COMMENTS ON THE PUPA OF Zavrelimyia sp. (INSECTA: DIPTERA, CHIRONOMIDAE) FROM MADEIRA

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Zavrelimyia nubila (Meigen, 1830) is the only species of Zavrelimyia FITKRAU (1962) recorded previously from Madeira based on collections of adult specimens. However, pupal exuviae recently obtained in Madeira differ from those of Z. nubila in their overall smaller size, presence of a corona on the thoracic horn and in the abdominal pigmentation and shagreen pattern. An illustrated description of these features is given here to distinguish this morphotype from related Palaearctic species.

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INTRODUCTION

Qualitative collections made in 1995 and 1996 to investigate the distribution and occurrence of Chironomidae in selected freshwater habitats of Madeira yielded 53 taxa at species level, of which 16 were new to the island’s fauna (HUGHES & MURRAY 2000). Additional pupal exuviae material has since been obtained during the 1997 biological monitoring survey of Laboratório Regional de Engenharia Civil, Departamento de Recursos Naturais e de Hidráulica (LREC/DRNI) to assess the ecological quality of Madeira’s surface waters. The majority of specimens collected were readily identifiable using existing taxonomic determination keys but 13 exhibited morphological differences in comparison with descriptions of currently known species and possibly represent variant forms or species endemic to Madeira.

This paper presents some of the characteristics of the pupal exuviae of a species of Zavrelimyia, collected from several sites on Madeira, that differ from the exuviae of Z. nubila (Meigen, 1830) the only species of Zavrelimyia previously recorded (as an adult) from the island. The pupal exuviae, the cast “skin” of the pupa remaining on the water surface following eclosion of the adult, possesses a wealth of species-specific diagnostic features. Examination of collections of pupal exuviae rapidly provides reliable information of the resident fauna, species composition and phenology at a given site (WILSON 1996).

METHODS

During field sampling carried in September 1995, April 1996 and throughout 1997, collections of Chironomidae were obtained from 57 sites covering several types of freshwater habitat. Exuviae were collected by drift net in selected flowing-water sites, augmented by skimming the water surface with a hand net (250 μm mesh) and picking up flotsam to which pupal exuviae may adhere.

Although adult Chironomidae were collected at many sites, adult male or female specimens of Zavrelimyia were not obtained. However pupal exuviae of Zavrelimyia were obtained at the sites indicated (Fig. 1, Table 1). Exuviae of Z. nubila from Ireland were used for comparison with the Madeiran specimens. All exuviae for examination by light microscopy were processed and slide mounted according to methods outlined in WIEDERHOLM (1986). Scanning electron
microscopy was carried out on selected specimens. Identifications are based on key works of FITTKAU (1962), FITTKAU & MURRAY (1986) and LANGTON (1991).

Fig. 1. Sites where specimens of Zavrelimyia sp have been collected. Details of each site are given in Table 1.

<table>
<thead>
<tr>
<th>Date</th>
<th>#</th>
<th>Location</th>
<th>Method</th>
<th>Co-ordinates</th>
<th>Alt (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.09.95</td>
<td>1</td>
<td>Fajã de Nogueira hydro electric reservoir</td>
<td>S/A</td>
<td>N32°44'909 / W16°55'411</td>
<td>530</td>
</tr>
<tr>
<td>13.04.96</td>
<td>2</td>
<td>Curral das Freiras (Terra Chã) - reservoir</td>
<td>A</td>
<td>N32°42'714 / W16°58'335</td>
<td>450</td>
</tr>
<tr>
<td>21.05.97</td>
<td>3</td>
<td>Perennial stream in laurissilva copse Arco da Calheta</td>
<td>A</td>
<td>N32°43'597 / W17°07'511</td>
<td>780</td>
</tr>
</tbody>
</table>

Table 1.

Sites where samples during 1995 and 1996 on Madeira and Porto Santo (S= Sweep netting, A= Aquatic collections). Site co-ordinates were obtained using a GARMIN GPS 45 receiver.

Material examined:

Zavrelimyia sp. Madeira
Pe, 15/09/1995, hydroelectric station reservoir, Fajã de Nogueira.
Pe, 13/04/1996, artificial irrigation reservoir, Terra Chã, Curral das Freiras.
Pe, 21/05/1997, 1st order stream in small copse of laurel forest, Arco da Calheta.

Zavrelimyia nubila.
Pe, 20/05/1986, water tank, Ardsallagh, Co. Meath, Ireland.
Pe, 29/09/1997, artificial small garden pool, Meadesbrook, near Ashbourne, Co. Meath, Ireland.

