

Linzer biol. Beitr.	47/1	591-595	31.7.2015
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First record of *Eoxenos laboulbenei* DE PEYERIMHOFF, 1919 (Strepsiptera, Mengenillidae) from Tuscany, central Italy

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Abstract: The first faunistic record of the strepsipteran species *Eoxenos laboulbenei* DE PEYERIMHOFF, 1919 (Mengenillidae) from central Italy is presented. Several male and female puparia were found under stones on the banks of the river Formone near Bagni san Filippo (Val d'Orcia, Tuscany, Italy) in August 2012.

Key words: Strepsiptera, *Eoxenos laboulbenei*, Mengenillidae, Tuscany, first record.

Introduction

Strepsipterans, or twisted-wing parasites, are an entomophagous group of Holometabola consisting of ca. 600 species (POHL & BEUTEL 2005). All strepsipteran species display a highly specialised life cycle as obligate endoparasites with the first instar larva and the adult male being the only free-living stages. Only in Mengenillidae does the last larval stage of both male and female leave the host completely to pupate within the hardened larval exuvia, which forms a puparium (POHL & BEUTEL 2008). In all other families of Strepsiptera the female remains inside the host's abdomen, merely extruding its cephalothorax to copulate with the short-lived male and to release the first instar larvae (KINZELBACH 1978, POHL & BEUTEL 2008).

All species exhibit extreme sexual dimorphism (POHL & BEUTEL 2005, 2008). The males are free-living and the females highly simplified. Strepsiptera utilise representatives of the following insect orders as hosts: Zygentoma, Blattodea, Mantodea, Orthoptera, Hemiptera, Diptera and aculeate Hymenoptera (POHL & BEUTEL 2005).

Due to the diminutive size of the first instar larvae (ca. 230 µm in length (POHL 2002)) and the very short life-span of males, strepsipterans are hard to collect in the field. The best approach is to look for stylopedic hosts or using light or malaise traps (SMIT & RAMEL 2009, DEL RIO et al. 2014). Puparia of Mengenillidae can be collected by turning stones in appropriate habitats (POHL & BEUTEL 2008).

Mengenillidae constitute the second branch within extant Strepsiptera (after the most basal Bahiixenidae (BRAVO et al. 2009)) and form the sister taxon to Stylopidia, the remaining Strepsiptera (POHL & BEUTEL 2005, 2008). They parasitize Zygentoma of the family Lepismatidae. The females of Mengenillidae are free-living, but a certain proportion of them do not leave the puparia (SILVESTRI 1941, POHL & BEUTEL 2008).

The genus *Eoxenos* (Strepsiptera, Mengenillidae) comprises only one valid species (*E. laboulbenei*). There are records for this species from Algeria, the Canary Islands and the Iberian Peninsula, France, Italy (including Sardinia and Sicily), Libya, Greece and the Balearic Islands (KINZELBACH 1978, SMIT & RAMEL 2009, DEL RIO et al. 2014). Known hosts are the following species of lepismatid silverfishes: *Tricholepisma aurea* (DUFOUR), *Neoasterolepisma crassipes* (ESCHERICH), *N. wasmanni* (MONIEZ) and *N. pallida* Molero, GAJU & BACH (SILVESTRI 1941, DELGADO et al. 2014).

Here we report the first evidence of *E. laboulbenei* from Val d'Orcia, Tuscany (central Italy).

Material and methods

The material was examined using a Leica MZ 12.5 stereomicroscope. Photographs of the puparia were taken with a Nikon D 90 digital SLR fitted with a 63 Zeiss Luminar macro lens equipped with an adjustable extension bellow. The specimens were illuminated using two flashlights fitted with a transparent cylinder to produce soft, even light. Zerene Stacker Version 1.04 was used to combine a stack of several partially focused images.

Information concerning the specimens is presented in the following order: Locality, geographic coordinates, date of collection, habitat, collector, and preparation method. Sex is indicated by male (♂) and female (♀) symbols. All examined specimens are now held in the private collection belonging to Hans Pohl, Jena, Germany. The puparia were collected by turning stones within the given locality.

Material examined: *Eoxenos laboulbenei*. Italy, Tuscany, Val d'Orcia, Bagni San Filippo, banks of river Formone (Fig. I), 2♂♂ puparia, 3♀♀ puparia, 42°57'55.03'' N, 11°42'23.08'' E, 350 m, 2012/08/30, beneath stones, leg. M. Fraulob and H. Pohl (all puparia dry preparation).

Results

The puparia (Fig. II, 1-3; Fig. III, 1-3) were assigned to *E. laboulbenei* on the basis of the following characters (KINZELBACH 1978, DEL RIO et al. 2014; pers. observations HP). ♀♀ puparia: anterior margin of prothorax straight (in *Mengenilla* spp. with distinct bulge), anterior region of metathorax widens at an angle of nearly 90 degrees (in *Mengenilla* spp. ca. 45 degrees, Fig. III, 4-6). ♂♂ puparia: lateral side strongly convex (in *Mengenilla* spp. almost straight) (Fig. II, 1-3).

Discussion

It is easier to find Mengenillidae by looking for their puparia beneath stones than by using light or Malaise traps since empty puparia are preserved for at least two years in the field (pers. observations HP). *Eoxenos laboulbenei* seems to be more widespread in the Mediterranean region than suggested by earlier information. This is congruent with the latest records of this species from Greece and the Balearic Islands (SMITH & RAMEL 2009, DEL RIO et al. 2014).

Acknowledgements

We would like to thank Lucy Cathrow for improving the English version of the manuscript and all participants of the entomological field trip to Italy in summer 2012.

Zusammenfassung

Der erste faunistische Nachweis der Strepsipteren-Art *Eoxenos laboulbenei* DE PEYERIMHOFF 1919 (Mengenillidae) aus der Toskana (Italien) wird veröffentlicht. Im August 2012 wurden mehrere männliche und weibliche Puparien unter Steinen am Ufer des Flusses Formone nahe Bagni san Filippo (Val d'Órcia) gefunden.

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Fig. I: Habitat of *Eoxenos laboulbenei*, Val d'Orcia, Bagni San Filippo, banks of river Formone.



Fig. II: ♂ puparium of *Eoxenos laboulbenei* (Val d'Orcia), head and prothorax detached. (1) lateral; (2) dorsal; (3) ventral view; photomicrographs.



Fig. III: ♀♀ puparia of Mengenillidae. (1-3) *Eoxenos laboulbenei* (Val d'Orcia). (4-6) *Mengenilla chobauti* HOFENEDER, 1910 (Sicily). 1, 4 lateral; 2, 5 dorsal; 3, 6 ventral view; photomicrographs; 4-6 modified from POHL et al. (2012).

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Zeitschrift/Journal: [Linzer biologische Beiträge](#)

Jahr/Year: 2015

Band/Volume: [0047_1](#)

Autor(en)/Author(s): Fraulob Maximilian, Pohl Hans-W.

Artikel/Article: [First record of *Eoxenos laboulbenei* DE PEYERIMHOFF, 1919 \(Strepsiptera, Mengenillidae\) from Tuscany, central Italy 591-595](#)