

Hymenopteran parasitoids of leaf-mining moths (Lepidoptera) affecting apple trees in Lublin (SE Poland)

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ABSTRACT. The rearing of 3864 larvae and 1005 pupae of 10 apple leafminers species was conducted in 1996-1998. Parasitoids were obtained from 7 of 10 species of moths involved in the rear. As a result 2092 imagines of parasitoids were obtained belonging to 35 species from 5 families and 9 subfamilies of terebrantia (Hymenoptera - Parasitica). *Achrysocharoides latreillei* CURT., *Cirrospilus diallus* WALK., *Sympiesis gregori* BOUČEK, *Elachertus inunctus* NEES and *Triclistus spicularis* THOMS. are reported as parasitoids of leaf-mining moths occurring on apple trees for the first time.

KEY WORDS: Lepidoptera, mining moths, Hymenoptera-Parasitica, Chalcidoidea, Ichneumonidae, Braconidae, parasitoid, apple tree, Poland.

INTRODUCTION

Leaf-mining moths are highly specialized group of phytophagous feeding in leaf chlorenchyma. The complete development of their caterpillars takes place inside a mine (permanent miners) or they feed inside leaf tissue temporarily, only during earlier instars (temporary miners). Owing to small body size and cryptic life of caterpillars, entomophagous parasitoids of this biotic group are not known well. Most parasitoids of leaf-mining moths belong to species from the superfamily Chalcidoidea and families Braconidae and Ichneumonidae. The present work also involves parasitoids of two moth species occurring on apple trees, *Choreutis pariana* (CLERCK) and *Swammerdamia pyrella* (VILL.), that are not typical leafminers. These species were also treated in detail in earlier publications of the first author (GÓRSKA-DRABIK 2003a, 2003b).

The aim of the present study was to determine the species composition in communities of leaf-mining moths' parasitoids inhabiting apple trees.

MATERIALS AND METHODS

The rearing of 3864 larvae and 1005 pupae of 10 apple-leaf mining moth species, trophically related to apple trees was conducted in 1996-1998. The material was collected from five sites located in Lublin: the Ethnographic Museum of Rural History, Maria Skłodowska Curie Botanical Garden, the household garden and the city centre garden (UTM code - FB 08). The fifth site was at the Agricultural University Experimental Orchard situated in the eastern outskirts of the city (FB 17). Larvae and pupae were collected every 10 – 14 days during the period between May-October. The reared larvae and pupae were maintained according to suggestions of BORKOWSKI (1969). The emerged adults were prepared and identified. The nomenclature of Hymenoptera-Parasitica follows MEDVEDEV (1978, 1981, 1986).

RESULTS

In laboratory rearing 2092 imagines of parasitoids were obtained, representing by 35 species from 5 families and 9 subfamilies of terebrantia (Hymenoptera - Parasitica). The most numerous were Chalcidoidea represented by 17 species. Twelve parasitoid species belonged to Ichneumonidae, six to Braconidae. Parasitoids were obtained from 7 of 10 species of moths involved in the rear (Table 1).

Three of the shown ichneumonids (*Gelis* sp., *G. areator*, *Mesochorus* sp.) are secondary parasitoids, therefore their relation with moths was indirect. Two chalcidoid species (*H. testaceipes* and *A. latreillei*) and one braconid (*O. laevigatus*) were gregarious parasitoids.

DISCUSSION

In Poland, almost 140 parasitoid species of leaf-mining lepidopterans have been reported, most numerous represented by species from the superfamily Chalcidoidea and families Braconidae and Ichneumonidae (VIDAL & BUSZKO 1990, MARCZAK & BUSZKO 1993, SAWONIEWICZ & BUSZKO 1994).

Table 1. Systematic review of parasitoids reared from mining moths (Lepidoptera) in Lublin.

