

Faunistic records of the critically endangered *Psarus abdominalis* (Diptera: Syrphidae) from the Czech Republic

Faunistické záznamy kriticky ohroženého druhu *Psarus abdominalis* (Diptera: Syrphidae) z České republiky

Jiří HADRAVA

Department of Zoology, Faculty of Science, Charles University, Viničná 7, CZ-128 43 Praha 2, Czech Republic & Institute of Entomology, Biological Centre, Czech Academy of Science, Branišovská 31, CZ-370 05 České Budějovice, Czech Republic;
e-mail: hadravajirka@seznam.cz

Diptera, Syrphidae, endangered species, *Psarus abdominalis*

Abstract. *Psarus abdominalis* (Fabricius, 1794) is a rare and declining species of hoverfly (Diptera: Syrphidae) endemic to Europe. In the Czech Republic, the species is classified as critically endangered. Based on specimens deposited in museum collections, I provide information on the historical distribution of the species in the country. *Psarus abdominalis* was not recorded in the Czech Republic since 1978. Recently, in 2021, a single male of *P. abdominalis* was recorded on southern Moravia (in an oak forest near the village of Mutěnice). Detailed information on the record is provided here.

INTRODUCTION

Hoverflies (Syrphidae) are one of the most diverse families of Diptera. Due to high variability in the ecological strategies of their larvae, hoverflies can serve as highly informative bioindicators in various types of habitats (Sommaggio 1999, Vujić et al. 2016, Talašová et al. 2018). However, in many rare and endangered species, we still lack even basic information on their geographical distribution and ecological requirements (Speight 2020). *Psarus abdominalis* (Fabricius, 1794) is one of the most notable rare, endangered, and poorly known species of hoverfly.

Psarus Latreille, 1804 is a monotypic genus of hoverfly (Diptera: Syrphidae) endemic to Europe (Speight 2020, Mengual & Ssymank 2015). Its only species, *Psarus abdominalis* (Fabricius, 1794) occurs from France in the west to European parts of Russia in the east, and from Latvia in the north to Greece in the south (Mengual & Ssymank 2015). However, it is very rare throughout its range and it is considered as regionally extinct in several European countries such as Sweden, Netherlands, and Belgium (Bot & Van de Meutter 2019, Speight 2020), while in other countries, it occurs only at very few sites (Mengual & Ssymank 2015). In eastern Europe, the species has a restricted and fragmented distribution, but in Ukraine it is still common in some places (Grigory Popov, pers. comm.). In the Czech Republic, *P. abdominalis* is listed in the local Red List as a critically endangered species (Mazánek & Barták 2005) and no record has been published in recent decades. However, in historical times (>100 years ago), the species was possibly much more common on the territory of present-day Czech Republic: a number of records of *P. abdominalis* are reported by Kowarz

(1885), Czižek (1910), and Vimmer (1912) from Moravia (eastern part of present-day Czech Republic) as well as Bohemia (western part of present-day Czech Republic), suggesting that the species was widely distributed across the country in former times. Despite the lack of more recent records, *P. abdominalis* is reported in the national check list from both regions, Bohemia and Moravia (Mazánek 2009). Here, I report new data on the occurrence of *Psarus abdominalis* in the Czech Republic.

MATERIAL AND METHODS

The collections of the following institutions were searched for specimens of *Psarus abdominalis*: National Museum in Prague, Czech Republic (NMPC), Moravian Museum in Brno, Czech Republic (MMBC), Museum of West Bohemia in Plzeň, Czech Republic (MWBP), and Museum of East Bohemia in Hradec Králové, Czech Republic (KMVC). The data were supplemented by a recent record by the author. The recently recorded specimen was pinned, and its middle right leg was taken off and stored in 96% ethanol in a freezer (-20 °C) for future isolation of DNA. The specimen was photographed using a Canon EOS 70d digital camera with Canon EF-S 60mm f/2.8 lens. Images were stacked with Zerene Stacker, method “P-Max”.

RESULTS

Newly reported historical records. Czech Republic: Moravia mer.: Přibice (7065), 20.v.1956, 1 ♀, Bláha lgt. (NMPC); Čejč (7067), vi.1958: 2 ♂♂, Kocourek lgt. (MMBC); Popice (7066), 25.vi.1977, 1 ♂, 1 ♀, Kocourek lgt. (MMBC); Popice (7066), 25.vi.1978, 1 ♂, 1 ♀, Kocourek lgt. (MMBC).

