DISTRIBUTION OF GENUS Libelloides Schaeffer, 1766 (NEUROPTERA: ASCALAPHIDAE) IN SERBIA WITH THE HELP OF CITIZEN SCIENCE

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ABSTRACT. Genus Libelloides Schaeffer, 1766 in Serbia is represented by two species, rare Libelloides lacteus (Brullé, 1832) and common L. macaronius (Scopoli, 1763). The data presented in this study were obtained from Alciphron online database and its members. The data on the distribution of both species in Serbia are presented on maps and diagrams of the dependence of the period of occurrence of adults and altitude. A large number of data was collected using citizen science.

Keywords: Ascalaphidae, Libelloides lacteus, Libelloides macaronius, Neuroptera, Serbia.

Owl-flies (Ascalaphidae) are attractive insects that are widely distributed in tropical and subtropical regions. About 400 species in around 70 genera are known, of which 16 species are recorded in Europe (ASPÖCK et al., 2001). There are seven species of owl-flies in the Balkan Peninsula: Bubopsis andromache Aspöck, Aspöck & Hözel, 1979, Deleproctophylla australis (Fabricius, 1787), D. variegata (Klug, 1834), Libelloides lacteus (Brullé, 1832), L. longicornis (Linnaeus, 1764), L. macaronius (Scopoli, 1763), L. rhomboides (Schneider, 1845) (with two subspecies: L. r. cretensis (Van der Wheele, 1908) and L. r. rhomboides (Schneider, 1845)). Six out of those species were reported by POPOV and LETTARDI (2010), while DEVETAK and JAKŠIĆ (2019) reported L. longicornis in Montenegro. In Serbia there are two registered species: L. lacteus and L. macaronius (DEVETAK, 1992 and 2021; DEVETAK and JAKŠIĆ, 2003; PETROVIĆ, 2013). POPOV (2004) gives maps of the distribution of both species in Serbia, but no exact data was given.

Owl-flies are diurnal predators. Adults are capable of high velocity flight during predatory activity. They have strong legs and mandibles, which allows them to prey even on highly sclerotized insects (DEVETAK et al., 2002). Their larvae are similar to antlions larvae, however, they do not use pits to catch prey, but rather lie on the surface ambushing (DEVETAK, 2007).

Libelloides macaronius is treated as an endangered species and is protected by Serbian law (ANONYMOUS, 2016), therefore collecting data on its distribution is crucial for tracking its populations. Libelloides macaronius is a polycentric expansive Pontomediterranean: Anatolian element (ASPÖCK et al. 2001, POPOV, 2004, POPOV and LETTARDI 2010), inhabiting sunny, grassy areas (POPOV, 2004). Libelloides lacteus is Pontomediterranean: Balkan element expansive westwards (POPOV and LETTARDI, 2010), which inhabits open sloping treeless areas with
high dry herbaceous vegetation, changing in steep rocks (Popov, 2004). Humidity and temperature requirements for these two species are different. *Libelloides macaronius* prefers higher humidity than *L. lacteus*. While *L. macaronius* does not have a temperature preference, *L. lacteus* is thermophilous (Popov, 2004).

In this study, we review data on the distribution of *L. lacteus* and *L. macaronius* in Serbia, obtained mostly from citizen scientists and the Alchiphron database.

*Libelloides macaronius* and *L. lacteus* are easily differentiated by their color and markings on the wings (Fig. 1A and B). *Libelloides macaronius* has yellow tones with distinctive black markings on its wings while *L. lacteus* has white bluish tones and different markings. These characteristics have made it easy for photographers, insect lovers and enthusiasts to differentiate these two species.

![Figure 1](image1.png)

**Figure 1.** A – *Libelloides macaronius* (Scopoli, 1763) (photo by D. Petrović, 2021); B – *Libelloides lacteus* (Brullé, 1832) (photo by I. Medenica, 2017).

![Figure 2](image2.png)

**Figure 2.** Maps of distribution in Serbia: A – *Libelloides macaronius* (Scopoli, 1763); B – *L. lacteus* (Brullé, 1832). (Yellow – data collected by authors and citizen science, black – published data).
The data presented in this study were obtained from Alciphrone online database (https://alciphron.habiprot.org.rs/) and its members, plus published data (DEVETAK and JAKŠIĆ, 2003; PETROVIĆ 2013).

Maps were created using QGIS 3.16.5 software.

Based on the data from the Alciphrone database, a total of 252 entries for both species were recorded – 230 of *L. macaronius* and 22 of *L. lacteus*. A map of distribution was constructed based on these entries (Fig. 2). The database entries for *L. macaronius* and *L. lacteus* were recorded in the following periods: 11.06.2003 – 19.08.2021 and 28.05.2012 – 04.06.2021, respectively.

*Libelloides macaronius* had a much wider altitude distribution (over 1500 m a.s.l.) and a longer activity period, ranging from the end of April to the end of August, while *L. lacteus* was recorded at a maximum of around 1000 m a.s.l. and is active from the middle of April to the end of July (Fig. 3).

![Figure 3](image)

**Figure 3.** Data on distribution in Serbia by altitude (vertical axis) and months (horizontal axis). A – *Libelloides macaronius* (Scopoli, 1763); B – *Libelloides lacteus* (Brullé, 1832).

Citizen science has already been shown as a potentially useful tool for monitoring biodiversity, as it reduces the costs of research as well as its time consumption (GALLO and WAITT 2011; CHANDLER et al. 2017). Moreover, it has shown good results in helping to track changes in ladybug populations (GARDINER et al., 2012) or even to detect and monitor non-native species (e.g., DELANEY et al., 2008; SEAT et al., 2020; MILIOJKOVIĆ et al., 2021; SEIDEL et al., 2021; VUJIĆ et al., 2021). In Fig. 2 we can see that most data for both species were collected by citizen scientists, with only a small fraction collected from previously published data. This shows a potential for future uses of citizen science in studying the populations of these two species.

As previously mentioned, *L. macaronius* is considered endangered, due to the natural processes of deforestation of their habitats (meadows), and due to the declining number of grazing cattle causing pastures to reforest. DEVETAK (2007) suggests the use of human efforts to maintain these habitats. *Libelloides lacteus* is not a protected species in Serbia, however, it clearly has a small number of populations and should be considered for protection.

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References:


