



Eulophidae and Pteromalidae (Hymenoptera: Chalcidoidea) from the Rhodope Mts. – Recent Knowledge, Gaps and Perspectives, with Some New Records for the Bulgarian Fauna

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Abstract. In the current study we review previously recorded data concerning two chalcidoid families – Eulophidae and Pteromalidae from the area of the Rhodope Mountains. Only one Pteromalidae species – *Roptrocercus xylophagorum* was recorded for the studied region. However, available sources show that the eulophids were extensively studied so far. Therefore, a table with references about Eulophidae including data type and number of studied taxa is given. A short list of new species for the Rhodope Mts. is also presented. Among them four eulophid and two pteromalid species are reported for the first time for the Bulgarian fauna. In conclusion, we discuss gaps in our knowledge and future perspectives for more extensive investigations.

Key words: new data, mountainous habitats, review, Rhodope Mts.

Introduction

Chalcidoid wasps are widely distributed in various biogeographic regions and play an important role in ecosystems through regulation of population density of many other insects. The families Eulophidae and Pteromalidae are among the most studied taxa in Chalcidoidea in Europe during the 19-th and 20-th centuries. However, data regarding their diversity, taxonomy and biology for the Bulgarian fauna still remains scarce. The previous studies were focused mostly on economically important pests and their parasitoids. Nowadays a total of 273 species of Eulophidae (expected 1000-1200) and 200 species of Pteromalidae (expected 700-800) were recorded for Bulgarian fauna. The most recent studies were regarded mainly on species diversity, however biological contributions were also presented. The data is obtained by classical taxonomical approaches for species determination

– morphological identification keys. Interdisciplinary approaches including both morphological and molecular methods were not applied so far.

Material and Methods

For the purposes of the current study a review of all articles and books, published from the beginning of 20-th century up to now containing information on Hymenoptera from the Rhodope Mts. was performed. We also used the Universal Chalcidoidea Database (NOYES, 2018) to obtain some hardly accessible papers. The available data concerning Eulophidae and Pteromalidae was arranged into four groups: biological (immature development, host associations, plant associations, feeding strategy, behavior, etc.); faunistic (abundance, diversity, distribution); taxonomic (description of new taxa, nomenclature changes, revisions,

variability, etc.) and genetics (molecular data from DNA sequencing).

The new records presented here are based on chalcidoid material collected by the authors between 1996 and 2018 from mountainous localities. Part of the material was kindly given to us by Dr. Anelia Stojanova. Samples were taken by standard sweep netting and screen-sweeping in grasslands, meadows and branches of trees. Specimens were dried with isopropanol or with HMDS following HERATY & HAWKS (1998) and identified through the keys in GRAHAM (1969), ASKEW (1968), BOUČEK (1959), GEBIOLA *et al.* (2015) and HANSSON (1985; 2017). The examined specimens are deposited in the collections indicated by the following acronyms: PUPB,

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Results

A total of 25 publications on Eulophidae from the Rhodope Mts. region were found (Table 1), with an overall number of 187 studied species. Information mostly concerns species diversity and rarely – biology and taxonomy. In only two studies were used molecular methods (GUMOVSKY & BOYADZHIEV, 2003; GEBIOLA *et al.*, 2010).

Table 1. Previously recorded information on Eulophidae from the Rhodope Mts. (in chronological order).

References	Number of discussed species	Type of data
TSANKOV (1968)	1	biological
TSANKOV (1970)	1	biological
TSANKOV & DASKALOVA (1971)	1	biological
TSANKOV (1972)	1	biological
IVANOV & SLAVOV (1975)	16	faunistic; biological
SLAVOV (1978)	16	faunistic; biological
BOYADZHIEV (1997)	20	faunistic
MIRCHEV <i>et al.</i> (1998)	1	biological
PELOV & TOMOV (1998)	6	biological
BOYADZHIEV (1999)	7	faunistic
BOYADZHIEV (2000)	20	faunistic
BOYADZHIEV (2001)	20	faunistic
GEORGIEV (2001)	1	biological
BOYADZHIEV (2003a)	1	taxonomy; biological
BOYADZHIEV (2003b)	13	faunistic
GUMOVSKY & BOYADZHIEV (2003)	24	faunistic; taxonomic; biological; genetics
BOYADZHIEV (2004)	58	faunistic
BOYADZHIEV (2006)	163	faunistic
BOYADZHIEV & STOJANOVA (2008)	1	biological
MIRCHEV <i>et al.</i> (2011)	1	faunistic; biological
STRAKHOVA <i>et al.</i> (2011)	11	faunistic; taxonomic
MIRCHEV <i>et al.</i> (2012)	3	biological
GEBIOLA <i>et al.</i> (2010)	1	genetics
MIRCHEV <i>et al.</i> (2015)	3	biological
YEFREMOVA <i>et al.</i> (2017)	1	taxonomic

Until now, data on the pteromalids from the Rhodopes Mts. was very poor and for that reason it is not included in Table 1. Only one species is known from the literature - *Roptrocerus xylophagorum* (Ratzeburg, 1844), reared as a parasitoid of the spruce bark beetle, *Ips typographus* (Linnaeus, 1758) (Coleoptera: Curculionidae) (VIDAL, 1993; GEORGIEV & STOJANOVA, 2006; DOYCHEV *et al.*, 2016).