Recent record. Czech Republic, Moravia mer., Mutěnice (7068), 48.9067764°N 17.0632508°E, 30.v.2021, 1 ♂, J. Hadrava lgt. The specimen is shown on Fig. 1. Habitat description: Old-growth oak forest with open canopy and with very rich vegetation of herbs and shrubs. The specimen was found on the edge of a pathway, sitting on a leaf of *Rubus* close to ground level. The weather was rather cold (about 12 °C), cloudy in the morning and partly cloudy in the afternoon. *Psarus abdominalis* was found at 12:30, just when the first sunshine appeared that day.

DISCUSSION

Seven historical and one recent record of *Psarus abdominalis* are documented here from the Czech Republic, all of them from south Moravia (south-east of the Czech Republic). The distribution data (shown on Fig. 2) suggest that all the records reported here come from one single population which was widespread across south Moravia back in the 1950s, 1960s and 1970s, but then, not a single specimen has been recorded for more than 40 years until now.

Identification. *Psarus abdominalis* is an easily recognizable species with a rather small body size (no longer than 1 cm), deep red coloured abdominal tergites and conspicuously elongated antennae (see Fig. 1). Based on the identification key by van Veen (2004), the species can be distinguished by a combination of the following characters: (1) humeri haired (excluding Syrphinae), (2) antenna longer than the head (excluding the majority of other hoverflies), (3) scutellum not armed (excluding *Microdon* Meigen, 1803), (4) antenna with dorsal arista (excluding *Callicera* Panzer, 1809, *Ceriana* Rafinesque, 1815, and *Sphiximorpha* Rondani, 1850), and (5) abdomen largely reddish (excluding *Sphecomyia* Latreille, 1829).



Fig. 1. Photograph of the recently recorded male of *Psarus abdominalis* (Fabricius, 1794) in lateral view (photograph by J. Hadrava & P. Šípek).

Obr. 1. Fotografie nově zaznamenaného samce *Psarus abdominalis* (Fabricius, 1794) v bočním pohledu (fotografie J. Hadrava & P. Šípek).

Mimicry. Mengual & Ssymank (2015) report kleptoparasitic bees of genus *Sphecodes* Latreille, 1804 as a presumed model for *Psarus abdominalis*. However, at the recent locality for *P. abdominalis* near Mutěnice, I did not record any *Sphecodes* species. Nevertheless, females as well as males of a similar looking bee species *Andrena labiata* Fabricius, 1781 occurred there in high abundance and were observed flying close to the ground at exactly the spot where *P. abdominalis* was caught. Thus, I suggest *Andrena labiata* as another candidate for a mimicry model for *P. abdominalis*. *Andrena labiata* is a rather common species widespread in lowland xerothermophilous habitats across Europe (Macek et al. 2010), so its ecological requirements are consistent with those of *P. abdominalis*. *Andrena labiata* is a polylectic species that collects pollen mainly on plants of family Brassicaceae such as *Capsella bursa-pastoris* (Macek et al. 2010). A photograph of a female *A. labiata* is displayed on Fig. 3.

Larval ecology. Larvae of *P. abdominalis* are not known. Mengual & Ssymank (2015) mentioned a possible association between larvae of *P. abdominalis* and *Geranium sanguineum*. However, I didn't record any *G. sanguineum* at the locality, nor within the surrounding area. The only species of *Geranium* at the locality was *G. molle* (a single plant growing very close to the spot where *P. abdominalis* was found). Within a radius of 100 meters around the spot, there was also *Geranium robertianum* (which is quite common species in the undergrowth of forests in the Czech Republic), but no other species of *Geranium* was found there.

