



***Eupelmus (Macroneura) vladimiri* Fusu, 2017 (Hymenoptera: Eupelmidae), a New Egg Parasitoid of *Thaumetopoea pityocampa* (Denis & Schiffermüller, 1775) (Lepidoptera: Notodontidae)**

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Abstract: Egg parasitoids of the pine processionary moth (*Thaumetopoea pityocampa*) were studied in the Eastern Rhodopes, Bulgaria. A total of 180 egg batches were collected on 16 August 2018 from a plantation of *Pinus nigra* in the region of Fotinovo Village. As a result, *Eupelmus vladimiri* (Hymenoptera: Eupelmidae) was recorded for the first time in trophic association with this host. In the period 19–20 March 2019, 72 male specimens of *E. vladimiri* were found emerged from 17 egg batches of *T. pityocampa*. In addition to *E. vladimiri*, other common species of the families Eupelmidae, Encyrtidae and Eulophidae were found. The proportion of *E. vladimiri* was about 5% from the egg parasitoid complex of *T. pityocampa*.

Key words: new trophic association, Eastern Rhodopes, Bulgaria

Introduction

The pine processionary moth *Thaumetopoea pityocampa* (Denis & Schiffermüller, 1775) (Lepidoptera: Notodontidae) is one of the most common and dangerous defoliator insects in pine forests in the Mediterranean (BATTISTI et al. 2015). In Bulgaria, the pest attacks 5,000–27,000 ha per year (MIRCHEV et al. 2018). Six primary and one secondary parasitoids have been found to develop in *T. pityocampa* eggs in Bulgaria (MIRCHEV et al. 1998). They parasitise up to 8.5–44.7% of the eggs in different host's habitats. Three hymenopteran species, *Ooencyrtus pityocampae* (Mercet, 1921) (Encyrtidae), *Baryscapus servadeii* (Domenichini, 1965) (Eulophidae) and *Anastatus bifasciatus* (Geoffroy, 1785) (Eupelmidae) were reported as the most abundant and

important in reducing the pest numbers (TSANKOV et al. 1996a, 1996b, 1998). In this note, we report a new egg parasitoid of the pine processionary moth.

Materials and Methods

The biological material (180 egg batches of *T. pityocampa*) was collected on 16 August 2018 from a 30-year-old plantation of *Pinus nigra* Arn. in the region of Fotinovo Village in the Eastern Rhodopes (41°22'37.5"N, 25°19'18.5"E; 450 m a.s.l.). After collection, the egg batches were transported to the Forest Research Institute, Sofia. The scales were removed under laboratory conditions and each batch was placed singly in a test tube covered with a cotton stopper. The samples were kept at room temperature (20–22°C). In the period 19–20 March 2019,

the egg batches were carefully examined for parasitoid emergence.

Results

In this study, *Eupelmus (Macroneura) vladimiri* Fusu, 2017 (Hymenoptera: Eupelmidae) was established for the first time as an egg parasitoid of *T. pityocampa*. At the beginning of February 2019, 72 male eupelmid specimens were found emerged from 17 egg batches of the host. In addition to *E. vladimiri*, many specimens of the common hymenopteran parasitoids of *T. pityocampa* were also found: *Ooencyrtus pityocampae* (Mercet, 1921) (Encyrtidae), *Baryscapus servadeii* (Domenichini, 1965), *Baryscapus transversalis* Graham, 1991, *Pediobius bruchicida* (Rondani, 1872) (Eulophidae) and *Anastatus bifasciatus* (Geoffroy, 1785) (Eupelmidae). The relative share of *E. vladimiri* was c. 5% of the total parasitoid complex of the host (1434 specimens emerged between the date of sampling and 20 March 2019).

Discussion

Eupelmus vladimiri was recently described as a new species from the Balkan Peninsula and the Middle East (FUSU 2017). According to the article containing the original description, it is associated with *Apomyelois ceratoniae* (Zeller, 1839) (Lepidoptera: Pyralidae), *Asphondylia gennadii* (Marchal, 1904), *Lasioptera eryngii* (Vallot, 1829), *Rhopalomyia artemisiae* (Bouché, 1834) (Diptera: Cecidomyiidae), *Aulacidea acroptilonica* Tyurebaev, 1979, *Aylax hypocoii* (Trotter, 1913) and *Diplolepis* sp. (Hymenoptera: Cynipidae). Therefore, *Thaumetopoea pityocampa* is a new host of the parasitoid.

Another species of *Eupelmus* (subgenus *Macroneura*), i.e. *E. vesicularis* (Retzius, 1783), has been accidentally found and reported as parasitoid of *T. pityocampa* in Bulgaria. A specimen was reared from host eggs collected from the outskirts of the Kurtovo Village (Karlovo Region, Central Bulgaria) (TSANKOV et al. 1996a) and another one near Marikostinovo Village (Sandanski Region, SW Bulgaria) (TSANKOV et al. 1998). *Eupelmus vesicularis* is not important as a biocontrol agent of *T. pityocampa*, not only in Bulgaria but also in Algeria where another representative of the subgenus, *E. seculatus* (Ferriere, 1954), has been found on the same host (BATTISTI et al. 2015). *Eupelmus vesicularis* is a polyphagous species that attacks a wide range of insect hosts belonging to the following orders: Coleoptera, Diptera, Hymenoptera and Lepidoptera (FUSU 2017).

