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Psarus abdominalis (Fabricius, 1794) (Diptera: Syrphidae): rediscovery in Croatia after 102 years and the first record from the Mediterranean biogeographical region

Psarus abdominalis (Fabricius, 1794) (Diptera: Syrphidae): ponovno zabilježen u Hrvatskoj nakon 102 godine i prvi nalaz iz mediteranske biogeografske regije

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Abstract

This paper presents the first recent record of the species *Psarus abdominalis* (Fabricius, 1794) in Croatia. It is a rare and Europe-wide threatened species, currently assessed as vulnerable (VU) at the European level and as endangered (EN) at the EU27 level, according to the IUCN Red List criteria. All previously known historical records originate from northern Croatia, i.e., the continental biogeographical region, whereas the new record comes from the Mediterranean region, more precisely the sub-Mediterranean area of Mount Biokovo. In the latest IUCN Red List assessment, this species was classified as nationally extinct in Croatia; however, this finding unequivocally confirms that it is still present in the country. As this is the first confirmed record in 102 years the species may have been overlooked because of its rarity, specific ecology, or insufficient survey coverage in certain areas. This discovery therefore highlights the need for further systematic research and opens the possibility of detecting additional populations at other localities in Croatia.

Keywords: Biokovo Nature Park; distribution; rare species; sub-Mediterranean zone

Sažetak

Ovaj rad predstavlja prvi noviji nalaz vrste *Psarus abdominalis* (Fabricius, 1794) u Hrvatskoj. Riječ je o rijetkoj i na razini cijele Europe ugroženoj vrsti, koja je prema kriterijima Crvenog popisa IUCN-a trenutačno procijenjena kao osjetljiva (VU) na europskoj razini te kao ugrožena (EN) na razini EU27. Svi dosad poznati povijesni nalazi potječu iz sjeverne Hrvatske, odnosno kontinentalne biogeografske regije, dok novi nalaz dolazi iz mediteranske regije, točnije submediteranskog područja planine Biokovo. U najnovijoj IUCN procjeni ugroženosti ova vrsta je za Hrvatsku bila označena kao nacijonalno izumrla, no ovaj nalaz nedvojbeno potvrđuje njezinu prisutnost u zemlji. Budući da je ovo prvi potvrđeni nalaz nakon 102 godine, moguće je da je vrsta bila previđena zbog svoje rijetkosti, specifične ekologije ili nedovoljne istraženosti pojedinih područja. Ovo otkriće stoga naglašava potrebu za daljnjim sustavnim istraživanjima te otvara mogućnost pronalaska dodatnih populacija na drugim lokalitetima u Hrvatskoj.

Ključne riječi: Park prirode Biokovo; rasprostranjenost; rijetka vrsta; submediteranski pojas

Introduction - *Uvod*

Hoverflies (Diptera: Syrphidae) represent one of the most diverse and ecologically important families of flies, comprising more than 6,300 described species (Wu et al. 2024) worldwide and over 892 species in Europe (Vujić et al., 2022). Their adults are important flower visitors and pollinators, while larvae occupy a wide range of ecological niches, including predatory, saprophagous, and phytophagous lifestyles (Rotheray and Gilbert, 2011; Speight, 2024). Despite considerable advances in the study of European hoverflies (Rotheray and Gilbert, 2011; Ball and Morris, 2015; Vujić et al., 2022), many species remain poorly known. Deficiencies in knowledge of their life cycle, ecology, habitat requirements, and distribution remain common, particularly among rare and poorly

