

## **Adult Food of Osmylidae: Intestinal Contents of *Osmylus fulvicephalus* (Scopoli)**

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### **ABSTRACT**

The crop and gut contents of field-collected adult *O. fulvicephalus* were examined. Extensively chewed insect fragments, as well as various kinds of pollen and mineral particles were found in all specimens. An eriophyid mite was found in one specimen. Although some pollen, such as of Gramineae, Pinaceae, and Fagaceae were consistently present in their alimentary tracts, the species is principally carnivorous, feeding on aphids, Diptera, and other insects. The food habits of *O. fulvicephalus* are compared with those of *Sisyra terminalis* (Sisyridae) and some chrysopid species. Phylogenetical relationships between Osmylidae and Sisyridae are discussed.

### **INTRODUCTION**

In our investigation of adult food habits of Central European Neuroptera we included *Osmylus fulvicephalus* (Scopoli), as there are few concrete and recent reports. Citing DAVID (1936) and WITHEYCOMBE (1925), BALDUF (1939) described that the species is principally carnivorous but may also ingest plant substances. We here report our observations on the contents of alimentary tracts of field collected *O. fulvicephalus*.

### **MATERIALS AND METHODS**

Twelve males and 13 females were collected on June 21 and July 6 1983 at Leymen, France, about 9 km south-west of Basel, Switzerland. They were found resting under a concrete bridge over a wooded stream about 3 m wide. They were brought back to the laboratory in small individual vials, kept at 4°C and were dissected on the following day. Their alimentary tracts were mounted in glycerine-gelatine on glass slides. All females contained mature eggs ( $14.9 \pm 6.3$ ,  $n=13$ ).

### **RESULTS**

No consistent differences were observed between the crop and gut contents of males

and females, thus the results for the two sexes are treated together. All specimens contained arthropod fragments and 16 of the preparations (64%) showed moderate to heavily packed crops.

### Arthropod fragments

In all cases, the alimentary tracts contained insect setae and extensively fragmented insect legs and other exoskeletal parts. The origin of these fragments was variable. In 3 cases aphid antennae, cornicles, and redcolored compound eyes were discernible. In one case a dipteran tarsus was evident (Fig. 1). Six specimens contained parts of insect wings (Fig. 2). Dicondylic mandibles of unknown origin were located in 8 preparations (Fig. 3). One eriophyid mite was found embedded in the gut content.

### Plant and other material

In all preparations different kinds of pollen were found. Some of them were identified as *Pinus silvestris* L., *Picea abies* (L.) of the family Pinaceae, *Quercus robur* L. of the family Fagaceae, and undetermined species of Gramineae (Fig. 4). Nine specimens contained green and brown colored algae (not further determined). Minute sand or mineral particles were found also in all the insects dissected.

## DISCUSSION

The walls of the crop of *O. fulvicephalus* are thin and semi-transparent, thus brownish due to the color of the consumed food, whereas the mid- and hindgut are thicker walled, and of a dark brown color. This profile closely resembles that found in predacious Chrysopidae.

DAVID (1936) reported that *O. chrysops* L. (syn. *O. fulvicephalus*) occasionally fed on dead insects of various kinds and even preferred to attack weak individuals of their own species. We also noticed their cannibalistic nature. When more than two insects were placed in a vial, they immediately attacked each other, chewing off their antennae and wings. About one third of the specimens examined showed severed antennae, apparently chewed off during their adult life. KILLINGTON (1932) noted also some lepidopteran scales in their alimentary tracts. Among our specimens only one contained scales of Lepidoptera.

Insect setae of various kinds and sizes found in the alimentary tracts were no doubt derived partly from insect prey and also probably from their own cuticle as a result of grooming. In the alimentary tracts of adult *Chrysoperla carnea* (STEPHENS), which are non-predatory as adults, SHELDON and MacLEOD (1971) found considerable amounts of insect setae as well as antennal fragments and lepidopteran scales. They attributed the insect fragments to the self-grooming of the insects. Adult sponge flies (*Sisyra terminalis* CURT.) appear to perform a similar behavior, ingesting their body setae and later expelling them in the feces (KOKUBU and DUELLI, 1983).

