



## Distribution, host plant association, and morphological diagnosis of adults and larvae of *Haplothrips biroi* (Thysanoptera: Phlaeothripidae)

JOZEF BALCERČÍK<sup>1,\*</sup>, HALINA KUCHARCZYK<sup>2</sup>, MICHAELA MEŠKOVÁ<sup>1</sup>, MARTINA ZVARÍKOVÁ<sup>1</sup>,  
RUDOLF MASAROVIČ<sup>1</sup> & PETER FEDOR<sup>1</sup>

<sup>1</sup>Department of Environmental Ecology and Landscape Management, Faculty of Natural Sciences, Comenius University in Bratislava, Slovakia.

✉ [meskova16@uniba.sk](mailto:meskova16@uniba.sk); <https://orcid.org/0000-0003-0896-4544>

✉ [martina.zvarikova@uniba.sk](mailto:martina.zvarikova@uniba.sk); <https://orcid.org/0000-0002-4329-8172>

✉ [rudolf.masarovic@uniba.sk](mailto:rudolf.masarovic@uniba.sk); <https://orcid.org/0000-0002-9523-1711>

✉ [peter.fedor@uniba.sk](mailto:peter.fedor@uniba.sk); <https://orcid.org/0000-0003-4091-8935>

<sup>2</sup>Department of Zoology and Nature Protection, Institute of Biological Sciences, Faculty of Biology and Biotechnology, Marie Curie-Skłodowska University in Lublin, Poland.

✉ [ha.kucharczyk@gmail.com](mailto:ha.kucharczyk@gmail.com); <https://orcid.org/0000-0001-5341-1872>

\*Corresponding author: ✉ [jozef.balcercik@uniba.sk](mailto:jozef.balcercik@uniba.sk); <https://orcid.org/0009-0003-3322-3358>

### Abstract

*Haplothrips biroi* (Priesner) is known from several southern European countries and is here newly recorded from southwestern Slovakia. The host plant is confirmed as *Ballota nigra* [Lamiaceae], with 107 female and 25 male adults collected, and the species successfully reared on the host leaves. Key morphological features of adults and larvae are illustrated, and the ecological implication of the record briefly discussed.

**Key words:** new record, Slovakia, *Ballota nigra*

### Introduction

*Haplothrips biroi* (Priesner 1928) was described originally from a single female collected in Sashegy, in the Buda Hills (Budapest, Hungary) in 1917 (Jenser 1979). Initially classified in the genus *Neoheegeria*, it was later reclassified as *Haplothrips biroi* by Minaei *et al.* (2007) in a reassessment of the status of *Neoheegeria* and *Haplothrips*, in which *Neoheegeria* was restricted to species with three sense cones on the third antennal segment.

The original species description did not include information on its host plant. However, from Romania, Vasiliu-Oromulu (1998c) mentions an association between *H. biroi* and *Ballota nigra*, and Knechtel (1960) reports this thrips from *Clinopodium vulgare* [Lamiaceae]. From Northern Umbria, Italy, zur Strassen (1987) mentions *H. biroi* from “a red-flowering labiate plant” that was subsequently identified as *Rosmarinus* [Lamiaceae] (Marullo 2004; Marullo & De Grazia 2013), and one female of *H. biroi* was recorded on *Ballota nigra* by A. Bournier near Montpellier (France) in 1967 (NHM 2025). From Bulgaria, Karadjova and Krumov (2015) briefly mention *H. biroi* as having been found on *Lamium purpureum*. These records suggest that this thrips is closely associated with various members of the plant Family Lamiaceae, although one female is recorded from the flowers of *Arctium lappa* [Asteraceae] in Czechia near Brno in 1989 (Pelikán 1992). Apart from these records, *H. biroi* is mentioned in various checklists, including: Hungary (Jenser, 1979), Romania (Vasiliu-Oromulu 1998a,b), Italy (Marullo & De Grazia 2013), and Bulgaria (Karadjova & Krumov 2015), but zur Strassen (1987) records the species in Dalmatia (Croatia), based on specimens in Senckenberg Museum, Frankfurt am Main, and Croatia is also listed on the PESI portal (Vierbergen, 2004). The paucity of records might indicate that the species is rare, but could equally be due to lack of field work in appropriate areas.