known taxa (Speight, 2024). These gaps limit our ability to assess their conservation status accurately and design effective measures to protect and manage of their populations and habitats. *Psarus abdominalis* (Fabricius, 1794) is one of the rarest and most threatened European hoverflies (Diptera: Syrphidae) (Speight, 2024). According to the IUCN Red List assessment, *Psarus abdominalis* is considered Vulnerable (VU) at the European scale, while its status within the EU27 region is assessed as Endangered (EN) (Vujić et al., 2022). It is an easily recognizable species characterized by its almost hairless black body with extensively orange-red abdominal tergites, antennae longer than the head with a dorsal arista inserted on the apical half of the third antennal segment, and a prominent frontal tubercle (Bot and Van de Meutter, 2023). It is the sole representative of the genus *Psarus* Latreille, 1804, a monotypic genus endemic to Europe, with a fragmented distribution extending from France and Central Europe to the Balkan Peninsula and European Russia (Mengual and Ssymank, 2015). Within the Balkan Peninsula it is known from Slovenia (Kočić, 2023), Croatia (Langhoffer, 1919; Glumac, 1972; Kulijer et al., 2023), Bosnia and Herzegovina (Kulijer et al., 2023), Serbia (Radenković, 2008; Kulijer et al., 2023). It has recently been recorded in Ukraine (Zaika et al., 2011) and more recently in Belarus (Ostrovsky, 2024). Throughout its range, the species is considered highly localised and has experienced significant declines, leading to its extinction in several European countries and its inclusion among species of high conservation concern (Mengual and Ssymank, 2015). Despite its distinctive appearance, the ecology and habitat requirements of *P. abdominalis* remain insufficiently understood. Because of its rarity and sporadic occurrence, new records are of considerable importance for understanding its distribution and conservation status. A recent overview of the distribution of the species in Croatia, Bosnia and Herzegovina, and Serbia, based on previously unpublished records from museum specimens and a single recent observation from Serbia, was provided by Kulijer et al. (2023). In Croatia, *P. abdominalis* was known only from historical records and museum specimens from the continental part of the country. The first record, from Zagreb, was published by Langhoffer (1919) and later cited in the Catalogus Faunae Jugoslaviae (Glumac, 1972). This remained the only known record of the species in Croatia for several decades until Kulijer et al. (2023), during a revision of the entomological collections of the National Museum of Bosnia and Herzegovina (NMBiH) in Sarajevo and the entomological collection of Andrija Hensch in Zagreb, discovered a series of 12 specimens collected near Krapina in northern Croatia. The most recent specimen in this historical series was collected in 1924. Consequently, no confirmed records of *P. abdominalis* were available from Croatia for the following 102 years, and the species was considered potentially extinct in the country according to the most recent synthesized database for European bees and hoverflies (Reverté et al., 2023). Here, we report the first recent record of *P. abdominalis* in Croatia, collected in southern Croatia, Dalmatia, on Mt Biokovo near Makarska, in the Mediterranean biogeographical region. This finding represents the first record of the species in Croatia in 102 years and the first record from the country's Mediterranean biogeographical region, providing evidence that the species persists in the Croatian fauna.

Materials and methods – *Materijali i metode*

The record of *Psarus abdominalis* presented in this paper was obtained during field surveys conducted in Biokovo Nature Park in 2026. The surveys were primarily focused on the spring butterfly *Proterebia afra dalmata* (Godart, 1824), but all noteworthy observations of other insect groups, including hoverflies, were also recorded. The individual was collected using a standard entomological hand net. Geographic coordinates were recorded in the field using the Biologer application (Popović et al., 2020). Habitat characteristics and behaviour of the observed individual were noted directly in the field. Specimen identification was carried out using a BMS 141 stereo zoom microscope and the identification key by Bot and Van de Meutter (2023). The collected specimen is preserved in the author's private collection in Zagreb. In addition to the newly collected material, we also consulted previously published records and museum material from Croatia, based on the available literature (Langhoffer, 1919; Glumac, 1972; Kulijer et al., 2023). The map was created using QGIS software (QGIS Development Team, 2026).

Results - *Rezultati*

Published records for Croatia: Langhoffer, 1919; Glumac, 1972 and Kulijer et al., 2023.
New record: A single adult specimen of *P. abdominalis* (Figure 1) was recorded during the survey at Nature Park Biokovo, SE of the abandoned village of Podglogovik, Prisika, at the edge of a sub-Mediterranean downy oak (*Quercus pubescens* Wild.) and oriental hornbeam (*Carpinus orientalis* Mill.) woodland (Figure 2), 43°15'06.4"N 17°07'56.3"E, 20 May 2026, 1 male, obs. & leg. T. Koren (Figure 3).



Figure 1 *Psarus abdominalis* from Podglogovik, Biokovo Nature Park (Photo T. Koren)
Slika 1. *Psarus abdominalis* sa lokaliteta Podglogovik, Park prirode Biokovo (Slikao T. Koren).



Figure 2 Habitat of *Psarus abdominalis* at Podglogovik, Biokovo Nature Park (Photo T. Koren)
Slika 2. Stanište vrste *Psarus abdominalis* na lokalitetu Podglogovik, Park prirode Biokovo (Slikao T. Koren).

Habitat description. The specimen was observed resting on herbaceous vegetation along the ecotone between pasture and woodland. The surrounding habitat consisted of a mosaic of sub-Mediterranean grasslands, traditionally grazed pastures, and small patches of downy oak (*Quercus pubescens*) and oriental hornbeam (*Carpinus orientalis*) woodland. The locality is situated at an altitude of 760 m a.s.l. on the southeastern slopes of Mt Biokovo.

