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Short Communication

Another climate change induced infiltration? The northernmost record of thermophilous spore-feeding *Allothrips pillichellus* (Thysanoptera: Phlaeothripidae: Idolothripinae)

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Abstract: Environmental factors related to climate change can directly influence the spatial patterns of insect distribution, including many "southern" elements in mild climate ecosystems. This paper deals with potential infiltration of thermophilous *Allothrips pillichellus* (Priesner, 1925) up to North. Formerly known predominantly from southern Europe, its first record in Slovakia may indicate the extension of its distributional range.

Key words: *Allothrips pillichellus*; climate change; infiltration; Thysanoptera

Introduction

Recently, the global climate change has become one of the most discussed ecological topics worldwide. Earth's climate has generally warmed up by approximately 0.6 °C over the past 100 years (Walther et al. 2002). This phenomenon has undisputedly affected the distribution and ecological dynamics of species, that shift their geographical ranges closer to the poles or to higher altitudes and increase their population size (e.g., Bale et al. 2002; Walther et al. 2002; Samways 2005; Deka et al. 2011). Latitudinal and altitudinal range shifts have already been observed in more than 1000 species – especially those with high dispersal capacities like birds, marine invertebrates and insects (Parmesan 2006), including thrips (Thysanoptera) (e.g., Pelikán 1983; Czencz 1994; Bergant et al. 2005; Park et al. 2014).

The northernmost record of *Allothrips pillichellus* (Priesner, 1925) in Europe may correspond with continual climate change providing suitable ecological conditions for infiltration of many thermophilous elements even in more northern countries. As a typical spore-feeding species (Mound 1974; Mound & Palmer 1983), *A. pillichellus* is characterized by presence of broad maxillary stylets, reduction of male glandular areas and by long S2 setae on tergite IX. The genus *Allothrips* itself is usually wingless with rare macropterous forms (Mound & Palmer 1983). The compound eyes are reduced to less than five facetes dorsally (Fig. 1A).

Head with at least two pairs of setae with expanded apices, maxillary stylets retracted deeply into head. Antennae 7-segmented with segment VII constricted at

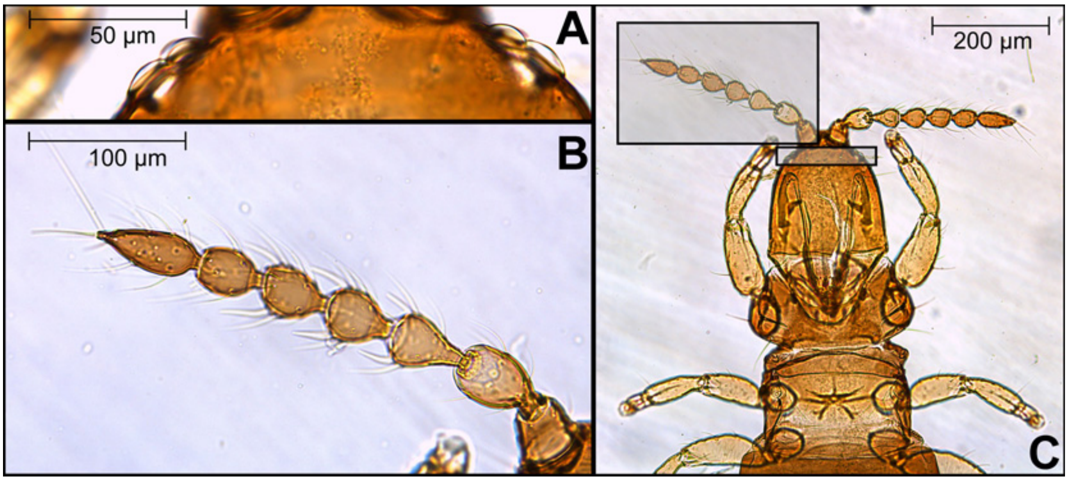

Fig. 1. Head and thorax of *Allothrips pillichellus*: A – compound eye; B – antennal segment VII base; C – head and thorax.

base (Fig. 1B) and with 2 sense cones on segment III and IV (Mound 1974). Maxillary palp with very stout sense cone apically (Fig. 2) (Dang & Qiao 2013).

Pelta with sub-basal line of sculpture usually complete, median mesonotal setae expanded at apex and mesonotum with 2 pairs of expanded setae are the main traits of *A. pillichellus* species (Mound 1972, 2012).