As a contribution, we present here 12 new records for the Rhodope Mts. New species and the new genus for the Bulgarian fauna are marked with one and two asterisks, respectively.

Eulophidae

Chrysocharis mediana Förster, 1861

Material: 1♀, Hrabrino vill., 400 m, 01.05.1998; 1♀ (leg. A. Stojanova); 1♀, m. h. Persenk Hill, 1600 m, 13.08.1996 (PUPB).

Distribution: Europe, North America (Canada).

**Cirrospilus elongatus* Bouček, 1958

Material: 1♀, Solishteto Peak, near Zagrazhden vill., 1856 m, 08.07.1996 (PUPB).

Distribution: Europe, Madeira, North Africa (Algeria).

**Diaulinopsis albimaxilla* Hannson, 2017

Material: 1♂ (leg. A. Stojanova), Asenovgrad, 500 m, 14.06.1997; 1♀ (leg. A. Stojanova), mentioned as *D. arenaria* (Erdös, 1951) by BOYADZHIEV (2006), Chehljovo vill., 1450 m, 27.07.2000 (PUPB).

Distribution: Romania.

***Di cladocerus euryalus* (Haliday, 1844)

Material: 1♂, Chernatitsa Hut, 1300 m, 05.07.2000, swept from *Pinus sylvestris* (PUPB).

Distribution: Europe.

**Necremnus artynes* (Walker, 1839)

Material: 1♀, Daskalovo vill., 500 m, 03.II.2002; 1♀, Daskalovo vill., 550 m, 19.06.2002 (PUPB).

Distribution: Europe, Canary Islands, Madeira, Turkey, Mongolia, North America (United States of America).

Pteromalidae

Chlorocytus polichna (Walker, 1848)

Material: 2♀, 1♂, SW Batak, 41°55'57.9"N/24°11'09.9"E, 1234 m, 17.VII.2018 (IBER).

Distribution: Europe, Kazakhstan, China.

**Mesopolobus anogmoides* Graham, 1969

Material: 2♀, near Pamporovo Resort, 41°37'21.4"N/24°42'04.1"E, 1580 m, 23.VIII.2018, swept from *Picea abies* (L.) H. Karst (IBER).

Distribution: Europe, China.

Mesopolobus incultus (Walker, 1834)

Material: 1♀, SW Batak, 41°55'57.9"N/24°11'09.9"E, 1234 m, 17.VII.2018 (IBER).

Distribution: Europe, Turkey, Middle East (Syria), Far East of Russia, North Africa, North America (Canada), New Zealand.

Pteromalus semotus (Walker, 1834)

Material: 1♀, near Pamporovo Resort, 41°37'21.4"N/24°42'04.1"E, 1580 m, 23.VIII.2018, swept from *P. abies* (IBER).

Distribution: Europe, Turkey, Middle East (Syria), Middle Asia, India (Kerala), China, North Africa, North America (Mexico), New Zealand.

Spintherus dubius Nees, 1834

Material: 4♀, 2♂, SW Batak, 41°55'57.9"N/24°11'09.9"E, 1234 m, 17.VII.2018 (IBER).

Distribution: Palearctic.

**Stenomalina illudens* (Walker, 1836)

Material: 1♀, near Pamporovo Resort, 41°37'21.4"N/24°42'04.1"E, 1580 m, 23.VIII.2018, swept from *P. abies* (IBER).

Distribution: Europe, China.

Stinoplus pervasus (Walker, 1836)

Material: 1♀, SW Batak, 41°55'57.9"N/24°11'09.9"E, 1234 m, 17.VII.2018 (IBER).

Distribution: Europe.

Discussion

The number of publications which fully or

partly contribute to the biology of some species is relatively high, but treated taxa are not numerous compared to the total number of species. The analyzed literature reveals not only the quantitative proportion of information about different data types but also shows the gaps in our knowledge and future perspectives for investigations. Eulophidae from the Rhodope Mts. could be considered, as well studied only concerning their species diversity and abundance. Therefore, this chalcidoid family should be an object of more intensive investigations especially in their biology, taxonomy and genetics. Regarding the group of Pteromalidae we need to obtain at least basic faunistic data that is still lacking in the literature. Pteromalids should be collected firstly to assess their diversity on the territory of the Rhodope Mts. and just later – to research into their biology, genetics and taxonomy. At the present work we make our first steps toward this purpose.

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