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Data on the parasitoid complexes of Metallus pumilus (Hymenoptera: Tenthredinidae) and Emmetia heinemanni (Lepidoptera: Tischeriidae) mining leaves of Rubus sp.*

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Abstract – 251 *Rubus* leaves mined by three species of leaf miners, *Metallus pumilus* (Klug, 1816), *Emmetia heinemanni* (Wocke, 1871) and *Ectoedemia rubivora* (Wocke, 1860), were collected between 2011 and 2014 in order to rear out their parasitoids. No parasitoids have been reared out from *Ectoedemia rubivora*, but we have identified 3 parasitoid species from *Emmetia heinemanni* and 5 species from *Metallus pumilus*. With 2 tables.

Key words – *Ectoedemia rubivora*, *Emmetia heinemanni, Metallus pumilus*, parasitoid complexes, *Rubus*

INTRODUCTION

The genus *Rubus* (Rosaceae) contains more than 700 species all over Europe (Király *et al.* 2013). Some of them are significant weeds of forest clearings and agricultural fields. Although several leaf miners live on them, their parasitoid complexes are poorly studied. Here, we present preliminary data for the parasitoid complexes of two of these leaf mining species.

Emmetia (syn.: *Coptotriche*) *heinemanni* (Wocke, 1871) (Lepidoptera: Tischeriidae) is a bivoltine species (Szőcs 1977) with mines develop in June–July and September–October. The autumn mines can be confused with those of *Tischeria marginea* (Braun, 1972). *E. heinemanni* produces less silk in the mine, and

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thus the mines are not contracted (Husiman *et al.* 2013). Food plants are various *Rubus* (Buhr 1939, Szőcs 1977, Nieukerken 2006) and *Agrimonia* species (Szőcs 1977, Nieukerken 2006). The mine is an irregular blotch mine on the upper side of the leaf. A single larva develops inside it. Only one species of parasitoid (*Chrysocharis nephereus*) is mentioned from this host by Erdős (1956). The Universal Chalcidoidea Database (Noyes 2014) lists 6 parasitoid species associated with *T. heinemanni*: *Chrysocharis budensis (*Erdős, 1954*)*, *Ch. nephereus* (Walker, 1839), *Ch. pentheus* (Walker, 1839), *Pediobius saulius (*Walker, 1839*)*, *Pnigalio pectinicornis* (Linnaeus, 1758) and *Pteromalus semotus* (Walker, 1834).

The leaf mining sawfly *Metallus pumilus* (Klug, 1816) is oligophagous on *Rubus* species (Buhr 1939). It has two generations per year (Altenhofer *et al.* 2003), and the mines are present from June to September (Zombori 1990), and even into October (personal observation by L. Szőcs). The solitary larvae develop in the blotch mines on the upper surface of the leaves. The Universal Chalcidoidea Database (Noyes 2014) lists only one *Eulophus* species under the synonymous name *Metallus rubi* (Boie, 1848).

MATERIAL AND METHODS

We have studied the parasitoid complexes of various leaf miners during four years (2011–2014). A total of 251 leaf mines (137 *Emmetia,* 60 *Metallus* and 54 *Ectoedemia*) were collected from *Rubus idaeus* and *Rubus caesius* from seven locations across Hungary (Table 1). The mines were cut out from the leaf in order to avoid contamination from other parasitoids (i.e. egg or aphid parasitoids) which parasitise other insects on leaves. After a short period of drying, the samples were placed individually into air ventilated plastic rearing tubes. The parasitoids that emerged were preserved in 95% ethanol, and later identified by Csaba Thuróczy and George Melika. The emerging leaf miner adults were also identified to make sure that the identification of the leaf mines was correct. After the identification process, the adult insects were kept in alcohol for further molecular analysis.

RESULTS AND DISCUSSION

From *Emmetia heinemanni* samples, we have identified three parasitoid species belonging to the family Eulophidae. These are *Chrysocharis budensis*, *Ch. nephereus* and *Ch. pentheus.* They all are solitary koinobiont endoparasitoids (Table 2). The species reared out were different at each sampling locations. The parasitisation rate was 27.6% at Várgesztes (n = 58 mines). The only parasitoid species reared out from the Várgesztes samples was *Ch. budensis* (68 parasitoid specimens). The parasitisation rate was 21.4% at Csongrád (n = 14 mines). At

Table 1. Collecting localities and collected sample sizes of our rearings between 2011 and 2014

Host plant species	Leaf miner species	Sample place	Kötegyán	Mátrafüred		Nógrád	Csongrád	Tiszabura		Várgesztes	Total samples
		Sample date	14.VII.2011	27.IX.2012	21.X.2013	10.VII.2012	09.VII.2014	14.VII.2011	06.VII.2014	19.X.2013	
Rubus caesius	*Emmetia heinemanni*			1		55	14		9	58	**137**
	Metallus pumilus				1					10	**11**
Rubus idaeus	*Metallus pumilus*		33					16			**49**
	Ectoedemia rubivora									54	**54**
Total samples			**33**	**1**	**1**	**55**	**14**	**16**	**9**	**122**	**251**

Csongrád, also only one species, *Ch. pentheus,* emerged from our samples. Only *Ch. nephereus* emerged from one single mine from Tiszabura. Due to the low sample size, we cannot calculate the parasitisation rate.

All three parasitoids, reared from *E. heinemanni* are listed in the Universal Chalcidoidea Database (Noyes 2014). With the exception of *Ch. budensis*, all

Table 2. Main biological characteristics and parasitoid assemblages of the two leaf miners from our rearings

Parasitoid species	Parasitoid biology			Leaf miner species	
				Emmetia heinemanni	*Metallus pumilus*
Achrysocharoides cilla	Gregarious	Koinobiont	Endoparasitoid		7
Aprostocetus sp.	Solitary	?	?		1
Chrysocharis budensis	Solitary	Koinobiont	Endoparasitoid	68	
Chrysocharis nephereus	Solitary	Koinobiont	Endoparasitoid	1	
Chrysocharis pentheus	Solitary	Koinobiont	Endoparasitoid	17	
Pnigalio pectinicornis	Solitary	Idiobiont	Ectoparasitoid		9
Sympiesis sericeicornis	Solitary	Idiobiont	Ectoparasitoid		1
Itoplectis alternans	Solitary	Koinobiont	Endoparasitoid		2
Total parasitoid specimens				**86**	**20**

species have a broad range of hosts. According to the literature, *Ch. budensis* develops as a solitary parasitoid, but even so, many adults (up to seven) emerged from a single leaf mine. The reared parasitoid species seem to be semi-specialized to the Tenthredinidae, Nepticulidae and Tischeriidae leaf miners (Noyes 2014, Szőcs *et al.* unpublished). They seem to prefer leaf mines situated on the upper surface of the leaves.

From the *Metallus pumilus* mines (n = 60) collected from two host plants (*R. caesius* and *R. idaeus*) we reared 20 specimens from five parasitoid species. Four of the emerged parasitoid species belonged to the family Eulophidae, and one to the family Ichneumonidae.

The dominant parasitoid in the samples was a secondary, solitary ectoparasitoid, *Pnigalio pectinicornis*. The subdominant species in the samples was the *Achrysocharoides cilla* (Walker, 1839), the only gregarious koinobiont endoparasitoid found on the sawfly, with seven emerged specimens.

We identified three parasitoid species in the samples from Kötegyán, which were *A. cilla*, *P. pectinicornis* and an ichneumonid wasp *Itoplectis alternans* (Gravenhorst, 1829). The attack rate was 36.4% (n = 33), with 16 parasitoid specimens emerged. Three species of parasitoids (*P. pectinicornis, A. cilla* and *Aprostocetus* sp.) also emerged from the samples from Tiszabura.

At Várgesztes, only one specimen of *Sympiesis sericeicornis* emerged from the samples, and therefore the parasitisation rate cannot be calculated.

The parasitoid complex of *M. pumilus*, based on our rearings, is composed mainly of generalist species. The parasitoid species of the complex can be reared from other members of the family Tenthredinidae, especially from *Profenusa pygmaea* (Klug, 1816) (Noyes 2014, Schönrogge & Altenhofer 1992, Szőcs *et al.* 2013).

No parasitoid has emerged from the *Ectoedemia rubivora* (Wocke, 1860) (Lepidoptera: Nepticulidae) sample (54 mines) collected at Várgesztes.

Despite the low sample size, we managed to identify three parasitoid species of *E. heinemanni* and five parasitoid species of *M. pumilus*. We have not found any overlap between the complexes of these two leaf miners. Even in the Universal Chalcidoidea Database, the two leaf miner species have very few common parasitoids, despite the fact that they regularly occur on the same host plant.

Both leaf miners have two generations and are abundant (locally very common), therefore, we assume that these species might have more species-rich parasitoid assemblages. Considering the relatively small sample sizes, it is conceivable that further rearings will help provide more information regarding their parasitoid fauna.

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