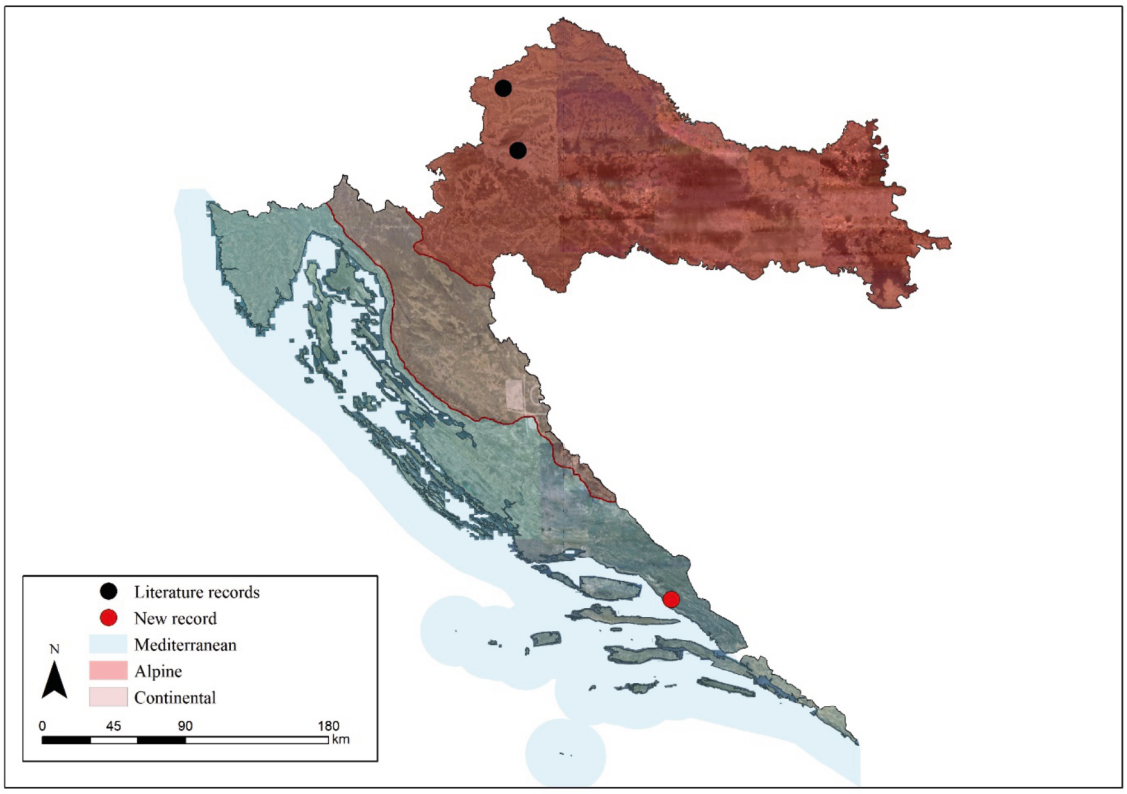


Figure 3 Current distribution of *Psarus abdominalis* in Croatia based on historical and a new record
Slika 3. Trenutna rasprostranjenost *Psarus abdominalis* u Hrvatskoj temeljena na povijesnim i novim nalazima.

Discussion - *Rasprava*

Although based on a single record, the rediscovery of *Psarus abdominalis* in Croatia is significant for several reasons. First, the species had been considered nationally extinct in Croatia (van Steenis et al., 2021), as the most recent known specimens came from historical museum material collected in 1924, although these specimens were only recently rediscovered and published by Kulijer et al. (2023). Consequently, this finding unequivocally confirms the continued presence of the species in the Croatian fauna and, more importantly, it represents the first documented record of *P. abdominalis* in the country after 102 years. Apart from a historical literature record and a small number of museum specimens, recent field surveys have not confirmed the species, despite a substantial increase in hoverfly research effort across Croatia in recent years. Recent surveys have covered a wide range of areas, including continental Croatia (e.g., Zagreb, Mt. Medvednica, and other localities in northern Croatia) as well as additional localities throughout the country (Vujić and Koren, 2020; Vujić et al., 2022; Ješovnik et al., 2025; Koren et al., 2025, Koren, unpublished). Nevertheless, no recent records of *P. abdominalis* were obtained before the discovery of the historical specimens reported by Kulijer et al. (2023). This record therefore shows that the species has persisted in Croatia, although it appears to occur at low densities and may easily be overlooked. This assumption is supported by observations from the Biokovo locality, where, following the discovery of the first individual, the author spent several additional hours searching the site and revisited the locality on two further occasions during the subsequent two weeks without recording any additional specimens. Furthermore, although opportunistic surveys of hoverflies have been conducted at the site since 2022, no other individuals of