## Materials and Methods

Specimens of *H. biroi* were collected during research on Thysanoptera assemblages in wind-blown calcareous sand dunes near Hurbanovo (SW Slovakia; 47°52'46.9"N 18°09'29.3"E) in 2024 and 2025. The surveyed area consists of dunes formed by the accumulation of carbonate-rich sand, which supports xerophilous herbaceous grass vegetation. Thrips sampling using a sweep-net started on April 10, 2024. The herbaceous layer at the study site was dominated by various grass species [Poaceae], along with other plants, including *Ballota nigra* [Lamiaceae], *Aristolochia clematitis* [Aristolochiaceae] and *Verbascum densiflorum* [Scrophulariaceae]. Following confirmation of the presence of *H. biroi* at the site, additional individuals were collected on May 9, 2024 directly from *Ballota nigra* plants. This plant species was abundant on elevated parts of the area, particularly in areas shaded by *Robinia pseudoacacia* [Fabaceae] trees, growing on soils with a notable accumulation of organic matter, and in close proximity to intensively cultivated agricultural land. This corresponds with previous observations that *Ballota nigra* is a nitrophilous species (Tichý *et al.* 2023). Subsequent collection, using both sweep-netting and direct sampling from *B. nigra*, was conducted on May 30, 2024. To confirm the host plant relationship, several *Ballota nigra* plants (including thrips) were uprooted on May 9, 2024 and cultivated under laboratory conditions in an enclosed insectarium for several weeks. This allowed continued observation of *H. biroi* adults, confirming this species as a true host, and rearing of the pre-imaginal stages that were also observed later. The following year, on March 25, 2025, the study site was revisited to reconfirm the presence of *H. biroi* on *B. nigra* plants, and we examined other Lamiales species at the site and recorded any associated thrips.

Thrips specimens were preserved in AGA solution (10 parts 60% ethyl alcohol, 1 part glycerine, and 1 part acetic acid). The adults were mounted using standard preparation techniques (Mound & Kibby, 1998), and larvae after clearing in lactic acid were enclosed in Berlese liquid (Kucharczyk & Stanisławek 2020). The adult thrips were identified using the available keys (Schliephake & Klimt 1979; Priesner 1964) under a Leica DM2000 microscope. The adults' morphometric measurements and photographic documentation were performed using an Olympus BX53M microscope. Larvae were examined under Olympus BX 61 microscope in the light field or phase contrast illumination, and Olympus CellSens Dimension image analyser was used for the measurements (in microns) and taking photos. The position and numbering of the setae are according to Kucharczyk & Stanisławek (2020).

## Results

Using the sweep-net 63 females and 14 males *H. biroi* were sampled on April 10, 2024. The species was particularly abundant during this period. Individual collections from *Ballota nigra* plants on May 9, 2024, yielded an additional three females and one male. Abundance was significantly lower during this later sampling. The plants did not flower under laboratory conditions, but adults and larvae fed on the leaves, frequently hiding in the leaf axils. On May 30, 2024, no individuals of *H. biroi* were collected from *B. nigra* at the study site using the sweeping method. Similarly, no individuals were observed on the plants during visual inspections.

In the following year, on March 25, 2025, an additional 41 females and 10 males were individually collected from emerging *B. nigra* plants at the study site. During this period, thrips were again found to be relatively abundant, particularly hidden in leaf axils. Other plants present at the locality were also examined, including members of the order Lamiales (*Lamium purpureum*, *Verbascum densiflorum*), but no individuals of *H. biroi* were found on these plants. However, adults of another thrips species, *Haplothrips verbasci* (Osborn, 1897), were found to be abundant on emerging rosettes of *V. densiflorum*.

## Diagnosis of *Haplothrips biroi*

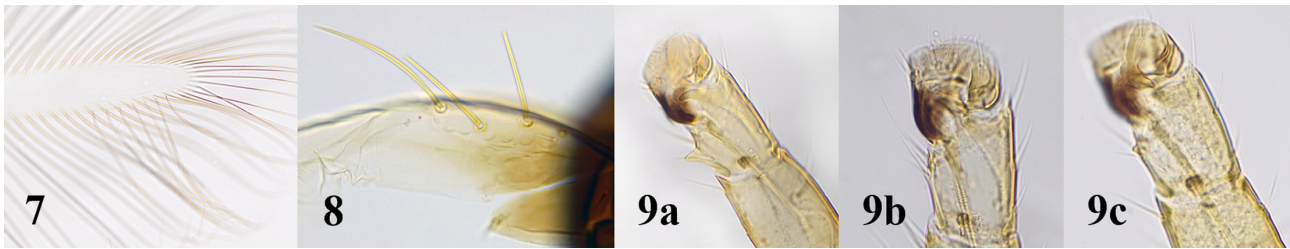
(Figures 1–9)

