impacts, especially in the upper river stretch (upstream from the Dojkinci settlement), the river and its surrounding are relatively unpolluted. The potential issue could arise if woodcutting and deforestation, still at the low level of environmental impact, in future become more intense.

Figure 1. The Dojkinci River, upstream from the Dojkinci village (photo M. Ilić)

The found larval specimen (figure 2) is about 8 mm long, slender, with characteristic large jaws of Neuoptera larvae. It shows characteristic and unique morphology of larval Nevrorthidae, with dorso-ventrally flattened head and collar-like elongate and sclerotized cervix (Beutel et al, 2010; Gavira et al. 2012).

Figure 2. Larval specimen of Nevrorthidae. from the Dojkinci River (10x magnification; photo V. Marković)

Due to lack of available taxonomic keys for larvae of Nevrorthidae (Gavira et al. 2012), this specimen could not be identified to lower taxonomic level, although bearing in mind biogeography of the group, and genus *Nevrorthus* itself (Aspöck and Aspöck, 2007; 2010), it most probably belongs to species *N. apatelios.*

Our finding represents, besides a new finding site for this rare and localized taxon, also the only recent (XXI century) report regarding presence of this Neuroptera in Serbia. Although this taxon is not on IUCN red list, its scattered distribution and rarity of findings (Popov, 2002; Devetak and Jakšić, 2003; Jones and Devetak, 2009; Gavira et al. 2012), implies a necessity for better protection of this "living fossils". Steps in that direction are taken in Bulgaria, where species *N. apatelios* is marked as "vulnerable" with B2ab(ii) conservation status according to IUCN criteria (Red Data Book of the Republic of Bulgaria; Golemanski et al, 2011).

Conclusion

Nevrorthids are enigmatic and important Neuroptera, sometimes considered as "living fossils". Knowledge of Neuroptera in Serbia is scarce, which could be illustrated by fact that the most recent reported finding of nevrorthids in this region was back from 1986. During conducted research on the slopes of the Stara Planina Mountain, near the city of Pirot (southeastern Serbia) in the 2013, one larval nevrorthid was found in the Dojkinci River on the August 20. Due to lack of available taxonomic keys, this larval specimen could not be identified to lower taxonomic level, but bearing in mind biogeography of group/genus, it

could be assumed that it's belonging to species *N. apatelios*. Nevertheless, our finding represents a new locality of this rare taxon, and moreover the only recent (XXI century) report regarding its presence in Serbia

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