Psarus abdominalis have been observed to date. These observations suggest the species is either genuinely rare in the area or occurs in a highly localised and temporally restricted manner. Such isolated records are not unusual for *Psarus abdominalis* in southeastern Europe. For example, the recent record from Serbia was also based on a single observed individual (Kulijer et al., 2023). In contrast, higher numbers have occasionally been reported elsewhere in Europe; for instance, a recent survey in France recorded a total of nine individuals (Mengual and Ssymank, 2015). This difference may be related to the availability and conservation status of suitable forest habitats in some parts of Europe. However, variation in sampling effort and local population size cannot be ruled out. Although these observations should be interpreted with caution due to differences in sampling effort and methodology, they suggest that populations of *P. abdominalis* may vary considerably in abundance across its range. Nevertheless, the scarcity of records throughout much of southeastern Europe (Mengual and Ssymank, 2015) indicates that the species is generally rare and difficult to detect, even in apparently suitable habitats. What is more important about this new record from Croatia is that it originates from a region well outside the previously known Croatian range of the species (Kulijer et al., 2023). Historical records were confined to the continental biogeographical region, primarily associated with lowland oak forests in the vicinity of Zagreb and Krapina. The occurrence of *P. abdominalis* on Mt Biokovo considerably expands its known distribution in Croatia and represents the first record from the Mediterranean biogeographical region (Fig. 3). This finding suggests that the species may occupy a broader range of habitats than previously assumed. It indicates that suitable conditions may also exist in sub-Mediterranean oak forests and other thermophilous woodland habitats of the Dinaric region. The discovery has important implications for future surveys. Previous search efforts by the author for *P. abdominalis* in Croatia have largely focused on continental forest habitats, reflecting the distribution of historical records. The Biokovo record demonstrates that future targeted surveys should also include sub-Mediterranean woodland habitats, particularly mature oak forests containing veteran trees, tree hollows and decaying wood. Such habitats are known to support numerous saproxylic hoverflies (Speight, 2024) and may harbour previously undetected populations of *P. abdominalis*. Throughout Europe, *P. abdominalis* is generally regarded as a rare and local species, typically associated with mature broadleaved forests rich in microhabitats such as rot holes, sap runs and decaying wood (Speight, 2024). In contrast, the specimen reported here was recorded in a relatively widespread habitat type on the southeastern slopes of Mt Biokovo, where small patches of downy oak woodland are embedded within a mosaic of traditionally managed pastures and karst grasslands. These woodland patches form a characteristic component of the local landscape and are maintained by the continued grazing of cattle and horses, which limits shrub encroachment and prevents forest succession. Notably, the woodland where *P. abdominalis* was observed lacked old-growth characteristics and veteran trees, which are often considered important habitat features for saproxylic hoverflies. Although conclusions based on a single record should be treated with caution, this finding suggests that the species may be able to persist in a broader range of woodland habitats than previously assumed. The absence of visible signs of logging or other forms of habitat degradation further indicates that the long-term preservation of these oak stands may be important for maintaining suitable conditions for the species. The present record therefore not only confirms the continued occurrence of *P. abdominalis* in Croatia after more than a century but also contributes to a better understanding of its habitat requirements and potential ecological plasticity in southeastern Europe. The lack of knowledge about the biology of *P. abdominalis*, particularly its larval ecology and host-plant associations, has been discussed extensively in the literature (Mengual and Ssymank, 2015; Kulijer et al., 2023; Speight, 2024). As the present record does not provide additional ecological information beyond confirming the species' occurrence, current knowledge regarding its biology remains largely unchanged. Nevertheless, the discovery highlights the need for further ecological studies to clarify the species' habitat requirements, larval development, and conservation status in Croatia and elsewhere in Europe. This record also highlights the importance of surveying previously unexplored regions of Croatia for hoverflies. The Biokovo Nature Park represents one such area, characterised by exceptional habitat diversity but still largely unexplored regarding its Syrphidae fauna. Although hoverflies are among the better-studied insect groups in parts of Europe, knowledge of their distribution in Croatia remains incomplete, and many regions have never been systematically surveyed. During recent years, the author has collected a considerable amount of material from Mt. Biokovo, revealing a rich hoverfly fauna and several noteworthy records. However, additional targeted and systematic surveys are still required to obtain a more comprehensive understanding of the area's species diversity. Given the limited survey effort conducted in many parts of the country, it is likely that additional rare, localised, or previ-

ously unrecorded species remain to be discovered. Continued research is therefore essential not only to improve our understanding of the Croatian hoverfly fauna but also provide the baseline data needed for future conservation assessments and management decisions.

