Observations on *Trioxycanus enysii* (Butler) (*sensu* Meyrick, 1890) (Lepidoptera: Hepialidae) on Kapiti Island, New Zealand, with a description of larval chaetotaxy

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Abstract

Adults and larvae of *Trioxycanus enysii* were recorded from Kapiti Island. Adults begin flying at dusk and may mate at or after dusk. Copulating pairs were observed under the forest canopy. Larvae excavate tunnels in the soil of the forest floor. Larval chaetotaxy is described for the first and final instars.

Keywords: Lepidoptera; Hepialidae; *Trioxycanus enysii*; biology; chaetotaxy; larva; New Zealand.

INTRODUCTION

Trioxycanus enysii (Butler) (*sensu* Meyrick, 1890) (Oxycaninae) is a lowland forest insect, restricted to the North Island of New Zealand. The adults appear from December to January (Dumbleton 1966) and in our experience, males may be commonly collected at light in or near native forest. Some observations on life history, habits, and larval chaetotaxy are described for the first time.

RESULTS

The presence of *Trioxycanus enysii* on Kapiti Island (40° 51 'S, 174° 54 'E, about 400 m a.s.l.) was first mentioned to us in January 1981 by Messrs J. Jolly and B. Lloyd (Wildlife Service) who observed large brown moths flying at night. These moths were

considerably larger than the *T. enysii* males with which they were familiar but they did not collect specimens. AM and MJM visited Kapiti Island on 3-5 February 1981 and found only *T. enysii* males.

From the general size and description of the large moths the species was believed to be *Trioxycanus* (perhaps *T. enysii* females) or *Aoria*. In the North Island at least one undetermined species of *Aoria* occurs in the forest (Grehan 1981, AM and MJM unpublished data). The moth on Kapiti Island evidently had a subterranean larval stage, because fresh pupal exuviae were found on the forest floor in February. A search for larvae by digging revealed 2 specimens about 150-200 mm deep in the soil. The larvae were distinct from *Aoria* (Grehan 1981) and believed to be *Trioxycanus* (J. S. Dugdale pers. comm.).

During the search for larvae, several dead specimens were found attacked by the fungus *Cordyceps* sp. The specimens fell into two distinct size groups (approximately 50 mm long by 7 mm wide, and 80 mm long by 13 mm wide). The smaller larvae were believed to be larvae of *T. enysii* and the larger specimens to be the larvae of the unidentified moths.

A second search for adults was made by AM and MJM on 20-22 January 1982. males were observed flying at dusk and a mating pair of moths was found just after dusk about 150 mm above ground level on a seedling. The weather was fine but windy. The pair was identified as *T. enysii*. In this and 2 other pairs the sexes were found to vary considerably (body length: males 35-40 mm, females 45-51 mm; wingspan: males 51-53 mm, females 85-90 mm). The mating pairs confirm that the large moths reported to us were females of *T. enysii*.

The adults may mate at dusk, possibly very soon after females emerge since the female wings of the 3 mating pairs were soft and one was not fully expanded. All 3 mating pairs at Kapiti Island were observed on plants, at less than 200 mm above the ground surface. The females clasped the plant by the legs and hung head uppermost while the males hung downward from the female by the genitalia with legs completely free.

The period of copulation was not determined, but one pair found at dusk was still mating 3 hours later. On 10 December 1981 the mating of an unidentified species of *Trioxycanus* (probably *T. enysii* as males were collected at the time) was observed at Khandallah Reserve, Wellington (41°14'S, 174°47'E) (Mr I. M. Henderson pers. comm.). A female was found resting on a branch at dusk about 2 m above ground level. A male arrived and hovered around the female before making genital contact and then hanging motionless head down from the female.

Larvae of *T. enysii* on Kapiti Island were found in the soil in tunnels which were not completely vertical and reached a depth of about 200 mm. The tunnel curved slightly near the bottom. There was no evidence of a silk/debris cover over the entrance of the tunnel as found in *Wiseana* spp.

About 9-10,000 eggs (volume 1.8 cm^3) were dissected from the female of one mating pair. The eggs were ovoid 0.8 × 0.7 mm in diameter. The dissected eggs were white, but others released from a female held overnight with a mating male were grey-black.

Chaetotaxy

The nomenclature of Hinton (1946) is used here for the head, thorax, and abdominal segments 1-9. The diagnosis of larvae and larval preparation for chaetotaxy follows Grehan (1981). First instar larvae were obtained by hatching eggs laid by a female *T. enysii,* and older larvae and final instar exuviae were collected on Kapiti Island in October 1981. It is not possible to indicate the frequency of fusion or separation of small adjacent pinacula of second to final instar because of the small sample (n = 3).

