The first record of a larval nemopterid from southern Africa
( Neuroptera: Nemopteridae: Nemopterinae )

by

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The first larvae of the family Nemopteridae (Order Neuroptera) to be recorded from southern Africa, were recently collected near Nossob Camp in the Kalahari Gemsbok National Park, South Africa.

One larva pupated and upon emergence, the adult was identified as Derhynchia vansoni Tjeder. An account of the morphology and aspects of the biology of the final instar larva of D. vansoni is given.

INTRODUCTION

The Nemopteridae of southern Africa have been monographed by Tjeder (1967), but his account deals exclusively with adult specimens as the larvae were unknown. Recently, three larvae belonging to the Nemopteridae were discovered in the sand dunes near Nossob Camp in the Kalahari Gemsbok National Park. One larva pupated and upon emergence of the adult it was identified as Derhynchia vansoni Tjeder. Two adult males of the same species, which is figured by Tjeder (1967), were collected at the same locality. The adults of this species are characterized by complete lack of a rostrum, highly reduced mouthparts and short antennae.

According to Tjeder (1967), the only information on the immature stages of the sub-family Nemopterinae, which includes D. vansoni, is a description of the egg and first instar larva of the Pyrenean Nemoptera bipennis (Illiger), and a description of, what is possibly, the third instar larva of the Australian Chasmoptera hutti (Westwood). There is no information on the biology of the Nemopterinae. Much is known about the immature stages of the other sub-family, the Crocinae, including species which occur in Egypt and this information has been reviewed by Tjeder (1967). Nothing is known concerning the immature stages of the Crocinae occurring in southern Africa.

The following account of the morphology and aspects of the biology of D. vansoni larvae is the first for immature nemopterids from Africa, south of the Sahara.

THE FINAL INSTAR LARVA OF DERHYNCHIA VANSONI TJEDER

Length of body 10 mm, width at metathorax 5 mm, width of head 1,7 mm, length of head 1 mm. Thorax and abdomen creamy white with four longitudinal flavous bands dorsally and one laterally, anterior region of prothorax unpigmented, head uniformly pale fuscous.

Head (figs 1 & 2) oval, about one and a half times as wide as long. A Y-shaped epicranial suture visible on dorsal surface. Anterior margin smooth, with irregularly arranged, slender setae. Dorsal surface smooth, convex, with sparsely arranged setae. Lateral margins covered with long, slender setae. Ventral surface smooth, convex, covered with long, slender setae. A clearly visible suture present along the ventral
Figs 1–4. Derhynchia vansonii Tjeder; final instar larva. 1. Dorsal aspect of larva. 2. Ventral aspect of head. 3. Portion of dorsal aspect of head to show structure of antenna. 4 a, b & c. Pro-, meso- and metathoracic legs. Most of the setae are omitted from the drawings for clarity. ANT—Antenna; C—Coxa; CAR—Cardo; F—Femur; HC—Head Capsule; LP—Labial Palp; MD—Mandible; MX—Maxilla; T—Trochanter; TA—Tarsus; TI—Tibia; TI/TA—Fused Tibia and Tarsus; STI—Stipes.
Mansell: First larval nemopterid from southern Africa

Mid-line. Eyes absent. Antennae (fig. 3) two segmented, basal segment short and cylindrical, terminal segment longer, clavate and bearing a delicate terminal bristle. Mandibles (figs 1 & 2) as long as head, evenly curved, stout and bulbous at bases, tapering acutely near apices. Proximal two thirds of mandibles light fuscous, apices black. Devoid of teeth or papillae. Maxillae (fig. 2) reduced to single blades fitting into ventral grooves of mandibles to form sectorial tubes. Labium (fig. 2) appears to be reduced to single plate, possibly due to fusion of gula, mentum and submentum (Crampton, 1921). Sutures indistinct. Labial palps four segmented situated laterally on plate. Basal segment large, terminal segment elongated, fusiform with pit-shaped sense organ near apex.

Thorax. Prothorax (fig. 1) with narrow anterior region bearing legs. Posterior region wider. Spiracles absent. Meso and metathorax (fig. 1) both superficially similar, much wider than long. Mesothorax lacking spiracles, metathorax with laterally placed, circular spiracles. Legs (figs 4a, b & c) short, stout with elongated coxae. Prothoracic legs (fig. 4a) with well developed claws and fused tibia and tarsus. Meso- and metathoracic legs (figs 4b & 4c) with distinct tibia and tarsi but tarsi much reduced, claws very weakly developed. Tibia and tarsi of all legs bearing spines. Coxae of metathoracic legs with projections overlying trochanters. All tarsi lack empodia.

