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New host record for the parasitoid fly *Phryxe nemea* (Meigen, 1824) (Diptera: Tachinidae) in Bulgaria

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Abstract. This research presents new data on the host selection behaviour of the parasitoid fly *Phryxe nemea* (Meigen, 1824). The observation was made during sample collection in an open-field experiment conducted at the University of Forestry's experimental station in Sofia. The experiment aimed to assess how intercropping kale (*Brassica oleracea* L. var. *acephala*) with various companion plants would impact the activity of key pests and their natural enemies. This is the first record of the host-parasitoid association between *Pieris rapae* (Linnaeus, 1758) and *Phryxe nemea* in Bulgaria.

Key words: host, *Pieris rapae,* Tachinidae.

Introduction

Tschorsnig (2017) presents *Phryxe nemea* (Meigen, 1824) as a polyphagous parasitoid of lepidopteran larvae, gathering compelling data in his catalogue about 115 different host reports for this species. The author even lists two species of wasps from the family Tenthredinidae as hosts for *P. nemea* (Tschorsnig 2017).

The first record for *P. nemea* in Bulgaria was made by Jacentkovsky in 1936, who did field surveys in our country in order to study the ecological conditions under which tachinid flies live. He paid attention to two main factors - microclimate (humidity and sunlight intensity) and the food plants of the adult flies. He described two adult specimens of *P. nemea* that were caught at an altitude of 1600 m a.s.l., on unidentified vegetation, near Rila Monastery (Jacentkovsky 1936: 123).

The most recent information on the hosts of *P. nemea* is provided by Hubenov (2025), who presents an up-to-date review of the current data on Bulgarian tachinid hosts. He gives a list of 6 lepidopteran species, which are reported as hosts for *P. nemea* in Bulgaria, but *Pieris rapae* (Linnaeus, 1758) is not among them (Hubenov 2025).

Material and Methods

Samples of *P. rapae* larvae were collected in the period between August and November 2024 as part of an open-field experiment conducted at the University of Forestry's experimental station, located in the capital city of Sofia.

In a pesticide-free area, kale seedlings from the cultivar "Nero di Toscana" were intercropped with 11 repellent and attractant companion plants: *Lobularia maritima*, *Borago officinalis*, *Fagopyrum esculentum*, *Tropaeolum majus*, *Calendula officinalis*, *Tagetes patula*, *Anethum graveolens*, *Coriandrum sativum*, *Petroselinum crispum*, *Ocimum basilicum* and *Allium porrum*. The main objective was to study the interactions between cruciferous pests and their natural enemies.

Each kale leaf was carefully searched for *P. rapae* larvae, which were hand-picked and collected for rearing in laboratory conditions. The sample from which *P. nemea* was reared was collected on 23.09.2024, from a bed with kale intercropped with *Fagopyrum esculentum* (Buckwheat). At that time, the buckwheat was at the blooming stage. The

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sample was identified by Prof. Dr Zdravko Hubenov from the National Museum of Natural History in Sofia.

Results

According to Hubenov (2025), the following hosts for *P. nemea* have been reported for Bulgaria so far: *Autographa gamma; Erannis defoliaria; Malacosoma neustria; Lacanobia oleracea; Operophtera brumata and Ptycholoma lecheana.* Even though host-parasitoid interactions between *P. nemea* and *P. rapae* are not recorded from Bulgaria, they are described in the works of Bisset (1938), Richards (1940) and Tschorsnig (2017).

There are numerous publications regarding *P. nemea*'s other hosts in many European countries: Belgium (Robertson & Shaw 2012), Croatia (Pernek et al. 2015), Czech republic (Vaňhara *et al.* 2009), Germany (Hesting 1965), Italy (Cerretti & Tschorsnig 2010; Scaramozzino *et al.* 2020), the Netherlands (Elzinga *et al.* 2007), Poland (Draber-Mońko 1982; Napiorkowska-Kowalik & Machowicz-Stefaniak 1988), Serbia (Glavendekić 2010; Žikić *et al.* 2013; Stanković *et al.* 2018; Stanković *et al.* 2024), Scotland (Jackson 1934), Sweetzerland (Pschorn-walcher & Herting, 1955), the United Kingdom (Robertson & Shaw 2012).

Information about the species' distribution and ecology is found in the work of Tschorsnig and Herting (1994), where *P. nemea* is reported in Temperate Europe, up to Sweden and Finland, very rarely in Southern Europe. It can be found in deciduous forest edges, bushes, hedges and orchards, on foliage and frequently in flowers. It has several generations from mid-April to mid-October. Its preferred hosts are macrolepidopteran larvae, but it avoids hairy caterpillars (Tschorsnig & Herting 1994: 84).

Hubenov (2024) gives information about the parasitoid's vertical distribution in different geographical and vegetation zones in Bulgaria. He describes *P. nemea* as a Transpalaearctic species. It has been reported in lowlands, hills, low mountains, middle mountains and high mountains up to 2000 m a.s.l., across xerothermic oak forests, mesophylic and xeromesophylic mixed forests, beech and conifer forests (Hubenov 2024).
P. rapae is a Holarctic butterfly. It is one of the most common species in Bulgaria, distributed all over the country. It can be found in forests, gardens, roadsides, fields, rocky slopes of hills and gorges and in most agricultural areas. It is also very well adapted to urban areas (Abadjiev 1992: 36).

The present study documents host-parasitoid interactions under urban conditions. Evidence for *P. nemea* in the urban environment can be found in Draber-Mońko's article (1982), where the species' presence has been reported in parks and Mazovia's town centre in Poland.

Discussion

Approximately 850 species of the family Tachinidae are known to inhabit Europe (Stanković *et al.* 2024), and a total of 432 species of them have been established in Bulgaria so far (Hubenov 2024). The establishment of new host-parasitoid relationships can be expected, taking into account the widespread polyphagy in the family (Hubenov 2025).

P. nemea is a polyphagous species that is regularly reared from various butterflies, sometimes more often than their more specialised parasitoids (Shaw *et al.* 2009: 149). Taking this into account, its potential role for biological control is a promising field yet to be explored.

In conclusion, the present work contributes to the understanding of *P. nemea*'s ecological plasticity and adaptability to new hosts and environments. While the presented parasitoid-host association has been previously described in other European countries, this new record extends the known host range of *P. nemea* in Bulgaria and the Balkan

Peninsula. Further research is needed to assess its distribution and beneficial role in ecosystem services.

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