

Research article

Eupelmus (Eupelmus) urozonus Dalman (Hymenoptera: Eupelmidae) – a new egg parasitoid of *Thaumetopoea pityocampa* (Denis & Schiffermüller) (Lepidoptera: Notodontidae) in Bulgaria

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Abstract: Based on samples collected in 2017 and 2024, *Eupelmus (Eupelmus) urozonus* (Hymenoptera: Eupelmidae) is recorded as a new egg parasitoid of *Thaumetopoea pityocampa* (Lepidoptera: Notodontidae) in Bulgaria. Seven male specimens of *E. urozonus* were reared from egg samples of the host: one specimen from Dabnitsa Village (Blagoevgrad Region; 2017), five specimens from Dobromirski Village (Kardzhali Region; 2017) and one specimen from Gorno Varshilo Village (Pazardzhik Region; 2024). Four primary and one secondary parasitoids (*Anastatus bifasciatus*, *Baryscapus servadeii*, *Baryscapus transversalis*, *Ooencyrtus pityocampae* and *Trichogramma* sp.) also emerged from the *T. pityocampa* egg batches with *E. urozonus* comprising only 0.1% of the parasitoid complex. The impact of egg parasitoids on host numbers varied between 18.7% (Dabnitsa Village) and 33.0% (Dobromirski Village).

Keywords: Bulgaria, new trophic association, limiting factor, parasitism, pine processionary moth

Introduction

The pine processionary moth, *Thaumetopoea pityocampa* (Denis & Schiffermüller, 1775) (Lepidoptera: Notodontidae), is one of the most common and dangerous defoliator insects on pines (*Pinus* spp.) in the Mediterranean. In Bulgaria, the pest attacks between 5000 and 27000 ha of pine forests annually (Mirchev et al., 2017).

Egg parasitoids are an important factor in regulating the pest's numbers. To date, seven primary parasitoids and one hyperparasitoid of *T. pityocampa* have been reported in Bulgaria: *Ooencyrtus pityocampae* (Mercet, 1921) (Hymenoptera:

Encyrtidae), *Baryscapus servadeii* (Domenichini, 1965), *Baryscapus transversalis* Graham, 1991, *Pediobius bruchicida* (Rondani, 1872) (Hymenoptera: Eulophidae), *Anastatus bifasciatus* (Geoffroy, 1785), *Eupelmus (Macroneura) vesicularis* (Retzius, 1783), *Eupelmus (Macroneura) vladimiri* Fusu, 2017 (Hymenoptera: Eupelmidae), and *Trichogramma* sp. (Hymenoptera: Trichogrammatidae) (Boyadzhiev et al., 2020; Georgiev et al., 2020; Mirchev et al., 2021).

This note reports *Eupelmus (Eupelmus) urozonus* Dalman, 1820 (Hymenoptera: Eupelmidae) as a new egg parasitoid of the pine processionary moth in Bulgaria.

Table 1. Main characteristics of the studied areas.

Locality	Altitude, m	Studied pine plantations		Studied biological material		
		Tree species	Age, years	Egg batches, N	Eggs, N	Date of collection
Dabnitsa	700	<i>Pinus nigra</i>	31	32	6633	September 2017
Dobromirski	450	<i>Pinus nigra</i>	40	99	20348	18 September 2017
Gorno Varshilo	600	<i>Pinus nigra</i> , <i>P. sylvestris</i>	25	39	9397	30 August 2024

Material and methods

In the Forest Research Institute in Bulgaria, annual surveys are conducted on the limiting factors of the pine processionary moth in the egg stage. *Eupelmus urozonus* was recorded from egg batches of *T. pityocampa* collected in plantations of *Pinus nigra* Arn. and *Pinus sylvestris* L. in 2017 and 2024 in three localities of the host: Dabnitsa Village (Western Rhodopes, Blagoevgrad Region), Dobromirski Village (Eastern Rhodopes, Kardzhali Region), and Gorno Varshilo Village (Pazardzhik Region) (Table 1).

In 2017, 586 egg batches with 115441 eggs in them were collected from 36 localities of the pest in the country, and in 2024 – 652 egg batches with 151529 eggs from 51 localities.

The collected samples were transported to the Laboratory of Entomology at the Forest Research Institute in Sofia, Bulgaria. The egg batches were placed individually in test tubes covered by cotton stoppers and kept at room temperatures (20–22 °C). The samples were checked weekly and the emerged parasitoids were separated and identified.

The impact of egg parasitoids on the host numbers was calculated as a ratio of parasitized eggs to total number of eggs in each sample.

Eupelmus urozonus was photographed with reflected light using a Carl Zeiss Amplitiv microscope equipped with a Canon PowerShot SD990 IS digital camera and a micromanipulator (after Boyadzhiev et al., 2012). The image was processed through Zerene Stacker software and subsequently edited in Adobe Photoshop to enhance clarity.

The biological material is housed in the entomological collections of the Forest Research Institute and the University of Plovdiv “Paisii Hilendarski”, Plovdiv, Bulgaria.



Fig. 1. A male specimen of *Eupelmus urozonus* (lateral view), Dobromirski Village.

Results

In 2017 and 2024, seven male specimens of *Eupelmus urozonus* were reared from egg samples of *Thaumetopoea pityocampa* (Fig. 1).

In 2017, one specimen of *E. urozonus* was reared from samples from Dabnitsa Village and five specimens from samples from Dobromirski Village, and in 2024 – one specimen from samples from Gorno Varshilo Village.

