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Short communication

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

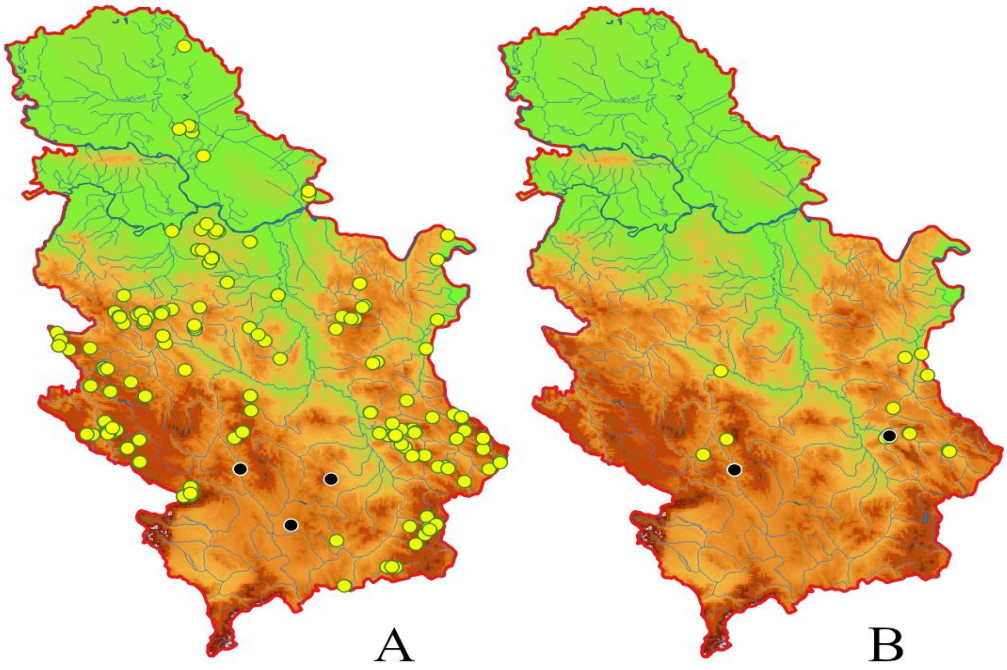

Figure 2. Maps of distribution in Serbia: A – *Libelloides macaronius* (Scopoli, 1763); B – *L. lacteus* (Brullé, 1832). (Yellow – data collected by authors and citizen science, black – published data).

The data presented in this study were obtained from Alciphron 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 Alciphron 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).

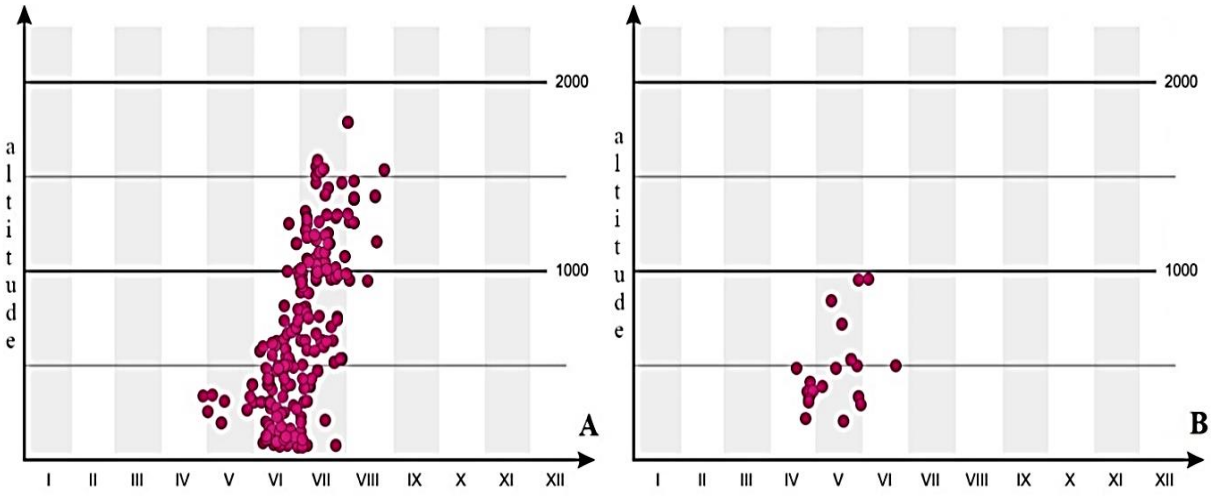

Figure 3. Data on distribution in Serbia by altitude (vertical axis) and months (horizontal axis). A – *Libelloides macaronius* (Scopoli, 1763); B – *Libelloides lacteus* (Brullé, 1832).

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; ŠEAT *et al*., 2020; MILOJKOVIĆ *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:

[1] ANONYMOUS (2016): Pravilnik o proglašenju i zaštiti strogo zaštićenih i zaštićenih divljih vrsta biljaka, životinja i gljiva: Prilog II Zaštićene divlje vrste biljaka, životinja i gljiva (Sl. glasnik RS, br. 5/2010, 47/2011, 32/2016 i 98/2016) [in Serbian] https://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/ministarstva/pravilnik/2010/5/3/reg Accessed 31 January 2022.

