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FIRST RECORD OF *LEUCOCHLORIDIUM PERTURBATUM* POJMANSKA, 1969 (TREMATODA: LEUCOCHLORIDIIDAE) PARASITIC IN AMBER SNAIL *SUCCINEA PUTRIS* (LINNAEUS, 1758) (GASTROPODA: SUCCINEIDAE) FROM SERBIA

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In this paper, we provide the first data on the occurrence of the trematode *Leucochloridium perturbatum* Pojmanska, 1969 in Serbia. This is also the first record of the genus *Leucochloridium* Carus, 1835 from the country. Trematodes were found pulsating in the tentacles of the amber snail *Succinea putris* (Linnaeus, 1758). Collected broodsacks are described, and short notes about the habitat where specimen was found are given.

Keywords: helminth, parasites, Digenea, life cycle

Vujić, M. & Gojšina, V., 2023: Prvi nalaz parazita *Leucochloridium perturbatum* Pojmanska, 1969 (Trematoda: Leucochloridiidae) u jantarnom pužu *Succinea putris* (Linnaeus, 1758) (Gastropoda: Succineidae) iz Srbije. Nat. Croat., Vol. 33, No. 1., 203-206, 2024, Zagreb.

U ovom radu donosimo prvi nalaz metilja *Leucochloridium perturbatum* Pojmanska, 1969 u Srbiji. To je ujedno za državu i prvi nalaz roda *Leucochloridium* Carus, 1835. Metilji su pronađeni u ticalima jantarnog puža *Succinea putris* (Linnaeus, 1758). Opisani su prikupljeni metilji te se daj kratki opis staništa u kojem je primjerak pronađen.

Ključne riječi: helminti, paraziti, Digenea, životni ciklus

INTRODUCTION

Trematodes of the genus *Leucochloridium* Carus, 1835 are well-known parasites of amber snails (Stylommatophora, Succineidae), in the tentacles of which they can be found pulsating. This pulsating behaviour of the sporocysts serves to attract birds, which feed on the infected snails and become infected themselves (Ataev *et al*., 2016), and this part of its life cycle is probably the most fascinating among parasites. However, the complete life cycle of *Leucochloridium* trematodes is much more complex, and it implies the involvement of two hosts (snails and birds). The first, parthenogenetic phase happens in the body of the amber snail. This phase includes the existence of mother sporocyst, whose germinative part is anchored in the snail's hepatopancreas. Numerous smaller and larger broodsack evaginations (serving as the area where cercariae aggregate and undergo

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development) start from the germinative part. Eventually, some of the largest broodsacks, connected to the thin canal with the germinative part, penetrate through into the snail's tentacles and start pulsating (Bakke, 1980; Niewiadomska & Pojmańska, 2011). At the end of the phase that takes place in the first host, the parasite starts manipulating the snail's behaviour, facilitating contact between the first and the definitive host. This manipulation can be seen in the infected snails manifesting positive phototaxis, crawling on the upper sides of leaves and becoming clearly exposed to birds. The colorful and pulsating parasite uses mimicry to attract birds, due to its resemblance to caterpillars, birds' usual prey (Niewiadomska & Pojmańska, 2011). After the ingestion of snails and/or broodsacks by birds, *Leucochloridium* cercariae will colonize their intestines, sometimes leading to emaciation and death, especially in the case of smaller birds (Okulewicz & Sitko, 2012). In Europe, *Leucochloridium perturbatum* Pojmanska, 1969 and *Leucochloridium paradoxum* Carus, 1835 were commonly found in a wide spectrum of birds from different families, e.g. Fringillidae, Paridae, Prunellidae, Sylviidae, Turdidae (Pojmanska, 1969; Okulewicz & Sitko, 2012). Amber snails are passively infected after consuming material containing *Leucochloridium* eggs, thus completing the parasite life cycle. It is not unusual for one snail specimen to be infected by multiple sporocysts of the same or different species of parasites. As it is not possible to precisely determine the number of sporocysts of the same species within one amber snail, an approximation can be made, based on the number of mature broodsacks. For example, it is known that one sporocyst of *L. paradoxum* cannot have more than three to five mature broodsacks (Wesenberg-Lund, 1931; Pojmanska, 1962; Ataev & Tokmakova, 2015). Ataev *et al*. (2016) recorded 19 mature broodsacks in a single snail specimen, meaning that between four and six sporocysts can be found within the body of one snail specimen. The single snail specimen can be infected by two or three different *Leucochloridium* sporocysts (Ataev *et al*., 2016). The identification of these sporocysts is based mainly on the colouration of the broodsacks, which is generally a reliable character, one that is confirmed by molecular methods (Casey *et al*., 2003; Rząd *et al*., 2013).

The biology and distribution of these trematodes in Serbia has not been previously studied. In this paper, we provide the first data concerning the presence of *L. perturbatum* in Serbia.

MATERIAL AND METHODS

Trematodes were collected together with infected *Succinea putris* (Linnaeus, 1758), during 2022, from one locality on Veliko ratno ostrvo (an island) at the confluence of the Danube and Sava rivers (Belgrade, Serbia). Sporocysts were extracted from snails *in situ* by exerting pressure on the snail, which resulted in the expulsion of the sporocysts, or by dissecting a preserved snail specimen. Sporocysts were photographed using a Nikon SMZ800N stereomicroscope equipped with a Nikon DS-Fi2 camera. Individual photos were stacked with Zerene Stacker in order to obtain a fully focused image. The collected material is stored at the Institute of Zoology, Faculty of Biology, Belgrade.

RESULTS AND DISCUSSION

Order Diplostomida Olson, Cribb, Tkach, Bray & Littlewood, 2003

Family Leucochloridiidae Poche, 1907

Leucochloridium perturbatum Pojmanska, 1969 (Fig. 1)

Fig. 1. Broodsacks of *Leucochloridium perturbatum* Pojmanska, 1969, collected from amber snail *Succinea putris* (Linnaeus, 1758) at Veliko ratno ostrvo, Belgrade, Serbia (photo by N. Vesović).

Material examined: Serbia, Belgrade, Veliko ratno ostrvo (coordinates: 44.839671, 20.427528), date: 18.07.2022., leg. V. Gojšina, N. Vesović.

Description of specimens from Serbia: Broodsacks were mainly pale in colour, with several additional brown bands in the apical part of the sack (the first darker and three lighter brown), which form an almost continuous brown field near the apical end. The basal part of the broodsack was a thin canal, somewhat brownish in the distal and broader part, becoming thinner and almost translucent in the proximal region. Although whitish in colour, the broodsack membrane is thin and clearly shows cercariae aggregates, viewed under the illumination of a binocular stereomicroscope (Fig. 1).

Remarks on the habitat: The locality where the infected *Succinea putris* snail was recorded is Veliko ratno ostrvo (Belgrade, Serbia), the alluvial river island at the confluence of Danube and Sava rivers. The area where infected snails were collected is a muddy river bank. The snail was collected from the upper surface of large fallen tree trunk. The habitat is still not under strong anthropogenic pressure, despite the proximity of the urban parts of the city.

Parasitic helminths not associated with humans are generally poorly studied in Serbia. The lack of data on the presence of many species of parasitic helminths, as in the case of *Leucochloridium* trematodes, can be explained by their insignificance for human health. The presented data of *L. perturbatum* provide the first record of any *Leucochloridium* species in Serbia, although it is almost certain that some of its congeners are members of the fauna of Serbia. Despite their complex life cycle which includes host changes, *Leucochloridium* trematodes can infect a broader spectrum of hosts, especially definitive hosts and so complete their development (Pojmanska, 1969). Accordingly, it can be assumed that their actual distribution in Serbia covers a much larger area, especially wetlands, marshes, bogs, river and lake banks and shores, as well as alluvial fields still present near large rivers. Their intermediate hosts, amber snails, are widely distributed across the country, and associated with wet habitats, (Welter-Schultes, 2012). Various amber snails are often collected during malacological surveys,

however, the only infected specimen found so far was the specimen presented in this article.

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