

Published data and new records to the fauna of Eupelmidae (Insecta: Hymenoptera) in Bulgaria

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Abstract. This study presents information about published data on eupelmid fauna of Bulgaria and new records of 16 species distributed in the country. Some of them are reared from Cynipidae (Hymenoptera) galls on *Quercus*, *Rosa*, *Hypocoum*, as well as from Cecidomyiidae (Diptera) developing in stems of *Eryngium campestre* L. Other species are reared from pods of *Astragalus glycyphyllos* L. and seeds of *Dianthus giganteus* d'Urv. New host associations are established. As a result of the study 4 species and 1 genus are new to the fauna of Bulgaria.

Key words: Eupelmidae, Bulgaria, new records, new host associations.

Introduction

Eupelmidae Walker, 1833 is a worldwide distributed family with the highest species diversity in tropical regions. Currently, there are over than 970 species in 49 genera recognized as valid and about 120 species are reported for European continent (Noyes 2015). The majority of eupelmid wasps in larval stages are primary idiobiont ectoparasitoids or predators of beetle larvae, but many other insect hosts are attacked from Diptera, Lepidoptera and Hymenoptera orders and spiders that mostly are concealed or protected in plant tissue. Polyphagy and hyperparasitism are typical for many eupelmid species (Gibson 1995).

The Eupelmid fauna in Bulgaria has not been a subject of special investigations. Only 21 species have been published in entomological papers till present study.

The first record of Eupelmidae from Bulgaria is given by (Chorbadzhev 1928). Later, many authors recorded additional species to Bulgarian fauna (Bouček 1965, 1967; Bouček & Andriescu 1967; Popov 1968; Angelov 1970; Pelov 1975; Kalina 1981, 1988). More intensive taxonomical and faunistical studies were carried out on eupelmid species that are associated with Lepidoptera pests on coniferous and some deciduous trees (Keremidchiev & Ganchev 1971, 1973; Tsankov & Mirchev 1983; Tsankov *et al.* 1984, 1996a, 1996b, 1997, 1998a, 1998b; Mirchev *et al.* 1998a, 1998b, 2003, 2010, 2011, 2012, 2014; Mirchev & Tsankov 2001; Tomov & Hristov 2007).

The great variety of habitats in Bulgaria and the geographical position of the country between Europe and Asia, give bases to presume existing of rich entomofauna there, including many endemic and relict forms. The present study is a first step of future investigations on eupelmids that are distributed in the region.

The aim of this paper is to summarize all accessible published data on Eupelmidae family from Bulgaria, as well as to present new faunistic records.

Material and Methods

The accessible published data on Eupelmidae family in Bulgaria was summarized. The original material was collected between 2003 and 2015 in different regions of Bulgaria mainly by sweeping in grass localities. Some specimens were reared at laboratory conditions from galls, pods, seeds and stems of different plants. The galls were put in the dark plastic bottles and boxes with an aluminum foil and misdirected test tubes. Emerged insects were fixed in 96° ethyl alcohol. An additional material was collected by Malaise trap. Complete data with names of the localities, GPS – coordinates and altitude are given in Table 1.

The species were determined after previously dehydration with isopropanol and placement on card plates. Determination was made after: Nikolskaya (1952); Kalina (1981, 1984, 1988); Askew & Nieves-Aldrey (2000); Gibson (2010, 2011); Al khatib *et al.* (2014).

The list of the established species comprises the following data: the valid taxa name, locality names, date of collecting, number and sex of specimens, host (in case of rearing), name of the collector. The species new to the Bulgarian fauna are marked with an asterisk (*) in the faunistic list; new genus to the Bulgarian fauna is marked with double asterisk (**). The material is preserved as card-mounted specimens in the authors' collection (University of Plovdiv).

Table 1. Collecting localities of Eupelmidae species in Bulgaria.