Mining moth	<i>Stigmella desperatella</i> (STT.)	<i>Stigmella malella</i> (Stt.)	<i>Callisto denticulella</i> (THNBG.)	<i>Phyltonorycter blancardella</i> (FABR.)	<i>Leucoptera malifoliella</i> (COSTA)	<i>Swammerdamia pyrella</i> (VILL.)	<i>Choreutis pariana</i> (CLERCK)	Total
-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-
Ichneumonidae								
Pimplinae (= Ephialtinae)								
<i>Itopectis alternans</i> GRAVENHORST						1♂ L1 N	7♂ 6♀ L1	14
<i>Itopectis maculator</i> FABRICIUS							3♂ L1 N	3
<i>Scambus calobatus</i> GRAVENHORST			16♂ 7♀ (2) L1				5♂ 4♀ L1	34
Gelinae (= Cryptinae)								
<i>Gelis areator</i> PANZER						1♀ L1 N	1♀ L1	2
<i>Gelis</i> sp.			1♂ L1					1
Campopleginae								
<i>Diadegma</i> sp. (<i>aff. germanica</i> HORSTMANN) (<i>aff. rectificator</i> AUBERT)			1♀ L1				5♂ 10♀ L1	16
<i>Diadegma</i> sp. (<i>aff. neoapostata</i> HORSTMANN) (<i>aff. crataegellae</i> THOMSON)			3♂ 8♀ L1					11
<i>Diadegma</i> sp.						2♂ L1		2
Mesochorinae								
<i>Mesochorus</i> sp.							3♂ 9♀ L1	12
Ichneumoninae								
<i>Oiorhinus pallipalpis</i> WESMAEL							2♂ 15♀ L1	17

-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-
Metopiinae								
<i>Triclistus congener</i> HOLMGREN							3♂ 84♀ (5) L1	92
<i>Triclistus spiracularis</i> THOMSON						1♂ L1 N		1
Braconidae Microgasterinae								
<i>Apanteles xanthostigma</i> HALIDAY			7♂ 5♀ L1		6♀ L2 N	9♂ 2♀ (2) L1		31
<i>Apanteles longicauda</i> WESMAEL			2♀ L1 N			2♀ L1 N	2♂ 10♀ L1	16
<i>Apanteles bicolor</i> NEES			2♀ L1 N	2♀ L1				4
<i>Apanteles blancardellae</i> BOUCHÉ				1♀ L1				1
Doryctinae								
<i>Oncophanes laevigatus</i> RATZEBURG							2♂ 4♀ L1	6
Acaeliinae								
<i>Acaelius subfasciatus</i> HALIDAY		(1) L1 N						1
Chalcidoidea Eulophidae								
<i>Achrysocharoides atys</i> WALKER				16♂ 55♀ L1				71
<i>Achrysocharoides latreillei</i> CURTIS			5♂ 634♀ L1 N					639
<i>Chrysocharis</i> sp.				1♂ L1				1
<i>Cirrospilus diallus</i> WALKER		1♀ L1 N	1♂ 6♀ L1 N	12♂ 36♀ L1 N				56
<i>Cirrospilus vittatus</i> WALKER	1♂ L1 N							1
<i>Derostenus</i> sp.		1♂ 1♀ L1						2
<i>Elachertus inunctus</i> NEES			6♀ L1 N					6
<i>Pediobius</i> sp.			1♂ L1					1

<i>Pnigalio pectinicornis</i> LINNAEUS		9♀ L1	1♀ L1, N	1♂ 5♀ L1, L2	1♀ L2			17
<i>Pnigalio soemius</i> WALKER			1♀ L1 N					1
<i>Sympiesis acalle</i> WALKER			8♀ L1					8
<i>Sympiesis gordius</i> WALKER			4♀ L1					4
<i>Sympiesis gregori</i> BOUČEK				1♀ L2 N				1
<i>Sympiesis sericeicornis</i> NEES			4♂4♀ L1	31♂ 23♀ L1 L2				62
<i>Sympiesis viridula</i> THOMSON				10♀ L1				10
Pteromalidae								
<i>Habrocytus semotus</i> WALKER			1♀ L1 N				3♂ 14♀ (1) L1	19
Encyrtidae								
<i>Holcothorax testaceipes</i> RATZEBURG				285♂ 644♀ L1				929
Total								2092

Abbreviations: L1 – Lublin FB 08; L2 – Lublin FB 17; N- first record

() - specimens of an unidentified sex

Many species of parasitic hymenopterans that were reared in this study (*S. calobatus*, *O. pallipalpis*, *T. congener*, *A. blancardella*, *O. laevigatus*, *A. atys*, *S. acalle*, *S. gordius*, *S. sericeicornis*, *S. viridula*, *H. testaceipes*), have already been reported from the same hosts by other authors (GOOS 1965, PIOTROWSKI 1980, KADŁUBOWSKI 1981, Balázs 1984, KADŁUBOWSKI & PIEKARSKA 1984, KADŁUBOWSKI & SZMYT 1985, VIDAL & BUSZKO 1990, OLSZAK 1992, JENSER et al. 1999).