Former three European subspecies of *Allothrips pillichellus* (*A. p. pillichellus, A. p. bicolor, A. p. bournieri*) (Mound 1972) have been recently revised as full species (*A. pillichellus, A. bicolor, A. bournieri*) (Mound 2012). *Allothrips pillichellus* was previously known only from southern Europe: Romania (Knechtel 1935; Mound 1972), Italy (Marullo 1994; Marullo & de Grazia 2013) and Hungary (Priesner 1925; Mound 1972).

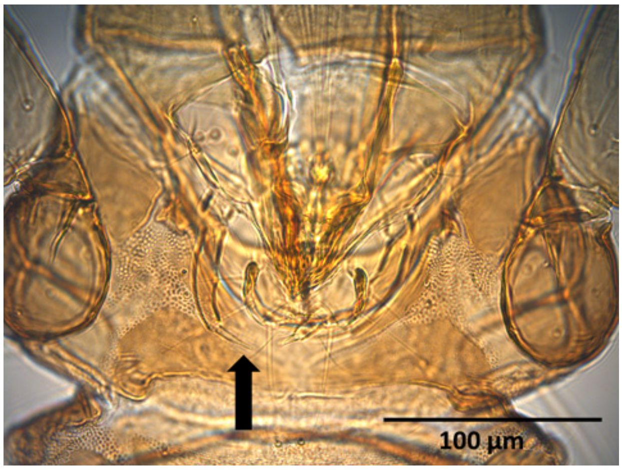

Fig. 2. Head of *Allothrips pillichellus* with maxillary palp (arrow).

Material and methods

Allothrips pillichellus specimens were obtained during wider entomological research in the surroundings of Kamenica nad Hronom in Pannonnian oak woods (Southern Slovakia) with *Quercus cerris, Quercus pubescens, Carpinus betulus* and *Fraxinus ornus* (Majzlan 2016). For thrips extraction from the leaf-litter material, the Berlese funnel was applied. The specimens of *A. pillichellus* were mounted according to the standard preparatory techniques used for thrips (Mound &