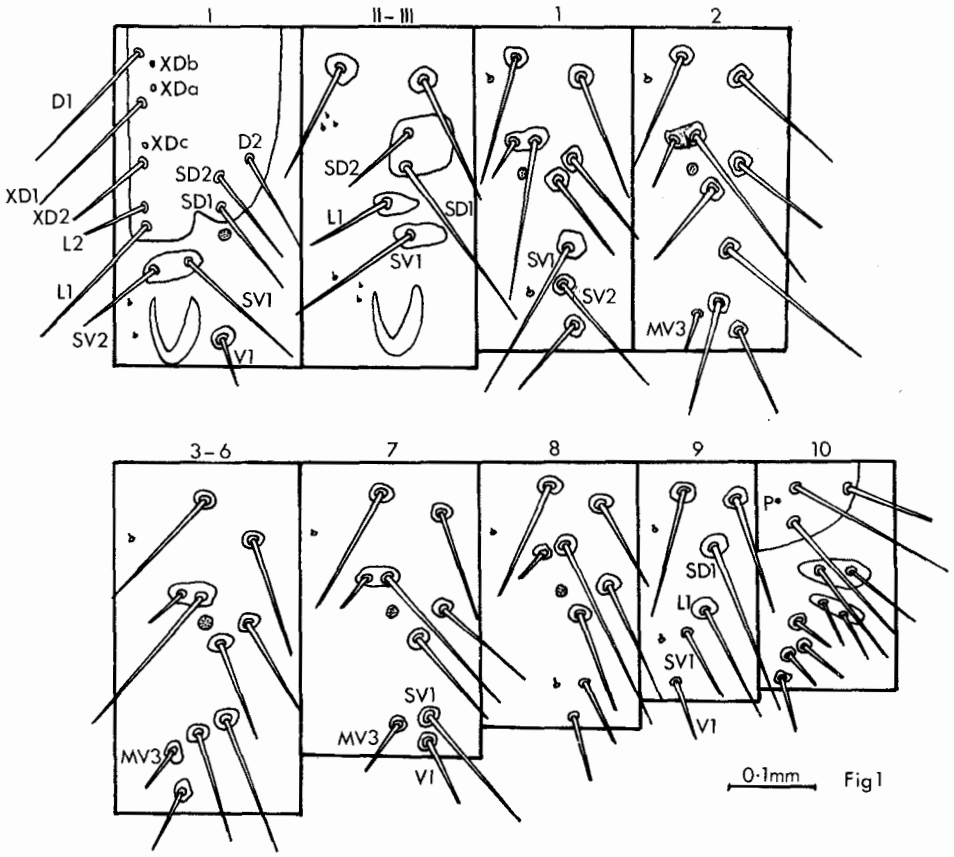

Fig. 1. Thoracic and abdominal chaetotaxy of *Trioxycanus enysii* (*sensu* Meyrick, 1890). 1st instar larva. (Spiracle indicated by stippling; pinacula bounded by solid lines; P = pit).

First instar (Fig. 1). On the prothorax D1 and D2 are on the same pinaculum as SD2, SD1, L1, and L2. On the meso- and metathorax and abdominal segments 1-9, D1 and D2 each occupy a single pinaculum. SD2 and SD1 occupy the same pinaculum on meso- and metathorax and abdominal segments 1-7, but may be on separate pinacula on abdominal segment 8. L1 and L2 may occur on a single pinaculum on abdominal segment 1. L2 is absent from meso- and metathorax and abdominal segment 9. SV1 and SV2 occupy the same pinaculum on the prothorax. SV2 is absent from the meso- and metathorax. The 4 most ventral setae on abdominal segment 10 appear to be on separate pinacula, although this is difficult to determine. A pit is located on the anal shield of abdominal segment 10. The prothoracic shield (dorsal pinaculum) is poorly sclerotised near the base of setae.