The highest number of parasitoid species (17) was reared from *C. denticulella*, five have not been previously reported in Poland from this host: *A. bicolor*, *A. latreillei*, *P. pectinicornis*, *P. soemius* and *H. semotus*. According to KADŁUBOWSKI (1981) *A. bicolor* is one of the synonyms of *Apanteles circumscriptus* (NEES) from *Ph. blancardella* ZAJANČKAUSKAS et al. (1979) it was reported the species from *Ph. blancardella* and *Ch. pariana*, whereas BALÁZS (1984) and JENSER et al. (1999) only from *Ph. blancardella*.

In the presented study from gregarious parasitoid *A. latreillei* 1 to 11 adults of parasitoids obtained from one individual. For the first time it was reported from Poland as a parasitoid of *Phyllonorycter* spp. from *Quercus robur* L. (VIDAL & BUSZKO 1990).

P. pectinicornis is known as an ectoparasitoid of larvae and prepupae of many lepidopteran families and also Agromyzidae and Curculionidae. This species shows a high mor-

phological variability. Reported from *Ph. blancardella*, *S. malella*, *Lyonetia clerkella* and *L. malifoliella* (GOOS 1965, GÓRNY 1979, PIOTROWSKI 1980, KADŁUBOWSKI 1981, OLSZAK 1992, JENSER et al. 1999).

P. soemius was reported only from *Ph. blancardella* (BALÁZS 1984, JENSER et al. 1999). Another species, *H. semotus*, has already been reported from *Ph. blancardella* (KADŁUBOWSKI 1981) and as *Habrocytus* sp. aff. *semotus* (WALK.) from *Ch. pariana* (ZAJANČKAUSKAS et al. 1979).

Until now, *A. longicauda* was reported only from *Ch. pariana* (ZAJANČKAUSKAS et al. 1979). In the presented study this species of parasitic hymenopteran was reared from two other species of moths: *C. denticulella* i *S. pyrella*.

In own studies, among all species of parasitoids which were observed, six species were obtained from *S. pyrella*. The species that were reported for the first time from *S. pyrella* are: *I. alternans*, *G. areator*, *T. spilacularis* and *A. longicauda*.

I. alternans is an endoparasitoid of prepupae or pupae (GÓRNY 1979). The species was reared from *Ch. pariana* (ZAJANČKAUSKAS et al. 1979). Another parasitoid - *G. areator* is secondary parasitoid (GÓRNY 1979). ZAJANČKAUSKAS et al. (1979) reared this species only from *Ch. pariana*.

From the rearing of larvae and pupae of *Ch. pariana* ten species of parasitoids were obtained - nine of them are known from this host. *I. maculator* is reported for the first time from *Ch. pariana*. It is an endoparasitoid of pupae (GÓRNY 1979). It is also a predominating species among parasitoids of first instar larvae of *S. pyrella* (KADŁUBOWSKI & SZMYT 1985).

A. xanthostigma is the parasitoid of many species of moths occurring on apple trees. It has been reported from *Ph. blancardella*, *C. denticulella*, *S. pyrella* and *Ch. pariana* (ZAJANČKAUSKAS et al. 1979, KADŁUBOWSKI & SZMYT 1985, OLSZAK 1992). In the present study, this species is reported for the first time from *L. malifoliella*.

A. subfasciatus was reported from *S. desperatella* and *Stigmella oxyacanthella* (VIDAL & BUSZKO 1990), whereas in presented study this species was reared from *S. malella*.

C. vittatus is an ectoparasitoid of older larval instars of *Ph. blancardella* and *S. malella* (EVENHUIS 1980, GRUYS 1980, KADŁUBOWSKI 1981, OLSZAK & MACIESIAK 1984, OLSZAK 1992). In the presented study this parasitoid was obtained from another species occurring on apple trees - *S. desperatella*.

S. gregori was reared from *Ph. blancardella*. This parasitoid has not been reported from this host before. In Poland, it is reported for the first time from *Phyllonorycter quinqueguttella* (STT.) and *Phyllonorycter ulmifoliella* (HBN.) (VIDAL & BUSZKO 1990). In this study species: *A. latreillei*, *C. diallus*, *S. gregori*, *E. inunctus* and *T. spilacularis* are reported as parasitoids of leaf-mining moths occurring on apple trees for the first time.

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