Both sexes fully winged; body brown to dark brown; all femora dark brown, fore tibiae yellow, middle and hind tibiae dark brown with yellow apices (approximately the distal fifth of their length); all tarsi yellow. Forewings pale with basal shadings (Fig. 1). Antennal segment I dark, II mostly dark but often narrowly brightened distally, III–V yellow, VI brown apically, VII–VIII brown.

Antennae 8-segmented, segment III with two sense cones, IV with four (Fig. 6). Head approximately 1.1 times longer than wide, genae slightly widened (Fig. 2). Maxillary stylets 0.4–0.6 times the head width apart, retracted almost to level of postocular setae; maxillary bridge well developed, mouth cone pointed but relatively short (Fig. 2).



**FIGURES 1–6.** *Haplothrips biroi* adult. (1) outline of adult female body; (2) head; (3) pronotum; (4) male pseudovirga; (5) pelta; (6) detail of sense cones on antennal III (2 sense cones) and IV (4 sense cones).



**FIGURES 7–9.** *Haplothrips biroi* adult. (7) forewing duplicated cilia; (8) sub-basal wing setae; (9a–c) fore tarsal tooth variation (a – male; b – absent in female; c – stunted in female).

Fore tarsal tooth absent in females (Fig. 9b) but sometimes reduced or stunted (Fig. 9c); males always with small fore tarsal tooth (Fig. 9a). Pronotum with five pairs of major setae (Fig. 3); anteromarginal and anteroangular setae prominent but shorter than midlateral and posteroangulars setae; epimeral seta typically slightly longer. All major body setae blunt. Forewing medially constricted, typically with four to eight duplicated cilia, most commonly six or seven (Fig. 7); sub-basal wing setae bases arranged in a line (Fig. 8); forewing distal cilia with surface smooth. Pelta bell-shaped (Fig. 5); tergite VII campaniform sensilla wide apart, distance between them approximately 0.8–1.0 times that of tergite VIII sensilla; tergite IX setae S1 shorter than tube, approximately 60% length of tube; tube at least 2.5 times its basal width.

**Measurements** (in  $\mu\text{m}$ ; see Table 1): Postocular setae approximately 70 (62 in males); compound eye length 72 in females, 69 in males). Epimeral setae 84 in females, 70 in males; posteroangular setae 83 in females, 68 in males.

**TABLE 1.** Variation in selected body measurements (in  $\mu\text{m}$ ) in *Haplothrips biroi* specimens collected in Hurbanovo (Slovakia) in 2024 and 2025, showing differences between females and males

	Female	Male
Body length	2142 $\pm$ 123 (n = 99)	1831 $\pm$ 118 (n = 22)
Postocular seta	70 $\pm$ 5 (n = 88)	62 $\pm$ 8 (n = 22)
Length of compound eye	72 $\pm$ 4 (n = 90)	69 $\pm$ 4 (n = 22)
Epimeral seta	84 $\pm$ 6 (n = 84)	70 $\pm$ 5 (n = 21)
Postangular seta	83 $\pm$ 6 (n = 87)	68 $\pm$ 7 (n = 22)
Distance between campaniform sensilla on tergite VII	38 $\pm$ 5 (n = 92)	28 $\pm$ 4 (n = 21)
Distance between campaniform sensilla on tergite VIII	41 $\pm$ 6 (n = 95)	29 $\pm$ 4 (n = 19)
Tube length	179 $\pm$ 8 (n = 90)	165 $\pm$ 9 (n = 18)
Tube width	66 $\pm$ 5 (n = 87)	59 $\pm$ 4 (n = 17)

### Diagnosis of first larval instar

(Figures 10–11)