Locality	GPS - coordinates	Altitude
Vitosha Mts., Vladaya Village	N 42°37'26.4" E 023°10'50.9"	853 m.
Vitosha Mts., Marchaevo Village	N 42°37'12.4" E 023°11'03.9"	918 m.
Rhodope Mts., Madzharovo	N 41°39'04.3" E 025°53'01.3"	245 m.
Rhodope Mts., Dolni Glavanak Village, Kromleh loc.	N 41°40'51.4" E 025°49'28.7"	295 m.
Rhodope Mts., Hrabrino Village	N 42°02'10.0" E 024°39'33.9"	529 m.
Osogovo Mts., Vratsa Village, Dervena loc.	N 42°15'35.4" E 022°33'39.9"	959 m.
Osogovo Mts., Granitsa Village	N 42°15'30.0" E 022°44'26.2"	559 m.
Osogovo Mts., Eremiya Village	N 42°12'53.8" E 022°50'11.3"	600 m.
Ihtimanska Sredna Gora Mts., Verinsko Village	N 42°29'09.6" E 023°45'12.0"	743 m.
Thracian Lowland, Plovdiv, Dzhenem Tepe loc.	N 42°08'11.2" E 024°43'55.6"	307 m.
Stara Planina Mts., Vlasatili Village	N 42°49'19.6" E 025°35'30.8"	855 m.
Stara Planina Mts., above Vlasatili Village	N 42°48'48.7" E 025°35'32.6"	758 m.
West Stara Planina Mts., Vrachanski Balkan Nature Park	N 43°11'16.8" E 023°30'18.2"	709 m.
Stara Planina Mts., Plachkovtsi	N 42°48'04.2" E 025°28'09.7"	594 m.
Stara Planina Mts., above Gorni Stoevtsi Village, Rata loc.	N 42°47'41.1" E 025°29'03.8"	817 m.

Mezdra, Darmantsi Village	N 43°07'45.3" E 023°43'23.0"	276 m.
Veliko Tarnovo, Arbanasi Village	N 43°05'50.1" E 025°40'38.3"	417 m.
Black Sea Coast, Tsarevo	N 42°10'44.1" E 027°50'33.2"	10 m.
Black Sea Coast, Sinemorets, Silistar Protected Area	N 42°03'09.6" E 027°59'20.6"	22 m.
Strandzha Mts., The Mouth of Veleka River Protected Area	N 42°03'21.4" E 027°58'07.4"	41 m.
Belasitsa Mts., Kongura Hut	N 41°20'54.7" E 023°11'18.9"	1273 m.
Belasitsa, Ribnik Village	N 41°29'13.5" E 023°15'44.5"	96 m.
Ropotamo River	N 42°18'26.3" E 027°43'27.5"	35 m.

Results and Discussion

All accessible information concerning Eupelmidae species in Bulgaria till present study is presented in Table 2. Twenty-one species belonging to 5 genera were recorded in entomological papers. The species are arranged in alphabetic order.

Table 2. List of species of Eupelmidae family reported for Bulgaria.

Valid name	Literary source
1. <i>Anastatus bifasciatus</i> (Geoffroy, 1785)	Zanati 1978; Tsankov 1981, 1990; Tsankov & Mirchev 1983; Zaharieva 1983; Tsankov <i>et al.</i> 1984, 1996a, 1996b, 1997, 1998a, 1998b; Vidal 1993; Georgiev 1996; Zaharieva <i>et al.</i> 1997; Mirchev <i>et al.</i> 1998a, 1998b, 2003, 2010, 2011, 2012, 2014; Mirchev & Tsankov 2001
2. <i>Anastatus catalonicus</i> Bolivar y Pieltain, 1935	Pelov 1975
3. <i>Anastatus japonicus</i> Ashmead, 1904	Chorbadzhiev 1928; Thompson 1955; Stefanov & Keremidchiev 1961; Keremidchiev & Ganchev 1971, 1973; Herting 1976; Ganchev <i>et al.</i> 1980; Tsankov <i>et al.</i> 1984
4. <i>Calosota metallica</i> (Gahan, 1922)	Gibson 2010
5. <i>Calymmochilus dispar</i> Boucek & Andriescu, 1967	Bouček & Andriescu 1967; Bouček 1977; Trjapitzin 1978
6. <i>Eupelmus annulatus</i> Nees, 1834	Tsankov <i>et al.</i> 1991; Melika <i>et al.</i> 2002; Georgiev 2004; Stojanova 2006