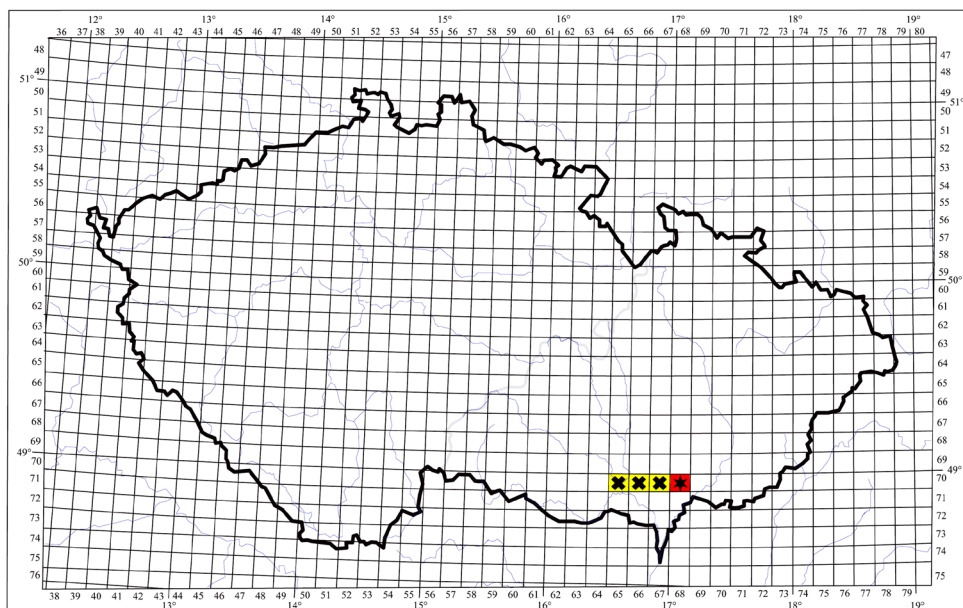


Fig. 2. Distribution of *Psarus abdominalis* (Fabricius, 1794) in the Czech Republic. Star on red background indicates the recent record (2021), crosses on yellow background show historical records (pre-1980). Data from the literature older than 100 years are not included in the map. The map grid follows the standard scheme used for the insect distribution monitoring in the Czech Republic, the map base is provided by the Czech Entomological Society (<https://www.entospol.cz/sit-mapovych-ctvercu/>).

Obr. 2. Rozšíření *Psarus abdominalis* (Fabricius, 1794) v České republice. Hvězdička na červeném pozadí značí současný nález (2021), křížky na žlutém pozadí značí historické nálezy (před 1980). Literární data starší než 100 let nejsou v mapě zahrnuta. Čtvercová síť odpovídá faunistickým čtvercům standardně používaným pro síťové mapování rozšíření hmyzu v České republice, mapový podklad byl přejat od České společnosti entomologické (<https://www.entospol.cz/sit-mapovych-ctvercu/>).

Co-occurring hoverflies. At the same locality as *P. abdominalis* was recorded, I observed many other rare and threatened species of hoverflies, such as *Xanthogramma laetum* (Fabricius, 1794) (critically endangered in the Czech Republic), *Chalcosyrphus femoratus* (Linnaeus, 1758) (endangered in the Czech Republic), and *Ceriana conopsoides* (Linnaeus, 1758) (endangered in the Czech Republic). In the same forest, a few hundred metres south from the locality of *P. abdominalis*, I also recorded *Microdon analis* (Macquart, 1842) (vulnerable in the Czech Republic) sitting next to the nest of its host species *Lasius platythorax* Seifert, 1991. Mengual & Ssymank (2015) also recorded a rich community of hoverflies including rare and threatened species co-occurring with *P. abdominalis*. Such result suggests that *P. abdominalis* could be an excellent umbrella species for the conservation of rare hoverflies, as its habitat is valuable for other endangered species of hoverflies as well.

Conservation. The recent record of *P. abdominalis* demonstrates that the species is not yet extinct in the country, but the declining trend of its range of occurrence is obvious: the species was widespread in the country over 100 years ago; in the second half of the 20th century, its



Fig. 3. Photograph of female bee *Andrena labiata* Fabricius, 1781, possible mimicry model for *Psarus abdominalis* (Fabricius, 1794) (photography by J. Hadrava & P. Šípek).

Obr. 3. Fotografie samice včely *Andrena labiata* Fabricius, 1781, možného mimetického modelu *Psarus abdominalis* (Fabricius, 1794) (fotografie J. Hadrava & P. Šípek).

occurrence was restricted to southern Moravia; and only single specimen was found in the last 40 years in the Czech Republic. Thus, protection for *P. abdominalis* is urgently needed. The recent locality for *P. abdominalis* is one of very few relicts of old-growth oak forest in the region (Petr Baňaf, pers. comm.) and is unique for the low density of trees and consequently rich herbal vegetation. Despite its apparently high nature conservation value, the locality is not protected under national law, it is only protected under the legislation of European Union under Natura 2000 (“Evropsky významná lokalita Hodoninská Doubrava”).