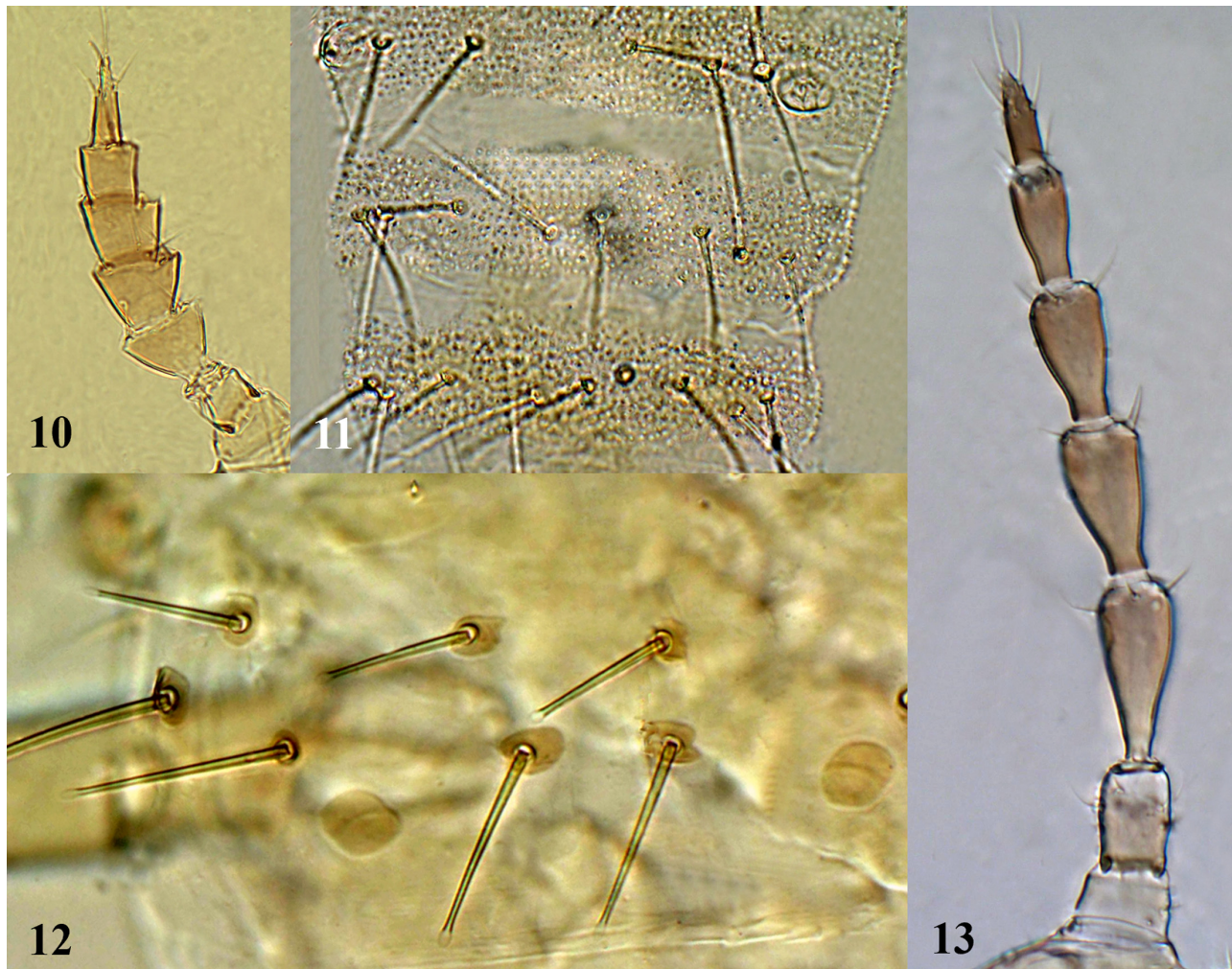
Body pale creamy, thorax without sclerotisation, legs slightly darker, end of abdomen: segments IX (in distal part) and X light brown; antennae short with segments I, III–V wider than long, III–V tapering towards the apex, and II, VI, VII longer than wide. Segment I in the body colour, but II darker at base, III–VII brown (Fig. 10).

Cuticle of dorsal and ventral sides of thorax and abdomen with clear, dense and lumpy sculpture without microtrichia, ventral setae acute at apex, dorsal acute or slightly blunt (Fig. 11).

