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The larvae of European Myrmeleontidae (Neuroptera)

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Abstract

The larvae of the European Myrmeleontidae are reviewed with the aim to ease their identification, covering 15 genera and 28 species. Diagnostic characters and illustrations are given for each taxon. Larvae of the genera *Nemoleon* and *Macronemurus* are described for the first time while *Megistopus*, *Neuroleon* and *Myrmeleon* are revised. The larvae of *Dendroleon pantherinus* (Fabricius), *Macronemurus appendiculatus* (Latreille), *Megistopus lucasi* (Navás), *Nemoleon notatus* (Rambur), *Neuroleon arenarius* (Navás), *Neuroleon assimilis* (Navás), *Neuroleon nemausiensis* (Borkhausen), *Cueta lineosa* (Rambur) and *Myrmeleon gerlindae* (Hölzel) are described or accurately depicted for the first time.

Key words: Myrmeleontiformia, antlions, larval morphology, identification, Mediterranean, Western Palaearctic

Introduction

The order Neuroptera, as currently established, is mostly based on larval characters (U. Aspöck 1992; U. Aspöck *et al.* 2001) and even the reciprocal relationships between families are mainly elucidated by the study of larval morphology, as underlined for the first time by the unmatched work of Withycombe (1925) and confirmed by recent studies (Beutel *et al.* 2010; Winterton *et al.* 2010). Myrmeleontidae are one of the larger families of the order, rivaling with Chrysopidae in the number of described species, comprising conspicuous insects and representing a major component of the insect fauna in arid environments, although at the same time representing a poorly known family whose systematics remains unclear (Mansell 1999).

The study of larval morphology is necessary to solve the complex systematics of Myrmeleontidae (Stange & Miller 1990; Stange 1994, 2004), presently mostly based on adult characters (Markl 1954). Despite the larvae of some species attracted the attention of the ancient naturalists thanks to their remarkable pit building behavior, earning the vernacular name “antlion” attested for the first time during the Middle Ages (Druce 1923; Kevan 1992), they are known only for a limited minority of species thus representing a serious obstacle to a better knowledge of the family. The European species of Myrmeleontidae are illustrative of the difficulties involving the study of the larvae of this family. The first accurate morphological studies on the European antlion larvae were undertaken by Brauer (1854, 1855a, 1855b, 1867), who understood for the first time the importance of the preimaginal stages in the systematics of Neuroptera, and Hagen (1873). Later works regarding the European fauna mostly deal with the descriptions of single species, such as the morphological studies of Principi (1943, 1947) and noticeably few original comprehensive and comparative works for identification purposes have been published (Redtenbacher 1884; Steffan 1968, 1975; Friheden 1973; Willmann 1977). Nevertheless, most of the European antlion larvae remain insufficiently known and frequently the existing description are not deepened or simply based on occasional findings. At the same time the ecology of numerous species remains unknown.

The present study is the result of a three years field research mainly conducted in southern Europe, especially in the western Mediterranean, with aim to improve the state of knowledge of the larvae of Myrmeleontidae of the genera present in this area. This work culminates a series of studies on this subject realized by the authors (Cesaroni *et al.* 2010; Pantaleoni *et al.* 2010; Pantaleoni & Badano 2012).

Material and methods

The larvae were directly collected in the field or alternatively obtained from eggs laid by adult females. In the first case, they were directly located at sight for the pit building species or by sieving the substratum. The oviposition was obtained by keeping the females in containers partly filled with sand, superiorly closed with paper or a net and with some sticks as support; if the condition are optimal the female lays the eggs into sand. The two methods, the direct research of the larvae in the field and rearing from eggs, provide complementary information: ecological requirements of each species and sure identification respectively. Afterwards, the larvae were reared in the laboratory in order to check the identification or to obtain the 3rd instar, being the first two instars not suitable for diagnostic purposes. Rearing was carried out in a dedicated room with a mean temperature of 25°C and 60% humidity while during winter the larvae were moved into an unconditioned room to simulate natural conditions. The antlions were kept in small cylindrical plastic containers a third filled with sand; for some species with different substratum preferences, loose soil or vegetal detritus were used instead. The preys were constituted by

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