Second instar to final instar (Fig. 2). A large sensory pit, absent in the 1st instar, is present on the prothoracic shield enclosing SD1 and D2, and microtrichia line the pit surface. Most pinacula were poorly sclerotised in the specimens examined with the exception of abdominal segment 10, the main pinacula of the thorax, and the ventral and subventral pinacula of abdominal segments 3-6. The extent of the pinacula has therefore not been indicated for many setae in Fig. 2. It is possible that the pinacula may be more distinct in earlier instars as in *Aenetus virescens* (Grehan 1981). On the mesothorax, D2 occupies the same pinaculum as SD2, SD1 and L3, but is separate on

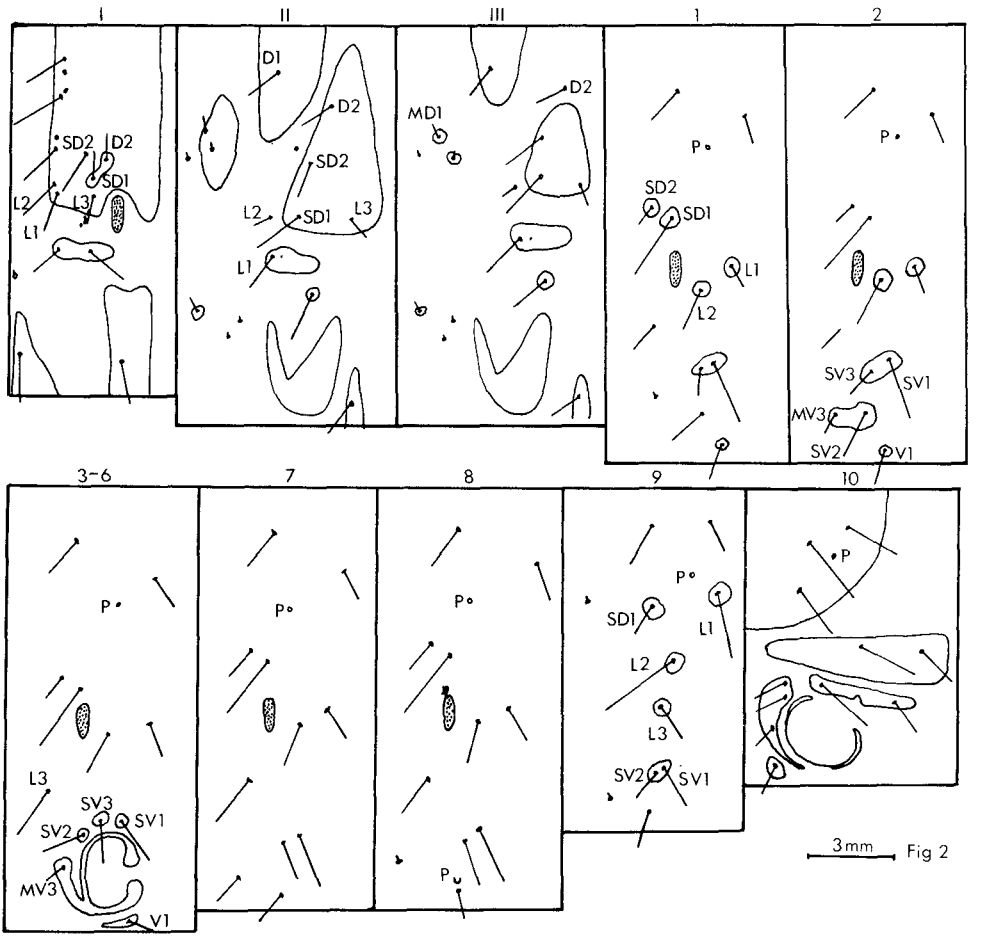

Fig. 2. Thoracic and abdominal chaetotaxy of *Trioxycanus enysii* (*sensu* Meyrick, 1890). Final instar larva. (Spiracle indicated by stippling; pinacula bounded by solid lines; P = pit).

the metathorax. On abdominal segments 3-6 the pinaculum of MV3 encircles most of the proleg base, and SV2, SV3, and SV1 each occupy a single pinaculum. A pit is located between and ventral to the 2 most dorsal setae on abdominal segment 10; in front and below D2 on the meso- and metathorax on abdominal segments 1-9; lateral to V1 on abdominal segment 8; and posterior to L1 on the meso- and metathorax. Setae appearing after the 1st instar are L3 on pro-, meso- and metathorax, and abdominal segment 9; L2 on meso- and metathorax, and and abdominal segment 9; SV2 on abdominal segments 8 and 9; and SV3 on abdominal segments 1-6.

The head has the same chaetotaxy in the 1st and succeeding instars, but setae differ in relative position as the head changes in shape (Fig. 3). Apart from differences in chaetotaxy the 1st instar differs from the older instars examined by having circular spiracles instead of oval, and 1 row of proleg crotchets instead of numerous (multiseral).

