



FIRST RECORD OF MENGANILLIDAE (INSECTA, STREPSIPTERA) FROM THE BALEARIC ISLANDS

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ABSTRACT

This is the first report of the strepsipteran species *Eoxenos laboulbenei* De Peyerimhoff, 1919 and *Mengenilla* sp. Hofeneder, 1910 on the Balearic Islands. Several males of *E. laboulbenei* were found in samples obtained using a UV light suction trap on a cattle farm in Majorca in October 2012. A number of empty male and female puparia of *Mengenilla* sp. were found in Ibiza in April 2003.

Key words: Light traps; *Eoxenos*; *Mengenilla*; Balearic Islands; Mengenillidae.

RESUMEN

Primera cita de Mengenillidae (Insecta, Strepsiptera) en las Islas Baleares

Se cita por primera vez la especie *Eoxenos laboulbenei* De Peyerimhoff, 1919 en las Islas Baleares. Varios machos de esta especie se encontraron en capturas obtenidas con una trampa de luz ultravioleta situada en una finca ganadera de Mallorca durante el mes de octubre de 2012. Varios puparios de machos y hembras de *Mengenilla* sp. se encontraron también en Ibiza en abril de 2013.

Palabras clave: Trampas de luz; *Eoxenos*; *Mengenilla*; Islas Baleares; Mengenillidae.

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Introduction

Strepsipterans are a monophyletic group of endopterygote insects (Pohl & Beutel, 2005) also known as twisted-wing parasites (from Greek; *streptos* = twisted and *pteron* = wings) due to the fact that the forewings in dried specimens are often twisted. To date, approximately 600 species have been described. All species within this group are obligate endoparasites of insects and, except in Mengenillidae, only the first instar larvae (host-seeking stage) and the adult males (which live just long enough to seek and fertilize a female (Kinzelbach, 1978) are free-living. Females remain inside their pterygote hosts throughout their lives, only extruding the cephalothorax to copulate with the male. Strepsipterans are rarely encountered in the field due

to the tiny size of the first instar larvae (average total length 230 µm (Pohl, 2002) and the short lifespan of the adult males. The best way to find them in the field is to look for styloped hosts. Adult males have sometimes been found in Malaise (Pohl & Melber, 1996; Van Zuijlen *et al.*, 1996) or light traps (Henderickx, 1982; Smit & Ramel, 2009; Pohl *et al.*, 2012).

Males and females of this order exhibit an extreme form of sexual dimorphism (Pohl & Beutel, 2005, 2008). Hosts include apterygote insects, Polyneoptera, Hemiptera, and seven orders (34 families) of holometabolous hexapods, namely Zygentoma, Blattodea, Mantodea, Orthoptera, Hemiptera, Diptera and aculeate Hymenoptera (Kathirithamby, 2009). Parasitization occurs when the host is in the larval, nymphal or egg stage (Linsley & MacSwain, 1957; Maeta *et al.*,

2001; Hughes *et al.*, 2003) and continues into host maturity until the male strepsipteran hatches or the first instar larvae of the viviparous female are released to coincide with production of the next generation of the host's larvae/nymphs/eggs. The lifespan of the host can be lengthened to allow completion of the parasite cycle, though its reproductive capacity is reduced by the castration caused by the parasite (Salt, 1927; Brandenburg, 1956; Strambi & Strambi, 1973; Kathirithamby, 1989; Solulu *et al.*, 1998; Maeta & Kurihara, 1999) and death eventually occurs a few hours or days after the emergence of the adult male or the larvae.

The most basal extant group of Strepsiptera is the recently described Bahiixenidae (Bravo *et al.*, 2009). The Mengenillidae represent the second branch and form the sister taxon to the remaining Strepsiptera, a group known as Stylopodia (Kinzelbach, 1978, 1990). Mengenillidae parasitize Zygentoma (Lepismatidae), and in contrast to the other strepsipteran species, both male and female larvae emerge to pupate externally and are free-living as adults (Silvestri, 1943; Pohl & Beutel, 2008).

There is only one valid species in the genus *Eoxenos*. *Eoxenos laboulbenei* has been recorded from Algeria, the Canary Islands and the Iberian Peninsula, France, Italy including Sardinia and Sicily, Libya and Greece (Kinzelbach, 1978; Smit & Ramel, 2009). The known hosts are *Tricholepsima aurea* (Dufour), *Neoasterolepsima crassipes* (Escherich), *N. wasmanni* (Moniez) and *N. pallida* Molero, Gaju and Bach (*Zygentoma*) (Silvestri, 1941a; Delgado *et al.*, 2014). The genus *Mengenilla* is restricted to Palearctic, Afrotropical, Australian and Oriental regions (Cook, 2007; Pohl *et al.*, 2012). *Mengenilla chobauti* Hofeneder, 1910 and *M. parvula* Silvestri, 1941 occur in the Mediterranean region. *Mengenilla chobauti* has been recorded from North Africa, Spain, Portugal, Crete, Malta and Italy including Sicily and Sardinia and has the widest distribution of all described *Mengenilla* species (Silvestri, 1941b, 1943; Kinzelbach, 1978). *Mengenilla parvula* is found only in Sicily. The known hosts of *Mengenilla* are *Ctenolepsima ciliata* (Dufour) (*M. chobauti*) and *C. michaelsoni* Escherich (*M. parvula*) (*Zygentoma*) (Silvestri, 1941b).