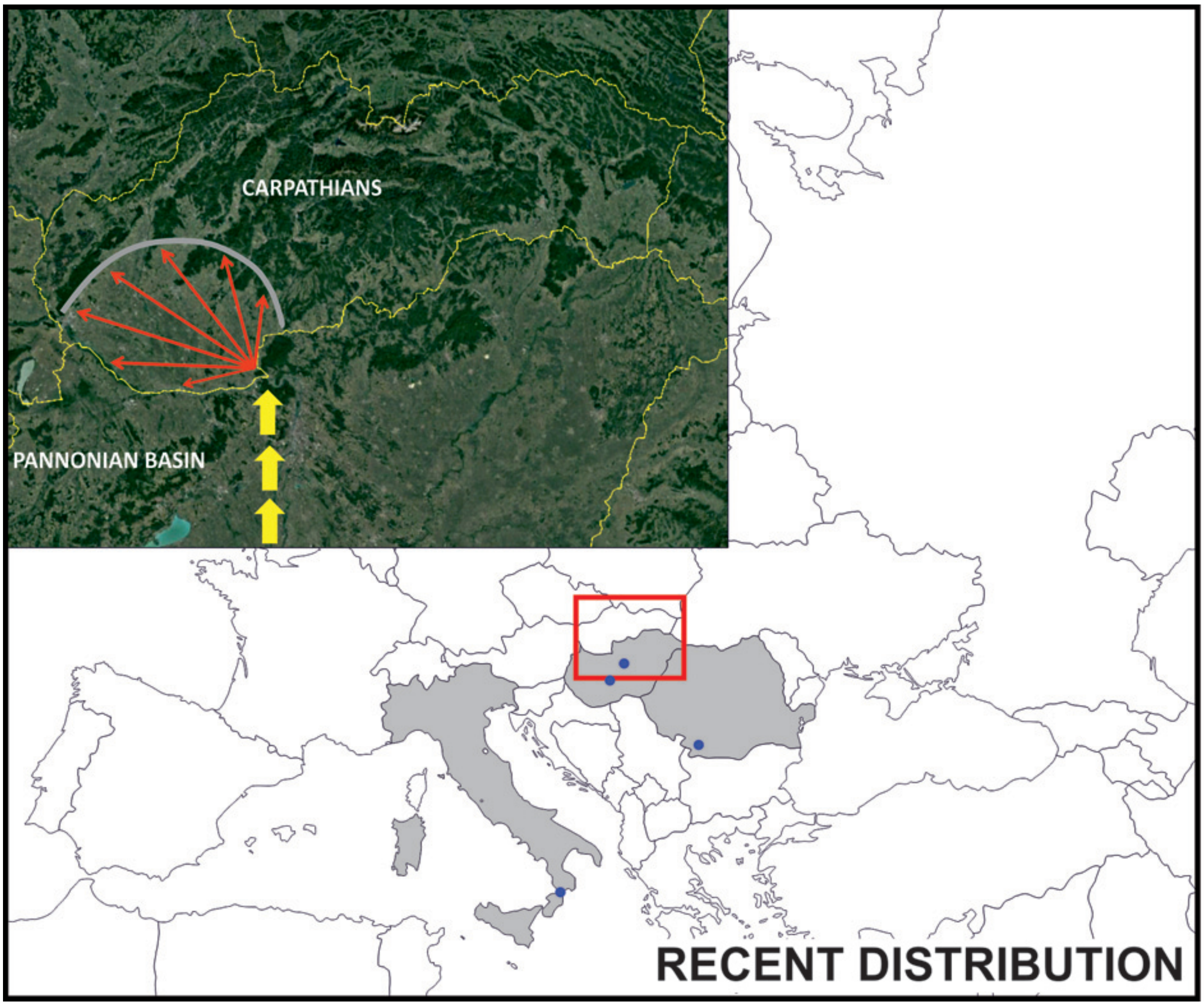

Fig. 3. European distribution of *Allothrips pillichellus* (yellow arrows – latest infiltration; red arrows – potential infiltration; grey line – Pannonian basin north border) (modified from Google Earth 2017).

Kibby 1998; Fedor et al. 2012) and identified according to Priesner (1964), Dang & Qiao (2013) and Mound (1972). The material has been deposited in the collections of authors.

Results and discussion

Material examined. S Slovakia, Burda Mts (47°49′ N; 18°44′ E; 8178 = grid reference number of the Databank of the fauna of Slovakia), 2.11.2012, 3 ♀♀ in oak leaf-litter, leg. O. Majzlan, det. M. Zvaríková. The northernmost record in Europe. The first record in Slovakia.

Factors affecting species distribution interact in synergic and complementary ways (Masarovič et al. 2014, 2017), and it is not surprising that simple correlations with temperature changes are not always observed. Range shifts are often episodic rather than gradual or monotonic. Thus, rates of range shifts vary greatly among and within species, implying differential dispersal abilities (Walther et al. 2002).

A 100 years long meteorological observation in Slovakia hints at an annual mean temperature increase by 1.1 ℃ and annual precipitation decline by 5.6% and even by 10% in southern Slovakia (Slovak Hydrometeorological Institute 2015). All these changes may thus induce a response in geographical distribution of Thysanoptera. *Allothrips pillichellus* was formerly known mostly from southern Europe (Marullo 1994; Marullo & DeGrazia 2013; Knechtel 1935; Priesner 1925, 1964; Mound 1972; Jenser 1982, 2011) with the northernmost record in Hungary (Mound 1972). There has been no evidence of its presence in Slovakia despite of previous intensive research in oak wood ecosystems (Pelikán 1983; Fedor 2003, 2004; Fedor et al. 2010, 2012; Dubovský et al. 2010; Masarovič et al. 2013; Zvaríková et al. 2016). In fact, the Pannonian basin, with its specific geoecological features, provides open space for dynamic infiltration of the species up to southern Slovakia with natural geographical barrier represented by the Carpathians (Fig. 3).

Infiltration of many thermophilous species from southern territories into mild climate conditions has been widely approved recently, particularly in Lepidoptera (Mikkola 1997; Hill et al. 2002; Parmesan et al. 1999) where, depending on the studies, some 30% to 75% of northern boundary sections had expanded north by 34–240 km. In a study of all 37 resident Odonata species in the United Kingdom, Hickling et al. (2005) documented the northern range limit expansion in 23 temperate Odonata species in Great Britain between 1960–1995. And even in thrips Pelikán (1983) recorded or just predicted new records of "southern" elements (e.g., *Haplothrips floricae* Knechtel, 1960, *Hoplothrips lichenis* Knechtel, 1954, *Oxythrips dentatus* Knechtel, 1923 or *Haplothrips quercinus* Priesner, 1950) in Central Europe. Generally, all species have an effort to establish small populations and taste limits for ecological and environmental factors (Masarovič et al. 2014).

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