Usually, the representatives of the genus *Eupelmus* are not egg parasitoids. They are primary or facultative secondary ectoparasitoids, with larvae developing as idiobionts on the immature stages (larvae, pupae and, more rarely, eggs) (AL KHATIB et al. 2016). An exception is *E. tibicinis* Bouček, 1963 that is known as an egg parasitoid of *Tibicina haematodes* (Scopoli, 1763) (Hemiptera: Cicadidae) (BOUČEK 1963, GIBSON & FUSU 2016).

In this study, only male specimens of *E. vladimiri* were reared from eggs of *T. pityocampa*. They were compared with males reared from *Lasioptera eryngii* galls on *Eryngium campestre* L., where female specimens were also obtained (personal collection of M. Antov). Female specimens reared from this host in Bulgaria were previously examined (FUSU 2017).

The observation that only males of *E. vladimiri* were obtained in this study is likely explained by the fact that females of *Eupelmus*, similar to other parasitoids, can choose to lay fertilised or unfertilised eggs depending on the size and quality of the host, a well-documented fact in *E. vuilleti* (Crawford, 1913) (TERRASSE et al. 1996). This indicates that *T. pityocampa* is not a very suitable host for *E. vladimiri*.

In conclusion, it could be noted that this new record of *E. vladimiri* on *T. pityocampa* enlarges the knowledge of the parasitoid complex of the host.

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References

- AL KHATIB F., CRUAUD A., FUSU L., GENSON G., RASPLUS J.-Y., RIS N. & DELVARE G. 2016. Multilocus phylogeny and ecological differentiation of the “*Eupelmus urozonus* species group” (Hymenoptera, Eupelmidae) in the West-Palaeartic. *BMC Evolutionary Biology* 16(13): 1–20. DOI 10.1186/s12862-015-0571-2.
- BATTISTI A., AVCI M., AVTZIS D.N., BEN JAMAA M.L., BERARDI L., BERRETIMA W., BRANCO M., CHAKALI G., EL ALAOU EL FELS M.A., FRÉROT B., HÓDAR J.A., IONESCU-MĂLĂNCUȘ I., İPEKDAL K., LARSSON S., MANOLE T., MENDEL Z., MEURISSE N., MIRCHEV P., NEMER N., PAIVA M.-R., PINO J., PROTASOV A., RAHIM N., ROUSSELET J., SANTOS H., SAUVARD D., SCHOPF A., SIMONATO M., YART A. & ZAMOUM M. 2015. Natural History of the Processionary Moths (*Thaumetopoea* spp.): New Insights in Relation to Climate Change. In: ROQUES A. (Ed.): *Processionary Moths and Climate Change: An Update*. Springer, pp. 15–79.

- BOUČEK Z. 1963. A new *Eupelmus* (Hymenoptera: Chalcidoidea), egg-parasite of the cicada *Tibicen haematodes*. Acta Societatis Entomologicae Cechoslovenicae 60: 277–279.
- FUSU L. 2017. An integrative taxonomic study of European *Eupelmus (Macroneura)* (Hymenoptera: Chalcidoidea: Eupelmidae), with a molecular and cytogenetic analysis of *Eupelmus (Macroneura) vesicularis*: several species hiding under one name for 240 years. Zoological Journal of the Linnean Society 181(3): 519–603.
- GIBSON G.A.P. & FUSU L. 2016. Revision of the Palearctic species of *Eupelmus (Eupelmus) Dalman* (Hymenoptera: Chalcidoidea: Eupelmidae). Zootaxa 4081(1): 001–331. doi.org/10.11646/zootaxa.4081.1.1.
- MIRCHEV P., SCHMIDT G.H. & TSANKOV G. 1998. The egg parasitoids of *Thaumetopoea pityocampa* (DEN. & SCHIFF.) (Lep., Thaumetopoeidae) in Bulgaria. Mitteilungen aus der Biologischen Bundesanstalt für Land- und Forstwirtschaft, Berlin-Dahlem 356: 45–52.
- MIRCHEV P., GEORGIEV G., GEORGIEVA M., MATOVA M. & ZAEM-DZHIKOVA G. 2018. Enlargement of the pine processionary moth (*Thaumetopoea pityocampa*) range in Bulgaria. Forest Review 48(1): 4–7.
- TERRASSE C., NOWBAHARI B. & ROJAS-ROUSSE D. 1996. Sex ratio regulation in the wasp *Eupelmus vuilleti* (Crwf.), an ectoparasitoid on bean weevil larvae (Hymenoptera: Pteromalidae). Journal of Insect Behavior 9(2): 251–263.
- TSANKOV G., SCHMIDT G.H. & MIRCHEV P. 1996a. Parasitism of egg-batches of the pine processionary moth *Thaumetopoea pityocampa* (Den. & Schiff.) (Lep., Thaumetopoeidae) in various regions of Bulgaria. Journal of Applied Entomology 120(2): 93–105.
- TSANKOV G., SCHMIDT G.H. & MIRCHEV P. 1996b. Structure and parasitism of egg-batches of a processionary moth population different from *Thaumetopoea pityocampa* (Den. and Schiff.) (Lep. Thaumetopoeidae) found in Bulgaria. Bollettino di Zoologia Agraria e Bachicoltura, Milano 28: 195–207.
- TSANKOV G., SCHMIDT G.H. & MIRCHEV P. 1998. Studies on the egg parasitism in *Thaumetopoea pityocampa* over a period of four years (1991–1994) at Marikostinovo/Bulgaria. Anzeiger für Schädlingskunde Pflanzenschutz Umweltschutz 71(1): 1–7.

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