Fig. 1: Tip of a dipteran tarsus. Tarsal claws, curved and sharp-pointed, as well as two lobe-like pulvilli (P) are evident.

Fig. 2: Part of an insect wing. The branched veins and minute setae on membranous part are apparent. Insect group not determined.

Fig. 3: A mandible of an undetermined insect. Only one of the articulations (a) is in focus.

Fig. 4: Various kinds of pollen, such as of *Picea abies* (Pa), were found packed in a crop.

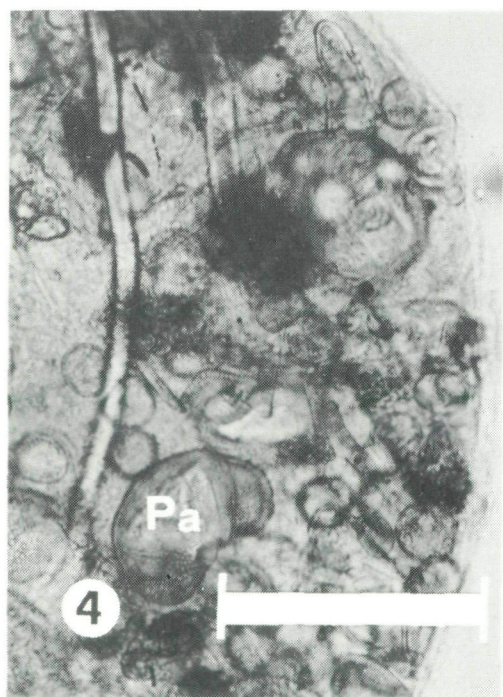
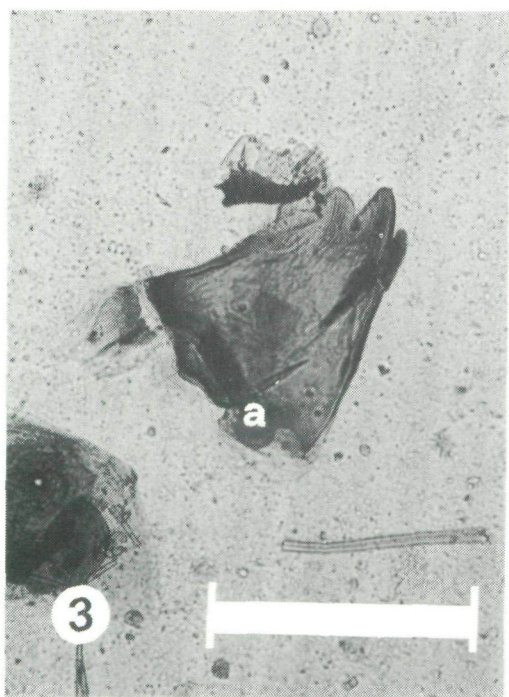
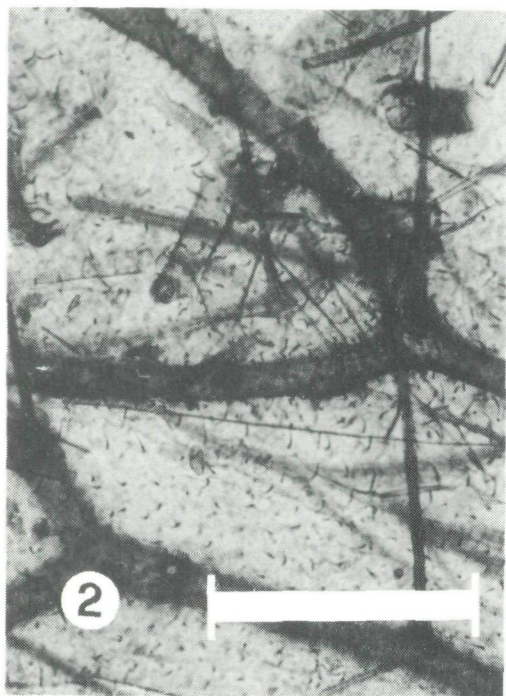
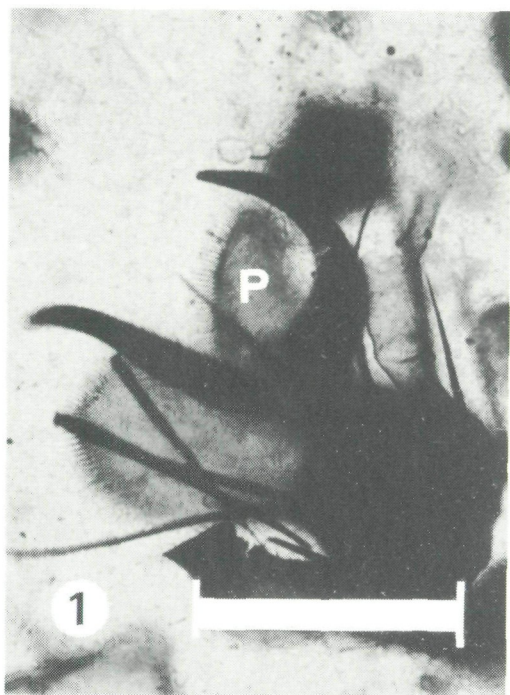