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References – *Literatura*

Ball, S. G., Morris, R. K. A. 2015. *Britain's Hoverflies: A Field Guide*. Second edition. WildGuides. Princeton University Press. 312 pp.

Bot, S., Van de Meutter, F. 2023. *Hoverflies of Britain and North-West Europe: A Photographic Guide*. Bloomsbury Wildlife. London, Bloomsbury Wildlife. 416 pp.

Glumac, S. 1972. *Catalogus faunae jugoslavije. III/6. Syrphoidea.* Ljubljana, Slovenska Akademija Znanosti in Umetnosti v Ljubljani. 72 pp.

Ješovnik, A., Boršić, I., Bujan, J. 2025. Urban Flower-Power for Wild Bee and Hoverfly Conservation. *Urban Ecosystems*, 28: 208. https://doi.org/10.1007/s11252-025-01813-4

Koren, T., Kulijer, D., Vujić, M. 2025. New Records of the Genus *Temnostoma* Le Peletier & Serville, 1828 (Diptera: Syrphidae) in the NW Balkans. *Entomologia Croatica*, 24: 13-26. https://doi.org/10.17971/ec.24.1.3.

Kočić, A., Vujić, A., Tot, T., Milosavljević, M.J., Groot, M.D. 2023. An updated checklist of the hoverflies (Diptera: Syrphidae) of Slovenia. *Zootaxa*, 5297: 189–227. https://doi.org/10.11646/zootaxa.5297.2.2

Kulijer, D, Vujić, M., Koren, T. 2023. New records and updated distribution of the rare and threatened European Hoverfly *Psarus abdominalis* (Fabricius, 1794) in NW Balkans. *Spixiana*, 46: 75-80.

Langhoffer, A. 1919. Beiträge zur Dipterenfauna Kroatiens. *Glasnik Hrvatskoga Prirodoslovnoga Društva*, 31: 125-139.

Mengual, X., Ssymank, A. 2015. New records of *Psarus abdominalis* (Fabricius) (Diptera: Syrphidae), a threatened species in Europe. *Annales de la Société Entomologique de France* (N.S.), 51: 197-207. https://doi.org/10.1080/00379271.2015.1059735

Ostrovsky, A.M. 2024. First records of *Psarus abdominalis* (Fabricius, 1794) (Diptera: Syrphidae) from Belarus. / Pierwsze doniesienie z Białorusi o *Psarus abdominalis* (Fabricius, 1794) (Diptera: Syrphidae). *Wiadomości Entomologiczne (Entomological News),* 43: 23-24.

Popović, M., Vasić, N., Koren, T., Burić, I., Živanović, N., Kulijer, D., Golubović, A. 2020. Biologer: an open platform for collecting biodiversity data. *Biodiversity Data Journal*, 8: e53014. https://doi.org/10.3897/BDJ.8.e53014

Radenković, S. 2008. *Fauna podfamilije Eristalinae (Diptera: Syrphidae) u Srbiji*. PhD Thesis, University of Novi Sad, Serbia, 352 pp. [in Serbian]

Reverté, S., Miličić, M., Ačanski, J., Andrić, A., Aracil, A., Aubert, M., Balzan, M.V., Bartomeus, I., Bogusch, P., Bosch, J., Budrys, E., Cantú-Salazar, L., Castro, S., Cornalba, M., Demeter, I., Devalez, J., Dorchin, A., Dufrêne, E., Đorđević, A., Fisler, L., Fitzpatrick, Ú., Flaminio, S., Földesi, R., Gaspar, H., Genoud, D., Geslin, B., Ghisbain, G., Gilbert, F., Gogala, A., Grković, A., Heimburg, H., Herrera-Mesías, F., Jacobs, M., Janković Milosavljević, M., Janssen, K., Jensen, J., Ješovnik, A., Józan, Z., Karlis, G., Kasparek, M., Kovács-Hostyánszki, A., Kuhlmann, M., Le Divelec, R., Leclercq, N., Likov, L., Litman, J., Ljubomirov, T., Madsen, H.B., Marshall, L., Mazánek, L., Milić, D., Mignot, M., Mudri-Stojnić, S., Müller, A., Nedeljković, Z., Nikolić, P., Ødegaard, F., Patiny, S., Paukkunen, J., Pennards, G., Pérez-Bañón, C., Perrard, A., Petanidou, T., Pettersson, L.B., Popov, G., Popov, S., Praz, C., Prokhorov, A., Quaranta, M., Radchenko, V.G., Radenković, S., Rasmont, P., Rasmussen, C., Reemer, M., Ricarte, A., Risch, S., Roberts, S.P.M., Rojo, S., Ropars, L., Rosa, P., Ruiz, C., Sentil, A., Shparyk, V., Smit, J., Sommaggio, D., Soon, V., Ssymank, A.,