## Diagnosis of second larval instar

(Figures 12–17)

Body pale creamy, antennal segments III (at the distal part)-VII darker than I-II (first the lightest), distal part of segment X brown (Fig. 13), apex of the mouth cone and maxillary palpi slightly darker, sclerotised plates on pronotum and spots on meso- and metanotum light brown (Fig. 12).

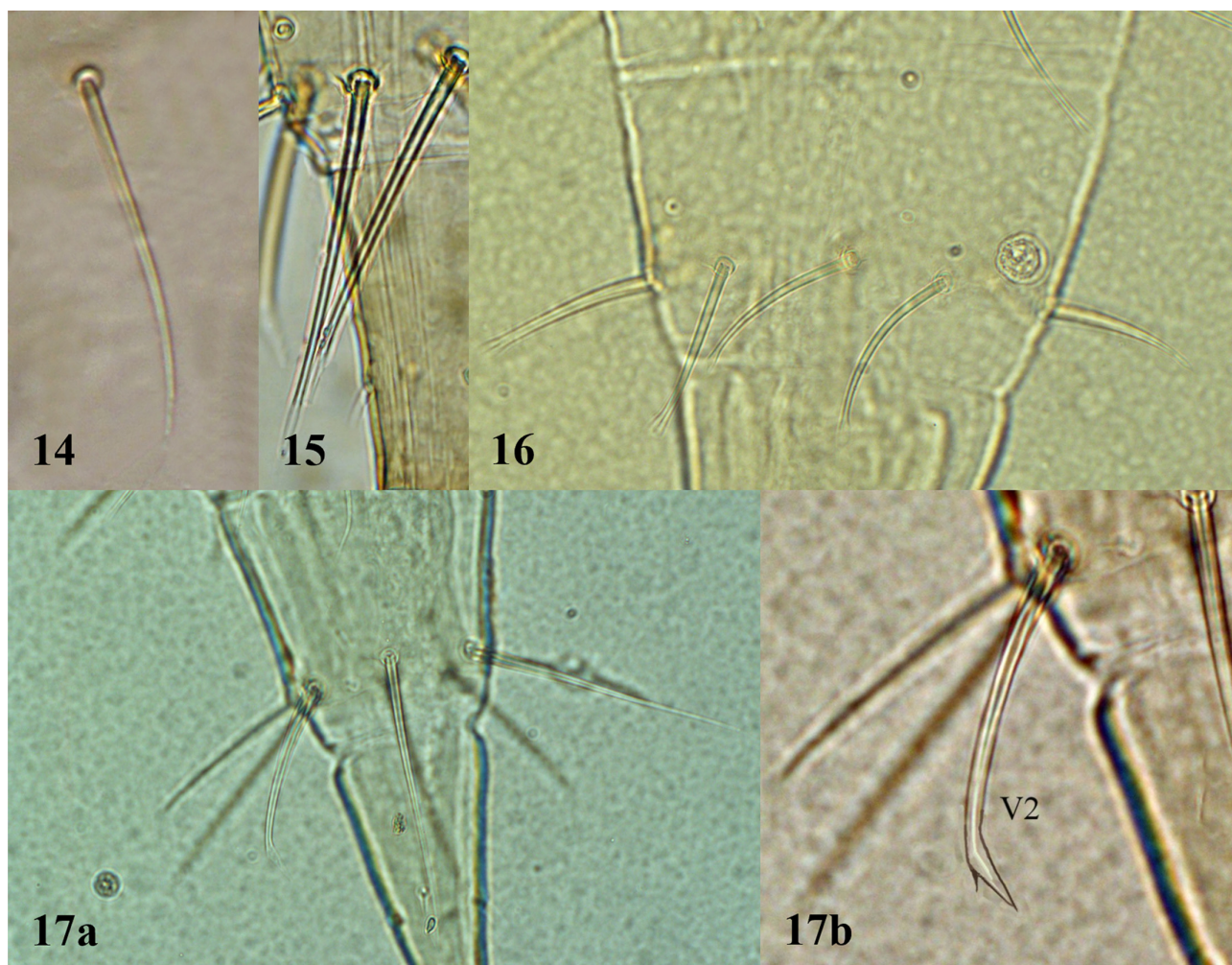


**FIGURES 10–13.** *Haplothrips biroi* first (L1) and second larval (L2) instars. **(10)** antenna of L1; **(11)** body sculpture of L1; **(12)** L2 mesonotum middle and left side; **(13)** L2 antenna.