Fig. 1 - Fig. 4.

The mite found in one of the specimens belongs to the family Eriophyidae. They are phytophagous and are usually called gall or rust mites. This group of mites seems to be ubiquitous in the sense that they are found in the intestine of many other insects. We reported that in case of *S. terminalis*, the adult insects actively fed upon the eriophyid mites (KOKUBU and DUELLI, 1983). RICCI (1985a, b and pers. comm.) also found the eriophyid mites, although not the same species as found in *S. terminalis*, in the digestive tracts of some coccinellid species, namely *Thea vigintiduopunctata* (L.), *Tytthaspis sedecimpunctata* (L.), and *Rhyzobius litura* (F.). The adults of the first two species are mycophagous and the third is aphidophagous. The ecological significance, as well as the nutritional value of the eriophyid mites in terms of the insects that feed on them, is still a subject to be investigated.

DAVID (1936) observed adult *O. fulvicephalus* feeding at flowers in nature and in captivity. He believed that the insects were feeding on nectar, not on pollen. NEW (1983) reported the adult food of Kempyninae, a subfamily of Osmyliidae, in Australia and found that the group takes plant materials such as pollen, fungi, and fragments of foliage and bark. All of our specimens contained pollen in variable amounts and of different kinds, either in their crop and/or the gut (Fig.4). Three insects, moreover, had abundant pollen grains of a single kind in their crop (*Quercus robur* L.). Our observations strongly suggest that the species does in fact actively feed on pollen.

The mineral particles found in all of the preparations pose some interesting questions. Why are they consistently present? Do the fine sand particles have any function in the digestive process? In the alimentary tracts of phytophagous chrysopid adults, we also found similar minerals. Sometimes the crops and/or the guts were packed with them (KOKUBU and DUELLI in prep.). One explanation for the presence of mineral particles, scattered pollen, algae, and lepidopteran scales could be that *O. fulvicephalus*, like many species in the order Planipennia, probably scrape off honeydew (from homopteran insects) spread on plant leaf surfaces and on twigs. A variety of airborne particles may get stuck on the sticky surface of leaves beneath homopteran colonies.

The phylogenetic affinity of the Osmyliidae and Sisyridae is discussed by WITHY-COMBE (1925). He considered the Sisyridae to be derived from a certain extinct osmyloid ancestor. HENNING (1981) and SCHLÜTER (1984) presented the relationship of the two families based on fossil records. As reported by KOKUBU and DUELLI (1983), *S. terminalis* has a limited diet, because they feed mainly on aphids and eriophyid mites. Their specialization may be due to their minute size (wing length: 5-6 mm). *O. fulvicephalus*, on the other hand, is a relatively large insect (wing length: 19-23 mm) and seems to be more generalistic in its diet. Fragments of aphids and diptera were present in their alimentary tracts, but the origin of many other fragments could not be identified. It is known that the larvae of *O. fulvicephalus* are fairly general predators along the water edges of small rivers, whereas the sisyrid larvae are fully aquatic and are specialized parasites feeding on freshwater sponges. Considering the food habits of the two families represented by the two species, it is plausible that the food specialization that *S. terminalis* exhibit is a derived form of an ancestral group, where *O. fulvicephalus* retains more primitive characteristics by being a general feeder.

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