Ståhls, G., Stavrinides, M., Straka, J., Tarlap, P., Terzo, M., Tomozii, B., Tot, T., Van Der Ent, L., Van Steenis, J., Van Steenis, W., Varnava, A.I., Vereecken, N.J., Veselić, S., Vesnić, A., Weigand, A., Wisniowski, B., Wood, T.J., Zimmermann, D., Michez, D., Vujić, A. 2023. National records of 3000 European bee and hoverfly species: A contribution to pollinator conservation. *Insect Conservation and Diversity,* 16: 758-775. https://doi.org/10.1111/icad.12680

Rotheray, G. E., Gilbert, F. 2011. *The Natural History of Hoverflies*. Cardigan, Forrest Text. 333 pp.

Speight, M. C. D. 2024. *Species accounts of European Syrphidae, 2024. Syrph the Net, the database of European Syrphidae (Diptera)*. Dublin, Syrph the Net publications. 115, pp. 1-381.

van Steenis, W., van Steenis, J., van der Ent, L.-J. 2021. *Psarus abdominalis*. *The IUCN Red List of Threatened Species 2021:* e.T149169243A149169249.

QGIS Development Team 2026. QGIS Geographic Information System. QGIS Association. https://www.qgis.org/

Vujić, M., Koren, T., Kulijer, D., Maglić, R., Martinović, M. 2022. Updated distribution of *Milesia crabroniformis* (Fabricius, 1775) and *M. semiluctifera* (Villers, 1789) (Diptera: Syrphidae: Eristalinae) in Bosnia and Herzegovina, Croatia and Serbia. *Acta Entomologica Slovenica*, 30: 53–64.

Vujić, M., Koren, T. 2020. *Criorhina floccosa* (Meigen, 1822), a New Hoverfly (Diptera: Syrphidae) in the Fauna of Croatia. *Acta Entomologica Slovenica*, 28: 65–68.

Vujić, A., Gilbert, f., flinn, G., Englefield, E., Varga, Z., ferreira, C.C., Eggert, f., Woolcock, S., Böhm, M., Vrba, J., Mergy, R., Ssymank, A., van Steenis, W., Aracil, A., földesi, R., Grković, A., Mazánek, L, Nedeljković, Z., Pennards, G.W.A., pérez, C., Radenković, S., Ricarte, A., Rojo, S., Ståhls, G., van der Ent, L.-J., van Steenis, J., Barkalov, A., Campoy, A., Janković, M., Likov, L., Lillo, I., Mengual, X., Milić, d., Miličić, M., Nielsen, T., Popov, G., Romig, T., Šebić, A., Speight, M., Tot, T., van Eck, A., Veselić, S., Andrić, A., Bowles, p., de Groot, M., Marcos-García, M.A., Hadrava, J., Lair, X. , Malidžan, S., Nève, G., Obreht Vidaković, d., Popov, S., Smit, J.T., Van de Meutter, F., Veličković, N. 2022. *Pollinators on the edge: our European hoverflies. The European Red List of Hoverflies*. Cardigan, Forrest Text. 333 pp.

Wu, G., Li, H., Mengual, X., Wang, Y., Zhao, R. 2024. Phylogenetic analysis of Syrphidae (Insecta, Diptera) based on low-coverage whole genomes. *Insect Systematics and Diversity*, 8: 1-10. https://doi.org/10.1093/isd/ixae034

Zaika, M.I., Korneyev, V.A., Popov, G.V. 2011. New finds of *Psarus abdominalis* (Diptera: Syrphidae) included to the Red Data Book of Ukraine. *Ukrainska Entomofaunistyka*, 2: 16.