In this contribution we report the species *Eoxenos laboulbenei* de Peyerimhoff, 1919 and evidence of the genus *Mengenilla* (Strepsiptera, Mengenillidae) for the first time in the Balearic Islands.

Material and methods

Examinations were carried out using a Zeiss stereomicroscope (SteReo Discovery .V8) and a Leica MZ 12.5. For micro photography, one specimen of *E. laboulbenei* was dehydrated using increasing steps of ethanol up to 100% and dried at the critical point

(Emitech K850 critical point dryer). Photographs of *E. laboulbenei* and the puparium of *Mengenilla* sp. were taken with a Nikon D 90 digital SLR equipped with a 25 mm and a 63 mm Zeiss Luminar macro lens, plus an adjustable extension bellows. The specimens were illuminated by two flashlights fitted with a transparent cylinder for soft and even light. Zerene Stacker Version 1.04 was used to combine a stack of several partially focused images.

The information pertaining to the specimens is given in the standard manner, i.e., locality, geographic coordinates, date of collection (month indicated in lower case Roman numerals), habitat information, collector, and preparation information. Male (♂) and female (♀) symbols indicate the sex. All specimens are deposited in the private collection of Hans Pohl, Jena, Germany.

Adult males of *E. laboulbenei* were collected using UV light suction traps (Onderstepoort model; ARC-OVI, South Africa). Two UV light traps were operated with 12V batteries from dusk till dawn (8:00 pm to 6:00 am) on several non-consecutive nights. Trapped insects were collected the morning after sampling and taken to the laboratory for examination. The puparia of *Mengenilla* sp. were collected by turning stones.

Results

MATERIAL EXAMINED. *Eoxenos laboulbenei*. Spain, Balearic islands, Majorca, Felanitx, cattle farm Ca's Boter, 20 ♂♂, 39°30'N, 03°07' E, x. 2012, black light, leg. R. del Río & C. Barceló (19 ♂♂ in ethanol, 1 ♂ critical point dried).



Fig. 1.— ♂ *Eoxenos laboulbenei* frontal view (Spain, Balearic Islands, Majorca); photomicrograph.

Fig. 1.— Vista frontal de *Eoxenos laboulbenei* ♂ (España, Islas Baleares, Mallorca); microfotografía.

Mengenilla sp. Spain, Balearic islands, Ibiza, Forn Nou des Raco, route between Can Pep des Cocons and Can Miquelet, 6 ♂♂ puparia, 7 ♀♀ puparia, 1 badly preserved puparium, sex unknown, 39°00'40"N, 01°24'10"E, 01-2.iv.2003, beneath stones (1 ♂ puparium, 3 ♀♀ puparia dry preparation; 5 ♂♂ puparia, 4 ♀♀ puparia in ethanol).

TAXONOMY

The males of *Eoxenos laboulbenei* (Fig. 1) were distinguished from other strepsipteran species on the basis of the following combination of characters (Kinzelbach, 1971, 1978; Pohl & Beutel, 2005): Compound eyes with 35-45 ommatidia, six-segmented antennae with flabella on antennomeres 3 and 4, robust mandibles with a straight basal part, and five-segmented tarsi with well developed claws.

A generic feature of female *Mengenilla* puparia (Fig. 2) is a distinct broadening in the anterior region of the metathorax by an angle of approx. 45 degrees. In contrast, the anterior region of the metathorax in

female *Eoxenos* puparia widens at an angle of nearly 90 degrees (pers. observations HP).

The coloration, number of ommatidia, proportions of the antennomeres, shape of the mandibles, and wing venation clearly confirm that the strepsipteran males from Majorca belong to *E. laboulbenei*.

The puparia from Ibiza were assigned to the genus *Mengenilla*. However, they differ distinctly from the *Mengenilla* puparia described to date. The female puparia from Ibiza display, in addition to the broadening in the metathorax, a broadening in the mesothorax (Figs. 2B, 2C). All three pairs of legs of both the male and female puparia insert much more medially on the ventral side of the puparia (Fig. 2C) than in the previously described *Mengenilla* puparia (*M. chobauti*, *M. parvula*, and *M. moldrzyki* [Silvestri, 1941b, 1943; Pohl *et al.*, 2012]) (Fig. 2F). As a result we cannot yet rule out the possibility that this species is only a variation of *M. chobauti*. Until adult specimens are available, we hesitate to describe this species as new to science.



Fig. 2.— A-C. ♀ puparia of *Mengenilla*. A-C *Mengenilla* sp. (Spain, Balearic Islands, Ibiza). D-F *Mengenilla chobauti* (Italy, Sicily). A, D lateral; B, E dorsal; C, F ventral view; photomicrographs; D-F modified from Pohl *et al.* (2012).

Fig. 2.— A-C. Pupario ♀ de *Mengenilla*. A-C *Mengenilla* sp. (España, Islas Baleares, Ibiza). D-F *Mengenilla chobauti* (Italia, Sicilia). A, D vista lateral; B, E vista dorsal; C, F vista ventral; microfotografía; D-F modificado de Pohl *et al.* (2012).

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