Abdomen (fig. 1) ten segmented, tapering posteriorly. Segments 1 to 6 morphologically similar with laterally placed spiracles. Segment 7 narrow, bilobed and closely associated with segment 8 which is coniform and covered ventrally with short, stout setae. Segments 9 and 10 much reduced and telescoped into segment 8; together forming the spinneret. Dolichasters absent.


Habitat and Behaviour

The larvae were collected by sieving sand on the crests of sparsely vegetated dunes in the Kalahari Gemsbok Park, an area which receives between 150 and 300 mm of rainfall per annum (Leistner, 1967). Fig. 5 shows the habitat in which the larvae were found. According to Leistner (1967), the highest mean soil temperatures at a depth of 30 cm occur during January and February when temperatures reached between 30 and 32°C and the lowest during July (11 to 12°C). When the air temperature was in the region of 40°C, the surface heated up to 70°C but at a depth of 2.5 cm the temperature was about 10°C lower. The larvae were all encountered living freely in the sand 15 to 25 cm beneath the surface in the vicinity of the grass tufts shown in fig. 5. The particle size of the sand in which the larvae were found measured between 0.02 and 2.0 mm in diameter (Leistner, 1967), and the sand was characteristically red in colour.

The most remarkable behavioural feature of D. vansoni larvae is the manner in which they burrow into the sand. Unlike myrmeleontid larvae which burrow backwards, these larvae enter the sand head first. The head and prothoracic legs are used to tunnel into the sand until the prothorax is covered, the ventral surface of the 8th abdominal segment is brought into contact with the sand by a contraction of the body. When the body is expanded the 8th abdominal segment exerts a thrusting force which
Fig. 5. The habitat (arrow) in which the larvae of *D. vansonii* were collected, near Nossob Camp in the Kalahari Gemsbok Park. The grasses are *Stipagrostis anabilis* and *S. uniplumis*.

propels the larva deeper into the sand. When placed upon sand the larvae will burrow immediately. When placed upon a hard surface, the larvae are able to walk forwards but unlike myrmeleontids, appear to be incapable of moving backwards. The 8th abdominal segment plays a major role in locomotion by propelling the larva forwards, the movement being similar to that described for burrowing.

Although feeding was not observed, it is probable that this takes place entirely beneath the surface. The main factor which supports this statement is the inability of the larvae to move backwards; in the Myrmeleontidae, prey is captured on the surface and is rapidly dragged under the surface by the larva moving backwards into the sand. During this process the prey is held secure by the tips of the mandibles and the mandibular teeth and the body of the larva is usually out of the reach of the prey. Because of the mode of burrowing in *D. vansonii* however, the prey, if captured upon the surface, would have to be pushed rather than dragged under the sand. This would impede burrowing and also the larva would be susceptible to retaliatory attacks by the prey as the abdomen is exposed above the surface during most of the burrowing process. Burrowing in *D. vansonii* is also very slow and therefore does not facilitate rapid subdua' of the prey as is the case in myrmeleontid larvae.

Pupation takes place in a silken, spherical, sand covered cocoon which is usually located at the base of a grass tuft, 5 to 10 cm beneath the surface. The cocoons measured about 7.5 mm in diameter. Several vacated cocoons were encountered in such locations.

**DISCUSSION**

The larvae of *D. vansonii* represent an interesting departure from the known larval nemopterid mode of existence, in that unlike larval Crocinae, these larvae are
Mansell: First larval nemopterid from southern Africa

not cavernicolous but live freely in sand. They are morphologically well adapted to a completely subterranean mode of existence. The antennae are reduced to two segments and are held close to the head. Eyes appear to be completely absent but may be reduced to a state where they are not visible under the light microscope. Unfortunately, paucity of material precluded the use of scanning electron microscope studies. The long setae prevent sand particles from impinging upon the body surface and ensure that a layer of air surrounds the larva. This may function as an insulating layer.

The legs are well adapted to a burrowing habit in that it is the prothoracic legs which are the principal digging appendages, a situation similar to that found in other burrowing insects. An interesting comparison may be drawn with the Myrmeleontidae in which all the known larvae burrow backwards into the sand and utilize the metathoracic legs as the principal digging appendages. In this case the tibia and tarsi of the metathoracic legs are fused whereas in *D. vansoni*, this particular adaptation is manifest in the prothoracic legs.

The habitat of larval *D. vansoni* is also occupied by several non-pit building larval myrmeleontid species, but it is unlikely that they compete for food as the myrmeleontids live near the surface and feed on surface dwelling insects whereas *D. vansoni* larvae are found well below the surface.

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