RESULTS

The pupal exuviae of Zavrelimyia sp. from Madeira differ from Z nubila in the overall size, pigmentation pattern of the abdominal tergites, structure of the abdominal armature (shagreen) and in features of the respiratory thoracic horn.

The overall length of the Madeiran specimens, 5.0 mm, is shorter than that of Z. nubila at 6.5 mm. The tergites of the Madeiran specimens have a distinctly homogenous pigmentation pattern with a rounded anterior median mark on tergites II to VI (Fig. 2a and b) whereas in Zavrelimyia nubila dark anterior and posterior bands on each tergite are joined by a single median band (Fig. 3a and b). The shagreen on tergite 2 of the Madeiran specimens is composed of individual spinules (Fig. 2c) while in Z. nubila the spinules are grouped and occasionally branched (Fig. 3c). The thoracic horns of all specimens obtained in Madeira have a distinct rim or corona that appears, under light microscopy, as a translucent area surrounding the plastron plate. The corona, which is absent in Z nubila, is clearly visible in scanning electron micrographs of the Madeiran specimens (Fig. 4). Reaching 0.075x the length of the thoracic horn, the plastron plate is broader than the neck of the respiratory atrium, which fills 3/4 of the horn respiratory chamber.
Fig. 2. Pupal Exuvia of *Zavrelimyia* sp. from Madeira. 
(a) pigmentation of the abdominal tergites (b) detail of tergites I and II 
(c) diagram of the spines on tergite II.

Fig. 3. Pupal Exuvia of *Zavrelimyia nubila* (a) 
pigmentation of the abdominal tergites (b) detail of tergites I and II 
(c) diagram of the spines on tergite II.

Fig. 4. Electron micrograph of the thoracic horn of *Zavrelimyia* sp. Madeira. Note the rim around the plastron plate. This characteristic is absent in *Zavrelimyia nubila* (Meigen, 1830). Scale bar 100 μm.
ACKNOWLEDGEMENTS

Observations on the Zavrelimyia pupal exuviae examined indicate that the specimens in question differ from Zavrelimyia nubila, the only species of Zavrelimyia recorded from Madeira until now (as adult only) by STORA (in FREY 1949), FREEMAN (1959) and BAEZ & ARMITAGE (1990). Z. nubila has also been recorded (likewise as adult only) from the Azores (STORA in FREY 1945) and the Canary Islands (CRANSTON & ARMITAGE 1988).

Pupal exuviae of all known Zavrelimyia species have a background golden/yellow colour. However, pigmentation patterns are evident in different species (FITTKAU 1962). Whereas the gross structure of the thoracic horn of Z. sp. Madeira most closely resembles Z. melanura, the abdominal tergites of Z. melanura possess dark transverse anterior and posterior bands connected by median and lateral longitudinal bands. In Z. nubila, a median longitudinal band connects dark anterior and posterior bands. The pattern in Z. sp. Madeira resembles neither of these species and is restricted to a distinct rounded, median anterior mark adjacent to the apophyses. Such a pattern is known in Z. berberi FITTKAU, 1962, from Morocco, but in that species the horn atrium is about half the width of the horn in contrast with the Madeiran specimen where the atrium is at least ¾ as wide as the thoracic horn.

The shagreen on abdominal tergite 2 of the pupa of Z. sp. Madeira also differs from that of Z. nubila. In Z. nubila the shagreen is composed of grouped and occasionally branched spinules, somewhat similar to Z. barbatipes (Kieffer), in contrast to the individual or single spinules of the Madeiran specimens.

It is clear from these observations that the exuviae of Z. sp. Madeira do not belong to Z. nubila. Without re-examination of previously collected specimens and until definitive, reared and associated, pupal and adult material is obtained is not possible to confirm the status of previous records or to state whether one or two species of Zavrelimyia occur on the island.

REFERENCES


DISCUSSION

The authors would like to thank all colleagues who helped identify material, in particular John H. Blackburn and Dr. Peter Langton. Thanks also to the technicians Agostinho Gouveia, Jorge Martins and Pedro Carreira for assistance in the field. Thanks to Dr. Filomena Seabra of the Laboratório Regional de Saúde Pública for carrying out physico-chemical analyses.

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LANGTON, P.H. 1991. *A Key to the pupal exuviae of west Palaearctic Chironomidae*. Published by the author. 3 St Felix Rd, Ramsey Forty Foot, Cambridgshire.


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