

First record of *Pteromalus varians* (Hymenoptera: Pteromalidae) parasitizing on *Tischeria ekebladella* (Lepidoptera: Tischeriidae) in Hungary*

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Abstract – *Pteromalus varians* (Spinola, 1808) is firstly recorded from *Quercus* leaves, mined by the trumpet leafminer moth *Tischeria ekebladella* (Bjerkander, 1795) in forests near Budapest, Hungary. A total of 392 parasitoids were reared in laboratory conditions, from which 14 females and 362 males belong to *P. varians*. A short review on the host range of *P. varians* is given. Known biological relationships of *Tischeria* to some other pteromalids and a possible similarity between host ranges of *P. varians* and *Pteromalus semotus* are also commented. With 2 figures.

Key words – *Pteromalus varians*, *Tischeria ekebladella*, parasitoids, host, arrhenotoky, thelytoky, Hungary

INTRODUCTION

The trumpet leafminer moth *Tischeria ekebladella* (Bjerkander, 1795) is a widespread pest on some oak species (*Quercus*) and less often on the sweet chestnut *Castanea sativa* (Mill.) in Europe. The larvae feed on the host plants from June to the beginning of November, overwinter in a cocoon-like hibernaculum and pupate within the mine in the late spring (JORDAN 1995). Twenty-seven chalcidoid (Hymenoptera: Chalcidoidea) species are known to attack immature stages of *T. ekebladella* (ERDÖS 1956, BOUCEK & ASKEW 1968, ASKEW & SHAW 1974, HERTING 1975, TUDOR & DRAGHIA 1978, HANSSON 1987, VIDAL 1993, JORDAN 1995, YEFREMOVA *et al.* 2012), all belong to family Eulophidae and

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listed for the most part by NOYES (2014). Most of them are larval or nymphal, primary parasitoids, or secondary parasitoids of the primary parasitoids, having large host range, mainly beetles of Curculionidae and Chrysomelidae, dipterans of Agromyzidae and Tephritidae, many groups of moths (Lepidoptera: Coleophoridae, Gelechiidae, Gracillariidae, Tischeriidae, etc.) and some parasitoid wasps from Ichneumonoidea and Chalcidoidea. On the other hand, *Pteromalus varians* (Spinola, 1808) is likely to prefer mostly curculionid beetles as hosts, parasitising at least four species of *Anthonomus* Germar, 1817 (NOYES 2014). However, one longhorn beetle, *Saperda populnea* (Linnaeus, 1758) (Cerambycidae) and the horse-chestnut leafminer, *Cameraria ohridella* Deschka et Dimic, 1986 (Gracillariidae) are also known as primary hosts of this pteromalid species (THOMPSON 1958, BAUR 2005, TÓTH *et al.* 2006, GRABENWEGER *et al.* 2010).

MATERIAL AND METHODS

For the purpose of a sex pheromone study on *T. ekebladella*, oak leaves of *Quercus petraea* (Matt.) Liebl., infested by moth's larvae, were collected in forests near Budapest during September to November in 2006 and 2007. The leaves were maintained outside throughout the winter and placed in laboratory conditions in early spring (MOLNÁR *et al.* 2012). Emerged parasitoids (392 individuals) were fixed in ethanol and mounted later for further identification. Species identity of *P. varians* (376 specimens) was determined by I. Todorov, and the collection material is deposited in the Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences. The remaining 16 individuals, belonging to Eulophidae and Pteromalidae, are not yet identified. Digital images of the female and male wasps were taken using Zeiss AxioCam ERc5s camera, mounted on Zeiss Stemi 2000-C stereomicroscope.

RESULTS

Pteromalus varians (Spinola, 1808) (Figs 1–2)

Material examined – Hungary, forests between Julianna-major Experimental Station of the Plant Protection Institute (Hungarian Academy of Sciences, Budapest) and Nagykovácsi (Pest county): 6 ♂, em. 10–11.V.2007; 3 ♀, 56 ♂, em. 12.V.2007; 27 ♂, em. 14.V.2007; 21 ♂, em. 16.V.2007; 1 ♀, 108 ♂, em. IV–V.2008; 2 ♀, em. 12.IV.2008; 8 ♀, 43 ♂, em. 23.IV.2008; 1 ♂, em. 09.V.2008; 9 ♂, em. 10.V.2008; 16 ♂, em. 16.V.2008; 41 ♂, em. 14.V.2008; 17 ♂, em. 18.V.2008; 17 ♂, em. 19.V.2008. Collector: M. Tóth.

Distribution – Europe, Kazakhstan. Recorded from Hungary by ERDŐS (1956).



Figs 1–2. *Pteromalus varians* (Spinola, 1808), lateral view, 1 = female, 2 = male (photo I. Todorov)

DISCUSSION

Most *Tischeria* species are predominantly parasitized by eulophids. However, two species, belonging to Pteromalidae, are also known to attack these moths – *Pteromalus semotus* (Walker, 1834) as a parasitoid of *T. heinemanni* (Wocke, 1871) in Poland (VIDAL & BUSZKO 1990) and *Hypopteromalus inimicus* Muesebeck, 1927 as a parasitoid of *T. malifoliella* Clemens, 1860 in the United States (OATMAN 1985), although the second relationship is possibly hyperparasitic through some *Apanteles* (Hymenoptera: Braconidae) primary parasitoids (NOYES 2014). According to GRAHAM's (1969) key, *P. varians* is morphologically much closer to *P. semotus* than to the other species of this genus, but its host range is obviously limited and includes only six species. However, as was discussed above, one of these hosts is the leafminer moth *C. ohridella*, of which larvae develop in very similar microhabitats like many of the *P. semotus* lepidopteran hosts. We suppose that the here ascertained biological relation of *P. varians* to *T. ekebladella* is not accidental, and future studies could reveal more moth hosts of this pteromalid. Considering the life history of *T. ekebladella* and the flight period of *P. varians*, established parasitism can be regarded as larval.

In our study, the overall sex ratio of *P. varians* was male biased. This phenomenon could be explained on the basis of chalcidoid biology. All chalcidoids, as members of Hymenoptera, have haplodiploid system for sex determination. The most common reproductive strategy in Chalcidoidea is arrhenotoky, i.e. unmated females can produce only male (haploid) eggs, from which only males hatch, whereas mated females are able to produce fertilized or unfertilized eggs. The second strategy, thelytoky (females produce females by parthenogenesis), is rare and obviously not shared in the observed populations of *P. varians*. It is known that Pteromalidae are mostly idiobionts (BOUCEK & HEYDON 1997) and many species using this strategy are able to assess the host size at the time of oviposition, so they can selectively lay male eggs in smaller hosts and female ones in larger hosts (CHARNOV *et al.* 1981, QUICKE 1997). We suppose that most of the parasitized *T. ekebladella* mature larvae in the material from Hungary were small in size and females of *P. varians* had laid mostly male eggs, or they had attacked the early instar larvae, resembling behaviour reported for two *Cirrospilus* spp. (Eulophidae) by LO PINTO *et al.* (2005).

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