Head longer than wide, smooth without sclerotised plates, with three pigmented stemmata. Dorsal setae D1 situated below the hind margin of stemmata and D2 below their front margin, in the line with a pair of microsetae. Seta D1 (postocular) acute and D2 blunt at the apex, setae on ventral side of head acute at apex, maxillary palpi two-segmented with three long setae at apex. Antenna seven-segmented, segments I and II rectangular, III–VI elongated, wider at the distal part, VII rounded at the apex, and III the longest (Fig. 13).

Thorax: Pronotum with two sclerotised plates, cuticle smooth without sculpture and microtrichia. Pronotum with seven pairs of setae; setae D1–D7 knobbed or expanded at the apex except for D2 (blunt) and D3 (acute). Setae D1–D5 situated on sclerotised plates, D6 and D7 located laterally of the plates. Mesonotum with two pairs of sclerotised spots, the front one elongated and aligned with spiracles, and the distal one round; setae surrounded by brown sclerotised plates at their bases; cuticle smooth. Mesonotum with six pairs of long setae with narrow spoon shaped apices. One pair of micro setae situated in front of elongated spots. Metanotum with one pair of sclerotised spots and five pairs of long setae with the apices similar with mesonotum ones. Metanotum cuticle smooth. Thoracic ventral setae longer than these dorsal ones and acute at apex (Fig. 14).

Abdomen: Segments I–VIII with smooth cuticle without sculpture and microtrichia. Setae D1–D3 long and knobbed (spoon shaped) at the apex except for IX D1 and D2, which are elongated and needle shaped at apex, D1 on tergite IX in the same length or a little longer than the tube; distance between CS wider than between D1 setae, and situated above D2 setae bases (Figs 15, 16). Apices of setae on the ventral side of the body slightly blunt or acute, V2 on sternite IX fork-shaped (Fig. 17a, b).



**FIGURES 14–17.** *Haplothrips biroi* second larval (L2) instar. (14) thoracic ventral seta; (15) tergite IX D1 and D2 setae and position of campaniform sensilla; (16) tergite VIII D1 and D2 setae; (17a,b) sternite IX setae (a – position of setae V1 and V2; b – fork-shaped V2 seta).

**Measurements** (in  $\mu\text{m}$ ): body length 1300–1550; head dorsal setae: D1 (postocular) 42,5–50. Antennal segment length/width (at the apex): III 50/25, IV 50/20, V 40/20, VI 30/15, VII 25; maxillary palpus length 30. Length of pronotal setae: D1 40–45, D2 30–35, D4 60–65, D6 70–85; length of mesonotal setae D1 42,5–50, D2 30–37,5; length of metanotal setae D1 50–55, D2 45–47,5, D3 42,5–45, D4 45–50, D5 80–90. Length of abdominal setae: VIII D1 40, D2 40, V1 80–87,5, V2 55, IX D1 75–90, D2 35–40; distance D1–D1 30. Distance between CS on tergite VIII 75–82,5, IX 45; length/width of segment IX 100/130, X 90/70. Length/width of spiracles on mesonotum 20/30, abdominal segment II 17,5/22,5 and VIII 15/15, facets of spiracles without pores.

#### **Distinction of *H. biroi* and *Neohegeeria dalmatica* larvae**

Both *H. biroi* and *N. dalmatica* develop on hosts belong to the Lamiaceae family, *Ballota nigra* and *Stachys* spp., respectively. The larval body is pale creamy in both species, but in *H. biroi*, the third antennal segment is darker than in *N. dalmatica* larva II. The main characteristic that differentiates the larvae of *H. biroi* and *N. dalmatica* is

the sculpture of their cuticle. The first larval instar of the former species exhibits a distinct, lumpy sculpture devoid of microtrichia, whereas the latter species is covered with dense microtrichia. The second larval instar's cuticle is smooth in *H. biroi* and covered by microtrichia in *N. dalmatica*. Sclerotisation of the body is similar in both analysed species. Setae on the dorsal and ventral sides of the body are shorter in *H. biroi* than in *N. dalmatica*. Most of the longest dorsal setae of the thorax and abdomen are expanded or knobbed at the apices in *N. dalmatica*; thoracal setae in *H. biroi* are expanded or knobbed on pronotum and long spoon shaped at apices on meso- and metanotum, and are similar with those on tergites. Setae D1 on tergite IX are a little shorter than the segment length in *H. biroi*, and longer in *N. dalmatica*. In both species, setae V2 on segment IX have a forked shape; however, they are much longer in *N. dalmatica* (Kucharczyk *et al.*, 2024).