The body colour of the 1st instar is white with dark brown pinacula. The post-1st instar larvae examined were white with brown head and body pinacula. Hudson (1928) gives a general description of a larva which is possibly *T. enysii*.

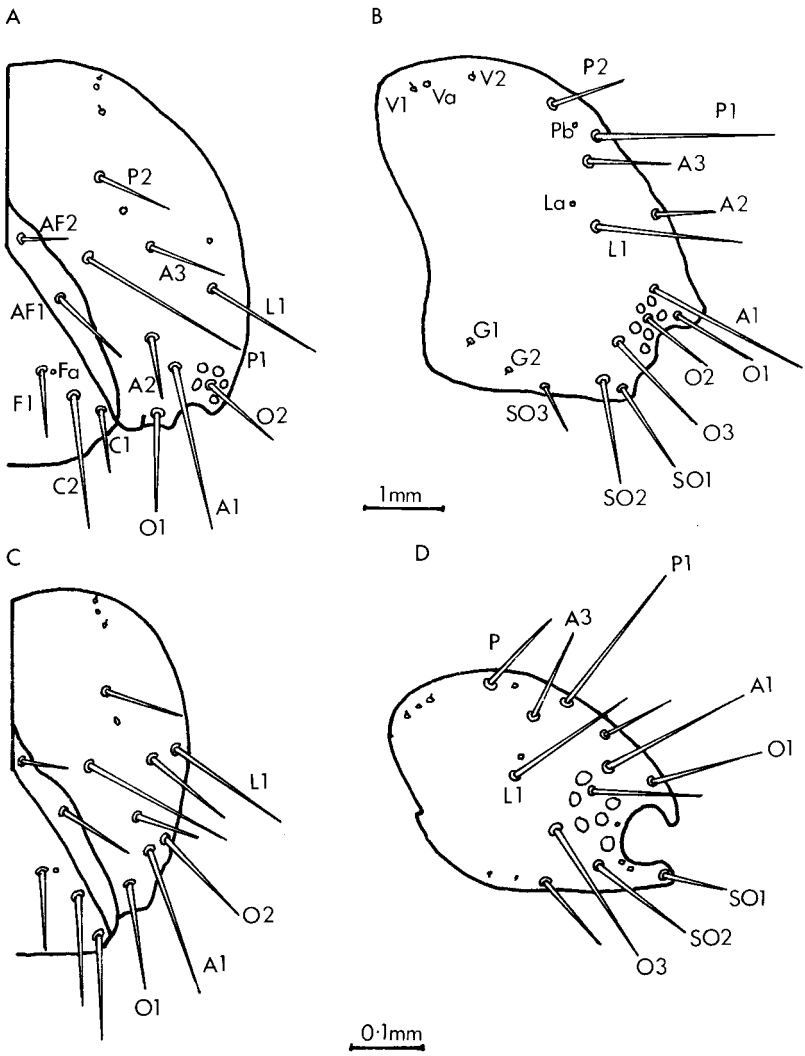

Fig. 3. Head chaetotaxy of *Trioxycanus enysii* (*sensu* Meyrick, 1890). A, B, final instar; C, D, 1st instar. Antero-dorsal (A, C) and right lateral (B, D) aspects.

DISCUSSION

There are 3 species in the endemic genus *Trioxycanus*. *T. enysii* and *T. characterifera* (Walker) have a largely sympatric distribution whereas *T. unimaculatus* (Salmon) is allopatric to the other species. The chaetotaxy of *Trioxycanus* species has not been described previously. This description for *T. enysii* is considered as a first step toward separating the species and distinguishing them from other genera. A larva thought to be that of *T. characterifera* from farmland at Murchison differs from *T. enysii* by having 2 prothoracic sensory pits, 1 around each of SD1 and D2 (J. S. Dugdale pers. comm.).

The size discrepancy between male and female adults is almost certainly to be reflected in the size of the larvae and pupae. Thus the 2 size classes of 'vegetable caterpillars' found on Kapiti Island probably represents sexual dimorphism in larval size. The sexual dimorphism of *T. enysii* adults has been recorded from the mainland by Hudson (1928).

Hudson (1928) states the larval food of *T. enysii* to be the roots of plants in the forest, but we were unable to find any evidence of this when digging for larvae. Because of the lack or absence of foliage on the forest floor either where larvae were found or where adults emerged, we suggest that the larval food item is dead leaf material on the ground. Some larvae have been reared in captivity from 1st to 2nd instar on dead leaves and organic debris.

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