Valid name	Literary source
7. <i>Eupelmus aseculatus</i> (Kalina, 1981)	Kalina 1981
8. <i>Eupelmus atropurpureus</i> Dalman, 1820	Angelov 1970
9. <i>Eupelmus australiensis</i> (Girault, 1913)	Bouček 1965
10. <i>Eupelmus azureus</i> Ratzeburg, 1844	Askew <i>et al.</i> 2013
11. <i>Eupelmus bulgaricus</i> Kalina, 1988	Kalina 1988
12. <i>Eupelmus cerris</i> Förster, 1860	Stojanova 2006
13. <i>Eupelmus confusus</i> Al khatib, 2014	Al khatib <i>et al.</i> 2014
14. <i>Eupelmus falcatus</i> (Nikolskaya, 1952)	Bouček 1966, Kalina 1981
15. <i>Eupelmus impennis</i> (Nikolskaya, 1952)	Kalina 1981
16. <i>Eupelmus maculatus</i> (Ferrière, 1954)	Fusu 2009
17. <i>Eupelmus microzonus</i> Förster, 1860	Popov 1968; Nieves-Aldrey & Melika 2005; Askew <i>et al.</i> 2006
18. <i>Eupelmus muellneri</i> Ruschka, 1921	Pelov 1975
19. <i>Eupelmus urozonus</i> Dalman, 1820	Popov 1968; Pelov 1975, 1999; Tsankov & Markova 1992; Vidal 1993; Georgiev & Pelov 1995, 1996; Tsankov <i>et al.</i> 1995; Markova 1997; Mirchev <i>et al.</i> 2001; Georgiev 2004; Georgiev <i>et al.</i> 2004; Stojanović & Marković 2004; Stojanova 2006; Pelov <i>et al.</i> 2007; Tomov & Hristov 2007; Daneshvar <i>et al.</i> 2009; Todorov <i>et al.</i> 2012; Askew <i>et al.</i> 2013

Valid name	Literary source
20. <i>Eupelmus vesicularis</i> (Retzius, 1783)	Angelov 1970; Pelov 1975; Tsankov <i>et al.</i> 1996a, 1996b; Mirchev <i>et al.</i> 1998b; Mirchev & Tsankov 2001; Stojanova 2006; Askew <i>et al.</i> 2006; Pelov <i>et al.</i> 2007; Todorov <i>et al.</i> 2012
21. <i>Eusandalum walkeri</i> (Curtis, 1836)	Bouček 1967

Faunistic list

Anastatus Motschulsky, 1859

****Anastatus giraudi* (Ruschka, 1921)**

Material: Vitosha Mts.: Vladaya Village, 14.VIII.2014, 1 ♀ (M. Antov).

***Anastatus japonicus* Ashmead, 1904**

Material: Ropotamo River, 15.VIII.2012, 16 ♀ (Malaise trap) (St. Petrov).

Calosota Curtis, 1836

***Calosota metallica* (Gahan, 1922)**

Material: Vitosha Mts.: Vladaya Village, 14.VIII.2014, 14 ♀ (M. Antov); Stara Planina Mts.: Vlasatili Village, 21.VII.2014, 1 ♀ (M. Antov).

Eupelmus Dalman, 1820

***Eupelmus annulatus* Nees, 1834**

Material: Rhodope Mts.: Madzharovo, 03.VI.2015, 1 ♀ (M. Antov) (emerged from *Andricus quercustozae* (Bosc, 1792) (Hymenoptera: Cynipidae) galls on *Quercus* sp.).

***Eupelmus aseculatus* (Kalina, 1981)**

Material: Thracian Lowland: Plovdiv, Dzhendem Tepe loc., 16 – 18.V.2015, 7 ♀ (A. Stojanova) (emerged from *Aylax hypecoi* (Trotter, 1913) (Hymenoptera: Cynipidae) galls on *Hypecoum imberbe* Sibth. & Sm.).