As the genus *Psarus* is endemic to Europe, we could conclude that *P. abdominalis* is a hoverfly with a long evolutionary association with European ecosystems. However,

P. abdominalis is recently becoming seriously endangered due to changes in the European landscape, especially due to the intensification of forestry and the abandoning of traditional managements such as coppicing and forest pasture, which helped retain a forest structure similar to natural forests managed by wild animals (Vera 2000, Konvička et al. 2006). The case of *P. abdominalis* emphasizes the need for conservation of lowland open-canopy forests.

Acknowledgement. I thank Vojtěch Brlík (Prague, Czech Republic) and Tereza Hadravová (Prague, Czech Republic) for their help in the field, Tereza Hadravová, Michal Tkoč (NMPC), Petr Baňář (MMBC), and Jitka Waldhauserová (Jihlava, Czech Republic) for their help with managing records from museum collections, and Libor Mazánek (Olomouc, Czech Republic) for general discussions regarding conservation of rare species of hoverflies. *Andrena labiata* was identified by Daniel Benda (Prague, Czech Republic), *Lasius platythorax* was identified by Tadeáš Ryšan (Prague, Czech Republic), and *Geranium* species were identified by Zdeněk Janovský (Prague, Czech Republic). I thank Petr Šípek (Prague, Czech Republic) for his kind help with taking the photographs and Libor Mazánek and Axel Ssymank (Bonn, Germany) for reviewing and providing valuable comments on the manuscript. The project was supported by Charles University grant agency (GAUK 1030119/2019).

REFERENCES

- BOT S. & VAN DE MEUTTER F. 2019: *Veldgids zweefvliegen*. [Hoverfly Field Guide.] KNNV Uitgeverij, Zeist, 388 pp. (in Dutch).
- CZIŽEK K. 1910: Beiträge zur Dipterenfauna Mährens (III. Nachtrag). *Zeitschrift des Mährischen Landesmuseums* **10** (1): 87–112 (in German).
- KONVIČKA M., ČIŽEK L. & BENEŠ J. 2006: *Ohrožený hmyz nížinných lesů: ochrana a management*. [Endangered Insects of Lowland Forests: Protection and Management.] Sagittaria, Olomouc, 79 pp. (in Czech).
- KOWARZ F. 1885: Beiträge zu einem Verzeichnisse der Dipteren Böhmens VI. *Wiener Entomologische Zeitung* **4**: 105–108; 133–136; 167–168; 201–208; 241–244 (in German).
- MACEK J., STRAKA J., BOGUSCH P., DVOŘÁK L., BEZDĚČKA P. & TYRNER P. 2010: *Blanokřídlí České republiky I. – Žahadloví*. [Hymenoptera of the Czech Republic I. – Aculeata.] Academia, Praha, 524 pp. (in Czech).
- MAZÁNEK L. & BARTÁK M. 2005: Čeled' Syrphidae (pestřenkovití). [Family Syrphidae (hoverflies)]. Pp. 300–304. In: FARKAČ J., KRÁL D. & ŠKORPÍK M. (eds): *Červený seznam ohrožených druhů České republiky. Bezobratlí. Red list of threatened species in the Czech Republic. Invertebrates*. Agentura ochrany přírody a krajiny ČR, Praha, 760 pp. (in Czech and English).
- MAZÁNEK L. 2009: Syrphidae Latreille, 1802. In: JEDLIČKA L., STLOUKALOVÁ V. & KÚDELA M. (eds): *Checklist of Diptera of the Czech Republic and Slovakia*. Electronic version 2. <http://www.edvis.sk/diptera2009/families/syrphidae.htm> (accessed 21 February 2022)
- 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 (Nouvelle Série)* **51**: 197–207.
- SOMMAGGIO D. 1999: Syrphidae: can they be used as environmental bioindicators? *Agriculture, Ecosystems and Environment* **74**: 343–356.
- SPEIGHT M. C. D. 2020: Species accounts of European Syrphidae (Diptera) 2020. *Syrph the Net, the database of European Syrphidae (Diptera)*, vol. 104, 314 pp., Syrph the Net publications, Dublin.
- TALAŠOVÁ A., STRAKA J., HADRAVA J., BENDA D., KOCOUREK F. & KAZDA J. 2018: High degree of philopatry is required for mobile insects used as local indicators in biodiversity studies. *Ecological Indicators* **94**: 99–103.
- VAN VEEN M. P. 2004: *Hoverflies of Northwest Europe. Identification Keys to Syrphidae*. KNNV Publishing, Utrecht, 254 pp.
- VERA, F. W. M. 2000: *Grazing ecology and forest history*. Cabi Publishing, Hague, 506 pp.
- VIMMER A. 1912: Seznam českých dipter. [List of Bohemian Diptera]. *Časopis České společnosti entomologické* **9**: 49–80 (in Czech).
- VIJIĆ A., RADENKOVIĆ S., NIKOLIĆ T., RADIŠIĆ D., TRIFUNOV S., ANDRIĆ A., MARKOV Z., JOVIČIĆ S., MUDRI STOJINIĆ S., JANKOVIĆ M. & LUGONJA P. 2016: Prime Hoverfly (Insecta: Diptera: Syrphidae) Areas (PHA) as a conservation tool in Serbia. *Biological Conservation* **198**: 22–32.