[2] ASPÖCK, H., HÖLZEL, H., ASPÖCK, U. (2001): Kommentierter Katalog der Neuropterida (Insecta:Raphidioptera, Megaloptera, Neuroptera) der Westpaläarktis. *Denisia* 2: 1–606.

[3] CHANDLER, M., SEE, L., COPAS, K., BONDE, A.M.Z., LÓPEZ, B.C., DANIELSEN, F., LEGIND, J.K., MASINDE, S., MILLER-RUSHING, A.J., NEWMAN, G., ROSEMARTIN, A., TURAK, E. (2017): Contribution of citizen science towards international biodiversity monitoring. *Biological Conservation* 213 (B): 280–294. doi: 10.1016/j.biocon.2016.09.004

[4] DELANEY, D.G., SPERLING, C.D., ADAMS, C.S., LEUNG, B. (2008) Marine invasive species: validation of citizen science and implications for national monitoring networks. *Biological Invasions* 10: 117–128. doi: 10.1007/s10530-007-9114-0

[5] DEVETAK, D. (1992): Present knowledge of the Megaloptera, Raphidioptera and Neuroptera of Yugoslavia (Insecta: Neuropteroidea). *In*: Canard, M., Aspöck, H. & Mansell, M.W. (eds.) *Current Research in Neuropterology*, Toulouse, pp. 107–118

[6] DEVETAK, D. (2007): A review of the owlflies of Slovenia (Neuroptera: Ascalaphidae). *Acta Entomologica Slovenica* 15: 105–112.

[7] DEVETAK, D. (2021): Nine Slovenian neuropterological expeditions to the Balkan Peninsula. *Acta Entomologica Slovenica* 29: 39–58.

[8] DEVETAK, D., JAKŠIĆ, P. (2003): Neuroptera of Kosovo and Metohija (Serbia). *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen* 55: 45–53.

[9] DEVETAK, D., JAKŠIĆ, P., (2019): Lacewings (Insecta: Neuropterida: Raphidioptera, Megaloptera, Neuroptera) collected in Montenegro. *Biologica Nyssana* 10: 35–41. doi: 10.5281/zenodo.3464002

[10] DEVETAK, D., PIRŠ, P., JANŽEKOVIC, F., (2002): Owl-fly *Libelloides macaronius* (Scopoli, 1763) in Slovenia and in the northwestern part of Croatia (Neuroptera: Ascalaphidae). *Annals for Istrian and Mediterranean Studies* 12: 219–226.

[11] GALLO, T., WAITT, D. (2011): Creating a Successful Citizen Science Model to Detect and Report Invasive Species. *BioScience* 61: 459–465. doi: 10.1525/bio.2011.61.6.8

[12] GARDINER, M.M., ALEE, L.L., BROWN, P.M.J., LOSEY, J.E., ROY, H.E., SMYTH, R.R. (2012): Lessons from lady beetles: accuracy of monitoring data from US and UK citizen-science programs. *Frontiers in Ecology and the Environment* 10 (9): 471–476. doi: 10.1890/110185

[13] MILOJKOVIĆ, S., VUJIĆ, M., ĐURIĆ, M., TOT, I. (2021): Geranium bronze, *Cacyreus marshalli* Butler, 1897 - New butterfly species for fauna of Serbia (Papilionidea: Lycaenidae). *Acta Entomologica Slovenica* 29 (1): 121–124.

[14] PETROVIĆ, S. (2013): A contribution to the knowledge of the Neuroptera (Insecta) fauna of Serbia. *Biologica Nyssana* 4 (1–2): 93–96.

[15] POPOV, A. (2004): The Ascalaphidae (Neuroptera) of the Balkan Peninsula. *Denisia* 13: 229–237.

[16] POPOV, A., LETARDI, A. (2010): Comparative zoogeographical analysis of Neuropterida of the Apennine and Balkan peninsulas. pp. 239–256. *In*: Devetak, D.; Lipovšek, S.; Arnett, A. E. (eds). *Proceedings of the 10th International Symposium on Neuropterology. Meeting: 22–25 June 2008, Piran, Slovenia*. University of Maribor, Maribor, Slovenia.

[17] SEIDEL, M., LÜTTKE, M., COCQUEMPOT, C., POTTS, K., HEENEY, W.J., HUSEMANN, M. (2021): Citizen scientists significantly improve our knowledge on the non-native longhorn beetle *Chlorophorus annularis* (Fabricius, 1787) (Coleoptera, Cerambycidae) in Europe. *BioRisk* 16: 1–13. doi: 10.3897/biorisk.16.61099

[18] ŠEAT, J., NADAŽDIN, B., ŠĆIBAN, M. (2020): *Acrosternum heegeri* (Heteroptera: Pentatomidae) in Serbia. *Acta Entomologica Serbica* 25 (1): 77–81. doi: 10.5281/zenodo.3871640

[19] VUJIĆ, M., IVKOVIĆ, S., REKECKI, T., KRSTIĆ, D., STANKOVIĆ, V., ĐURIĆ, M., TOT, I. (2021): A first record of the alien mantis species *Hierodula tenuidentata* (Mantodea: Mantidae) in Serbia. *Acta Entomologica Serbica* 26 (1): 1–7. doi: 10.5281/zenodo.4621135

[20] https://alciphron.habiprot.org.rs/ Accessed 31 January 2022.