## Discussion

The rediscovery of *Haplothrips biroi* is significant for several reasons. The historically sparse and sporadic records of this species since its original description suggest a potentially restricted or under reported distribution. This finding expands the known Thysanoptera fauna of Slovakia, increasing the total number of recorded thrips species in the country (Zvaríková *et al.*, 2020). In particular, the successful rearing of *H. biroi* under laboratory conditions confirms that the species can complete its life cycle on *Ballota nigra*, thereby establishing this as a host plant (Mound, 2013). Together with previous records of the species on *Clinopodium vulgare*, *Lamium purpureum*, *Ballota nigra* and *Rosmarinus* sp. this indicates a strong association with plants of the family Lamiaceae (Tab. 2). Despite the reports of *H. biroi* on *Lamium purpureum*, no individuals were found on this plant, even though it co-occurred at the study site with *B. nigra*. Only the record from Czechia (Pelikán, 1992), originates from *Arctium lappa* (Asteraceae), on which single female was recorded.

**TABLE 2.** Published records of *H. biroi* including information about locality, altitude and host plant. Altitude values are approximate and were inferred by the authors of this paper based on reported localities (\*specified in later paper)

Locality	Country	Year	Altitude a.s.l.	Host plant	Publication
Sashegy, Budapest	Hungary	1917	260 m	-	Priesner 1928
Valu lui Traian, Constanta	Romania	1960	50 m	<i>Clinopodium vulgare</i>	Knechtel 1960
Montpellier	France	1967	120 m	-	NHM 2025
Crocicchie	Italy	1983	450 m	* <i>Rosmarinus</i> sp.	zur Strassen 1987; *Marullo 2004; *Marullo & De Grazia 2013
Syrovice	Czechia	1989	200 m	<i>Arctium lappa</i>	Pelikán 1992
Krushovitsa	Bulgaria	1993	160 m	<i>Lamium purpureum</i>	Donchev 1993
Hurbanovo	Slovakia	2024, 2025	110 m	<i>Ballota nigra</i>	this paper

An analysis of the known distribution (Tab. 2)—including Slovakia, Romania Bulgaria, France, and Czechia—reveals that recorded localities are situated at low altitudes (approximately 110 m, 50 m, 160 m, 120 m, and 200 a.s.l., respectively) and are characterized by relatively high mean annual temperatures. Only the original record from Sashegy in Budapest (Hungary), and record from Crocicchie (Italy) appear to be located at a somewhat higher elevations (approximately 260 m, and 450 m a.s.l., respectively). Although the host plants are not strictly xerothermic, all of these localities exhibit a xerothermic character—defined by warm, dry conditions—suggesting that *H. biroi* may be associated with such biotopes. The proximity of several records to the alluvial region of the Danube may reflect that the host plants typically thrive in nutrient-rich soils.

Although overwintering as adults has been observed in some related species, the presence of adult of *H. biroi* in early spring when *Ballota nigra* plants were still emerging, suggests that this thrips may overwinter in the

soil, possibly in the pupal stage, and molt into adults before host plant development is complete. The absence of specimens during later observations may indicate that *H. biroi* is univoltine, with a single generation per year in the study area.

