THE BIOLOGY AND MORPHOLOGY

OF

AGROTIS INFUSA (BOISD).

A thesis presented in fulfilment of the requirements for the degree of Doctor of Philosophy of the University of Adelaide.

by

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INTRODUCTION

Agrotis infusa (Boisd.) - (Lepidoptera: Agrotidae) is one of the many common species of endemic cutworms in Australia. Over a long period of years it has been recorded as causing considerable damage to a variety of crops and pastures, at irregular intervals. At times it has been credited with the total destruction of crops particularly wheat, at least in isolated patches (Froggatt 1899, 1911; Anon. 1919). It may be pointed out, however, that grave doubts exist as to the correctness of many of the identifications made by the earlier observers.

In spite of the many references about economic damage by the species over the last 60 years, its biology and behaviour have hitherto been little known. Recently Common (1954) made an important contribution leading to the better understanding of the adult behaviour of the species in the south-eastern part of Australia. From his field observations, supplemented by laboratory investigations, he drew the following conclusions:

1. The major part of the population of A. infusa in south-eastern Australia has but a single generation each year. In very favourable habitats, however, three or four generations annually are theoretically possible.

2. In the spring the moths migrate to the mountains (Australian Alps), where they aestivate gregariously, in a sexually immature condition, in crevices and small caves at altitudes above about 4000 feet. In the late summer and autumn, they migrate back to their breeding grounds.

3. From the preliminary data he suggests that a facultative diapause occurs during aestivation.

4. The migration, together with the facultative diapause, enables the moths to survive when adverse environmental conditions on the plains, mainly lack of suitable larval food, prevail.

It should, however, be noted that, because of the collection of a few impregnated females in spring in light traps at Canberra, and the presence of an occasional larva in gardens during summer in the same locality, he suggested that a small part of the population fails to aestivate.

Now, it is an accepted principle, that the biology of a species in one area cannot be interpreted in terms of its biology in a distant and climatically different one, and, the collection of a large number of moths of A. infusa in a light-trap at the Waite Agricultural Research Institute throughout the year, suggested that its biology in the neighbourhood of Adelaide, might differ considerably from that exhibited in south-eastern Australia. Partly because of these considerations, and partly because of the lack of information on the habits and the biology of the species, the present study was started late in 1955 and continued until 1957.

Besides the investigation of the general biology and the seasonal history of the species in South Australia, a second objective was to evaluate the influences of certain environmental factors, - mainly temperature, moisture and food, - on the rate and course of development, survival, fecundity etc., with a view to obtaining a better understanding of its innate capacity for increase, under different conditions. Morphological studies of the larva, pupa and adult were also undertaken

as they are of great taxonomic value, and are therefore useful for the correct identification of the species in its various stages. As with many other common agrotids, failure to appreciate its morphological characters has led to much confusion in the past through misidentification of the species recorded as doing economic damage.