In Dabnitsa Village, 855 specimens of four primary parasitoids (*Ooencyrtus pityocampae*, *Baryscapus servadeii*, *Anastatus bifasciatus*, *Eupelmus urozonus*) and the hyperparasitoid *Baryscapus transversalis* emerged from egg batches of the host. The impact of egg parasitoids on the host numbers was 18.7%. The egg parasitoid complex was dominated by *A. bifasciatus* (34.8% relative proportion), followed by *O. pityocampae* (28.9%), *B. servadeii* (27.7%), *B. transversalis* (8.5%), and *E. urozonus* (0.1%).

In the Dobromiritsi Village area, 3929 specimens of four primary parasitoids (*O. pityocampae*, *B. servadeii*, *A. bifasciatus*, *E. urozonus*) and the hyperparasitoid *B. transversalis* emerged from egg batches of the host. The egg parasitoids complex was dominated by *B. servadeii* (49.5%), followed by *O. pityocampae* (43.1%), *B. transversalis* (7.2%), *Trichogramma* sp. (0.1%) and *E. urozonus* (0.1%). The impact of egg parasitoids on the host number was 33.0%.

In the Gorno Varshilo Village area, 1614 specimens of four primary parasitoids (*O. pityocampae*, *B. servadeii*, *A. bifasciatus*, *E. urozonus*) and the hyperparasitoid *B. transversalis* emerged from egg batches. The egg parasitoid complex was dominated by *O. pityocampae* (87.4%), followed by *B. servadeii* (9.7%), *B. transversalis* (1.9%), *A. bifasciatus* (0.9%), and *E. urozonus* (0.1%). The impact of egg parasitoids on the host number was 25.6%.

Discussion

Eupelmus urozonus is widespread in the Western Palaearctic region (Gibson & Fusu, 2016). The species is common throughout Bulgaria, mainly in the oak forest belt up to 800–1000 m, but specimens are also found at altitude up to 1500 m (Antov & Stojanova, 2020).

In this study, *Eupelmus urozonus* was found for the first time as egg parasitoid of *T. pityocampa* in Bulgaria. However, it was previously reared from the eggs of this host in Italy (Triggiani et al., 1993).

With the exception of *E. urozonus*, three other parasitoids of the family Eupelmidae have been reported on *T. pityocampa* in Bulgaria: *Anastatus bifasciatus*, *Eupelmus vesicularis* and *E. vladimiri*.

Anastatus bifasciatus was found in all habitats of *T. pityocampa* in Bulgaria, with predominately male specimens appearing from the eggs of the host (Mirchev, 2005). Singleton females were found only in samples from Marikostino Village in southwestern Bulgaria, and the towns of Kardzhali and Ivaylovgrad in the Eastern Rhodopes (Mirchev, 2005; Mirchev et al., 2012).

Eupelmus vesicularis has been reported as egg parasitoid of the pine processionary moth in Central Bulgaria – Kurtovo Village (Tsankov et al., 1996) and Dolno Sahrane Village (Mirchev et al., 2021), southwestern Bulgaria – Marikostino Village

(Tsankov et al., 1998) and the Eastern Rhodopes – Medevtsi Village (Mirchev et al., 2021).

Eupelmus vladimiri was established in egg samples of *T. pityocampa* collected in 2018 in the region of Fotinovo Village in the Eastern Rhodopes (Boyadzhiev et al., 2020).

Eupelmus urozonus is a common polyphagous species that develops in larvae, pupae and cocoons of various insects and their primary parasitoids, as well as in a wide variety of galls on trees, bushes and herbaceous plants (Bouček, 1977). The host spectrum of this parasitoid is extremely varied and includes Coleoptera, Diptera, Hymenoptera, Lepidoptera and Neuroptera (Gibson & Fusu, 2016). Summary data regarding the hosts of *E. urozonus* in Bulgaria are given by Antov & Stojanova (2020), with new additions in Todorov et al. (2024) and Gradinarov et al. (2024) and include four species of lepidopterans: *Apterona helicoidella* (Vallot, 1827) [= *A. crenulella* (Bruand, 1853)] (Psychidae), *Gelechia senticetella* (Staudinger, 1859) (Gelechiidae), *Phyllocnistis unipunctella* (Stephens, 1834) [= *Ph. suffusella* (Zeller, 1847)] and *Cameraria ohridella* Deschka & Dimić, 1986 (Gracillariidae).

In the present study, *E. urozonus* was found as an egg parasitoid of *T. pityocampa*. In other studies, however, it has been reported as a parasitoid of larvae or pupae: *Stereonychus fraxini* (DeGeer, 1775) (Coleoptera: Curculionidae) (Tsankov & Markova, 1992; Tsankov et al., 1995; Markova, 1997); *Heromyza schineri* (Giraud, 1861) (Diptera: Agromyzidae) (Georgiev, 2004), etc. Parasitism of individual pine processionary moth eggs could be considered incidental for the polyphagous *E. urozonus*.

In conclusion, it should be noted that the new finding increases the number of egg parasitoids of the pine processionary moth and expands our knowledge regarding the ecology of this pest in Bulgaria.

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Conflicts of interest

No potential conflict of interest has been reported by the author, reviewers, or subject editor.

Author's contributions

(using [CrediT](#) )

Miroslav Antov: resources, writing—original draft; Maria Dobрева: investigation, resources; Peter Boyadzhiev: resources, writing—original draft; Plamen Mirchev: investigation, methodology, writing—original draft; Georgi Georgiev: project administration, writing—original draft.

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