***Eupelmus atropurpureus* Dalman, 1820**

Material: Vitosha Mts.: Marchaev Village, 14.VIII.2014, 1 ♀ (M. Antov); Ihtimanska Sredna Gora Mts.: Verinsko Village, 13.VIII.2014, 1 ♀ (M. Antov); Black Sea Coast: Tsarevo, 11.VI.2014, 1 ♀ (M. Antov).

***Eupelmus australiensis* (Girault, 1913)**

Material: Ihtimanska Sredna Gora Mts.: Verinsko Village, 13.VIII.2014, 2 ♀ (M. Antov); West Stara Planina Mts.: Vrachanski Balkan Nature Park, 20.VIII.2014, 20 ♀ (M. Antov); Mezdra: Darmantsi Village, 21.VIII.2014, 4 ♀ (M. Antov); Stara Planina Mts.: Plachkovtsi, 22.VII.2014, 1 ♀ (M. Antov); Belasitsa Mts.: Ribnik Village, 07.VIII.2014, 2 ♀ (M. Antov); Rhodope Mts.: Hrabrino Village, 24.VI.2014, 1 ♀ (M. Antov).

***Eupelmus azureus* Ratzeburg, 1844**

Material: Rhodope Mts.: Dolni Glavanak Village, Kromleh loc., 30.V.2014, 2 ♀ (P. Boyadzhiev) (emerged from *Biorhiza pallida* (Olivier, 1791) (Hymenoptera: Cynipidae) galls on *Quercus* sp.); Black Sea Coast: Sinemorets Village, Silistar Protected Area, 16.X.2014, 2 ♀ (M. Antov) (emerged from *Andricus lucidus* (Hartig, 1843) (Hymenoptera: Cynipidae) galls on *Quercus* sp.); Silistar Protected Area, 14.X.2014, 1 ♀ (M. Antov) (emerged from *Andricus quercustozae* (Hymenoptera: Cynipidae) galls on *Quercus* sp.); Strandzha Mts.: The Mouth of

Veleka River Protected Area, 16.X.2014, 4 ♀, 2 ♂ (M. Antov) (emerged from *Andricus caputmedusae* (Hartig, 1843) (Hymenoptera: Cynipidae) galls on *Quercus* sp.).

****Eupelmus cicadae* Giraud, 1872**

Material: Rhodope Mts.: Hrabrino Village, 24.VI.2014, 1 ♀ (M. Antov).

***Eupelmus falcatus* (Nikolskaya, 1952)**

Material: Black Sea Coast: Tsarevo, 12.VI.2014, 1 ♀ (M. Antov); Mezdra: Darmantsi Village, 21.VIII.2014, 1 ♀ (M. Antov).

***Eupelmus impennis* (Nikolskaya, 1952)**

Material: Black Sea Coast: Sinemorets Village, Silistar Protected Area, 06.VIII.2003, 50 ♀, 29 ♂ (A. Stojanova) (emerged from *Lasioptera eryngii* (Vallot, 1829) (Diptera: Cecidomyiidae) galls in stems of *Eryngium campestre* L.); 16.X.2014, 4 ♀, 4 ♂ (M. Antov) (emerged from *Lasioptera eryngii* (Diptera: Cecidomyiidae) galls in stems of *Eryngium campestre*).

****Eupelmus linearis* Förster, 1860**

Material: Osogovo Mts.: Vrattsa Village, Dervena loc., 08.VII.2014, 1 ♀ (M. Antov); Granitsa Village, 09.VII.2014, 1 ♀ (M. Antov).

***Eupelmus microzonus* Förster, 1860**

Material: Thracian Lowland: Plovdiv, Dzhendem Tepe loc., 16 – 18.V.2015, 4 ♀, 2 ♂ (A. Stojanova) (emerged from *Aylax hypocoi* (Hymenoptera: Cynipidae) galls on *Hypocoum imberbe*); Veliko Tarnovo: Arbanasi Village, 01.VIII.2015, 9 ♀ (M. Antov) (emerged from seeds of *Dianthus giganteus* d'Urv).