SOUHRN

Psarus abdominalis (Fabricius, 1794) je jediným žijícím zástupcem rodu *Psarus* Latreille, 1804 (Diptera: Syrphidae). Tento rod a druh je evropským endemitem rozšířeným od Francie po evropskou část Ruska a od Finska po Řecko, ovšem po celém svém areálu je velmi vzácný a ohrožený. V několika evropských zemích (např. Švédsku, Holandsku a Belgii) je *P. abdominalis* považován za vymřelý druh, častěji se s ním lze setkat snad jen na některých lokalitách na Ukrajině. V České republice je *P. abdominalis* považován za kriticky ohroženého (Mazánek & Barták 2005). Jeho historický výskyt na řadě lokalit po Čechách i Moravě je dokládán v několika literárních zdrojích starších než 100 let, jako jsou Kowarz (1885), Czižek (1910) a Vimmer (1912). Novější záznamy tohoto druhu však z našeho území nejsou známy.

Jedince *P. abdominalis* jsem hledal v muzejních sbírkách a našel jsem sedm historických záznamů pocházejících ze tří lokalit na jižní Moravě (Přibice, Čejč a Popice) z let 1956 až 1978. Roku 2021 se mi pak podařilo jednoho samce tohoto druhu odchytit v řídkém dubovém lese u jihomoravské obce Mutěnice, kde se vyskytoval společně s celou řadou dalších velmi vzácných druhů pestřenek, jako je kriticky ohrožený druh *Xanthogramma laetum* nebo ohrožené druhy *Chalcosyrphus femoratus* a *Ceriana conopsoides*.

Domnívám se, že tento druh by zasluhoval mimořádnou pozornost ochrany přírody. Jakožto evropský endemit je rod *Psarus* unikátním prvkem evropských ekosystémů s těžištěm svého areálu právě ve střední Evropě. Současná podoba středoevropské krajiny je však pro jeho populace značně nevyhovující. *Psarus abdominalis* je vázán na řídké a prosvětlené nížinné lesy s bohatým bylinným podrostem, jako jsou pařezinové či pastevní lesy, což jsou celoevropsky mizející typy biotopů, na které je vázáno i mnoho dalších druhů vzácných pestřenek a celá řada jiných ohrožených druhů hmyzu (Konvička et al. 2006). Díky tomu, že *P. abdominalis* je snadno rozpoznatelný druh, mohl by sloužit i jako deštníkový druh v ochraně lesních biotopů. Sama lokalita u Mutěnic (tj. jediná lokalita se známým recentním výskytem tohoto druhu na našem území) není součástí žádného chráněného území, spadá však do území evropsky významné lokality Hodonínská Doubrava.

Od tvůrců filmu **Planeta Česko**, vypráví **Jiří Macháček**

PLANETA PRAHA



Dobrodružná výprava do městské džungle

V KINECH OD 4. SRPNA

KUL
FILM
příroda

Česká televize
CSO

První
Praha
Region

LUXOR
Tedy to nikdy

cinema

živa

Radiožurnál
Český rozhlas

RESPECT

marianne

Magdona

abc

radioklam

Jednotka