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## References

- Donchev, K. (1993) Contribution to the studies on order Thysanoptera in Bulgaria IV. *The proceedings of the Second National Scientific Conference of Entomology, Sofia, 25–27 October 1993*, 7–8. [in Bulgarian]
- Jenser, G. (1979) A check-list of Thysanoptera of Hungary. *Folia Entomologica Hungarica*, 22 (2), 31–42.
- Karadjova, O. & Krumov, V. (2015) Thysanoptera of Bulgaria. *ZooKeys*, 504, 93–131.  
<https://doi.org/10.3897/zookeys.504.9576>
- Knechtel, W.K. (1960) Phaenologische Forschungen über Thysanopteren (Die Thysanopteren der Dobrogeesteppe). *XI. Internationaler Kongreß für Entomologie (Proceedings)*, 489–493. [in German]
- Kucharczyk, H., Kucharczyk, M. & Saj, I. (2024) Morphology of *Neoheegeria dalmatica* Schmutz, 1909 (Thysanoptera, Phlaeothripidae) larvae – their diagnostic characteristics. *Zootaxa*, 5489 (1), 144–152.  
<https://doi.org/10.11646/zootaxa.5489.1.10>
- Kucharczyk, H. & Stanisławek, K. (2020) *Haplothrips* second instar larvae (Thysanoptera: Phlaeothripidae); character states and key to Central European species. *Zootaxa*, 4845 (3), 375–392.  
<https://doi.org/10.11646/zootaxa.4845.3.4>
- Marullo, R. (2004) Host-plant range and relationships in the Italian thrips fauna. *Acta Phytopathologica et Entomologica Hungarica*, 39, 243–254.  
<https://doi.org/10.1556/aphyt.39.2004.1-3.23>
- Marullo, R. & De Grazia, A. (2013) The introduced species over the last twenty years in the Italian Thrips Fauna. *Die Bodenkultur*, 66 (4), 27–31.
- Minaei, K., Azemayeshfard, P. & Mound, L. (2007) The southern Palaearctic genus *Neoheegeria* (Thysanoptera: Phlaeothripidae): redefinition and key to species. *Tijdschrift voor Entomologie*, 150, 55–64.  
<https://doi.org/10.1163/22119434-900000212>
- Mound, L.A. (2013) Homologies and host-plant specificity: Recurrent problems in the study of thrips. *Florida Entomologist*, 96 (2), 318–322.  
<https://doi.org/10.1653/024.096.0250>
- Mound, L.A. & Kibby, G. (1998) *Thysanoptera: An Identification Guide*. CAB international, Wallingford, New York, 78 pp.
- NHM (Natural History Museum) (2025) Natural History Museum (London) Collection Specimens. Occurrence dataset. Available from: <https://www.gbif.org/occurrence/3710643328> (accessed 7 April 2025)
- Pelikán, J. (1992) Faunistic records from Czechoslovakia. *Acta Entomologica Bohemoslovaca*, 88, 11–12.
- Priesner, H. (1928) Beiträge zur Kenntnis der europäischen Thysanopteren. *Konowia, Vienna*, 7, 322–325.
- Priesner, H. (1964) *Ordnung Thysanoptera: (Fransenflügler, Thripse)*. Akademie-Verlag, Berlin, 242 pp.  
<https://doi.org/10.1515/9783112760437>
- Schliepake, G. & Klimt, K. (1979) *Thysanoptera, Fransenflügler*. Veb Gustav Fischer Verlag Jena, 466 pp. [in German]
- Tichý, L., Axmanová, I., Dengler, J., Guarino, R., Jansen, F., Midolo, G., ... Chytrý, M. (2023) Ellenberg-type indicator values for European vascular plant species. *Journal of Vegetation Science*, 34 (e13168), 1–13.  
<https://doi.org/10.1111/jvs.13168>
- Vasiliiu-Oromulu, L. (1998a) The geographical distribution of Romanian Thysanoptera species (Insecta: Thysanoptera). *Entomologica Romanica*, 3, 67–72.
- Vasiliiu-Oromulu, L. (1998b) Lista revizuită a speciilor de thysanoptere (Insecta: Thysanoptera) din România. *Studii și Cercetări de Biologie*, 50 (2), 77–83. [in Romanian]
- Vasiliiu-Oromulu, L. (1998c) Specii de thysanoptere din România: aspecte ecologice (Insecta: Thysanoptera). *Studii și Cercetări de Biologie*, 50 (2), 85–96. [in Romanian]

- Vierbergen, B. (2004) *Neoheegeria biroi* Priesner, 1928. Available from: [http://www.faunaeur.org/full\\_results.php?id=90555](http://www.faunaeur.org/full_results.php?id=90555) (accessed 18 February 2025)
- zur Strassen, R. (1987) On some Thysanoptera of an agricultural area located on woody slopes in Northern Umbria, Italy. *Redia*, 70, 203–228.
- Zvaríková, M., Masarovič, R., Prokop, P. & Fedor, P. (2020) An updated checklist of thrips from Slovakia with emphasis on economic species. *Plant Protection Science*, 56, 292–304.  
<https://doi.org/10.17221/87/2020-PPS>