***Eupelmus urozonus* Dalman, 1820**

Material: Osogovo Mts.: Granitsa Village, 17.XI.2014, 18 ♀, 2 ♂; 13.IV.2015, 9 ♀, 1 ♂ (M. Antov) (emerged from *Diplolepis rosae* (Linnaeus, 1758) (Hymenoptera: Cynipidae) galls on *Rosa* sp.); Vitosha Mts.: Marchaevo Village, 07.XI.2014, 2 ♀; 01.V.2015, 1 ♀ (emerged from *Diplolepis rosae* (Hymenoptera: Cynipidae) galls on *Rosa* sp.); Vladaya Village, 01.V.2015, 1 ♀ (emerged from *Diplolepis rosae* (Hymenoptera: Cynipidae) galls on *Rosa* sp.).

***Eupelmus vesicularis* (Retzius, 1783)**

Material: Belasitsa Mts.: Kongura Hut, 06.VIII.2014, 1 ♀ (M. Antov); Ihtimanska Sredna Gora Mts.: Verinsko Village, 13.VIII.2014, 83 ♀ (M. Antov); Vitosha Mts.: Vladaya Village, 14.VIII.2014, 5 ♀ (M. Antov); Marchaevo Village, 14.VIII.2014, 2 ♀ (M. Antov); West Stara Planina Mts.: Vrachanski Balkan Nature Park, 20.VIII.2014, 1 ♀ (M. Antov); Stara Planina Mts.: above Vlasatili Village, 21.VII.2014, 1 ♀ (M. Antov); Stara Planina Mts.: above Gorni Stoevtsi Village, Rata loc., 22.VII.2014, 1 ♀ (M. Antov); Mezdra: Darmantsi Village, 21.VIII.2014, 1 ♀ (M. Antov); Osogovo Mts.: Vrattsa Village, Dervena loc., 08.VII.2014, 5 ♀ (M. Antov); Granitsa Village, 13.04.2015, 1 ♀ (M. Antov) (emerged from *Diplolepis rosae* (Hymenoptera: Cynipidae) galls on *Rosa* sp.); Eremiya Village, 04.IX.2015, 7 ♀ (M. Antov) (emerged from pods of *Astragalus glycyphyllos* L.); Veliko Tarnovo: Arbanasi Village, 01.VIII.2015, 2 ♀ (M. Antov) (emerged from *Lasioptera eryngii* (Diptera: Cecidomyiidae) galls in stems of *Eryngium campestre*); Black Sea Coast: Tsarevo, 11.VI.2014, 2 ♀ (M. Antov); 15.VI.2014, 3 ♀ (M. Antov).

*****Metapelma* Westwood, 1835**

****Metapelma nobile* (Förster, 1860)**

Material: Ropotamo River, 15.VIII.2012, 2 ♀ (Malaise trap) (St. Petrov).

Sixteen eupelmid species belonging to 4 genera are herein presented. Of these, 4 species (*Anastatus giraudi*, *Eupelmus cicadae*, *E. linearis* and *Metapelma nobile*) and one genus – *Metapelma*, are new to the Bulgarian fauna. For 4 species data for new associations are pointed out for the first time.

With respect to the recently known data, the information above extends the range of some eupelmids. Newly established for Bulgarian fauna species are distributed mainly in Central and South Europe and for all of them these records are the most Southeastern localities of the areal (Noyes 2015).

There is no information in the literature about host-parasitoid relationships for *Eupelmus aseculatus* and the rearing of the species from *Aylax hypecoi* (Hymenoptera: Cynipidae) galls on *Hypecoum imberbe* is new data.

Kalina (1981) bred *Eupelmus impennis* from *Boucheella artemisiae* (Bouché, 1834) galls (Diptera, Cecidomyiidae); in our study we reared over than 70 specimens from *Lasioptera eryngii* galls on *Eryngium campestre* and this result extends the information about host association of the species.

Eupelmus vesicularis and *E. microzonus* are polyphagous species with wide range of hosts from Coleoptera, Hymenoptera, Diptera and Lepidoptera orders (Noyes 2015), but plant associations with *Astragalus glycyphyllos* and *Eryngium campestre* for the first species and with *Dianthus giganteus* for the second one are mentioned for the first time.

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