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Notes on *Metacrias strategica* (Meyrick)

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Summary

THE life cycle of *M. strategica* is described. Larval hibernation is noted together with variation in the rate of growth of various larvae. These may be mechanisms for introducing two generations in suitable years. Some females were seen to emerge from the pupal nests and move a distance of up to one foot from it. This is the first record of female emergence in the genus. Distribution of the species is dependent almost entirely on movement of the larvae, which would seem to have no specific host plant.

These records of *M. strategica* from the Nenthorn district (average yearly rainfall 23.7in) extend the range of climate conditions recorded for the species (average yearly rainfall approximately 40in) (Gibbs, 1962).

IN 1962 Gibbs surveyed the whole New Zealand genus *Metacrias* Meyrick and included a specific description of *M. strategica* together with brief notes on its life history and ecological niche. From field and experimental studies over the last five years of *M. strategica* in the Nenthorn district, the following additional data may be made available.

THE MALE

There is considerable variation in colour pattern in the hind wing. Gibbs's description reads, "a moderate to broad black terminal band, scalloped along its inner margin between the veins; an isolated circular black tornal spot; a narrow band of red along the terminal margin from MI to the tornal spot on 2A". In the 11 males captured or reared at Nenthorn the following variations were noted. (1) In five specimens the red pigmentation extended slightly beyond the black patterning in the centre of the wing; in three it extended right up to the costa, almost to the wing base. (2) An additional small black spot (Fig. A) was present near the centre of the wing in eight specimens; it was absent in only three.

THE FEMALE

The body length is from 1.2 to 1.4 cm, of which 1.0 to 1.1 cm is occupied by the large, almost spherical abdomen, the width of which is approximately 1.0 cm (Fig. D).

Some, but not all, females leave the pupal nest and crawl about slowly, traversing a distance of not more than 1 foot in their life-time. This is the first record of female emergence from the pupal case in the genus *Metacrias*.

In captivity the female life span is from eight to twenty-eight days (average, twenty-one). Egg-laying commences in the laboratory after four to seven days,

about 50 almost-spherical creamy white eggs being produced. These may be scattered haphazardly or laid in clusters, but in all cases they are intermingled with fluff rubbed off the moth's body. This may be useful in separating the eggs.

One female which hatched out on December 20 was exposed on a hillside at Nenthorn on December 21 and also on the morning of December 26. No males were attracted, but on exposure during the afternoon of December 26 several males came within one quarter of an hour. Other females 1, 2, 5 and 13 days old failed to attract males. It may well be that the female is attractive to the male for only a short period of her life.

Larval Instars and the Hibernation Period

Larval development was studied in the laboratory mainly from the 27 larvae which emerged from a batch of eggs laid on December 27, 1958. The newly hatched forms measured 0.3 cm in length. These moulted six times, the mean duration of the larval instars being 6, 6, 8, 10, 13, and 21 days respectively. Length measurements in centimetres for each of the six instars were 0.3, 0.5, 0.6, 1.1, 1.3, 1.8, 2.3 with the maximum length of approximately 3 cm reached just before pupation.

Prior to moulting, the larvae went into shelter—usually under a curved piece of bark supplied as protection—and remained there, in a curled position, for from five to seven days. The actual moult began when a split appeared along the dorsal surface of the thorax, and continued to about half way along the body. The larva, on pulling its head and thorax out of the old skin, walked along the ground while wriggling the rest of its body free. The head, at first creamy-white in colour, darkened gradually to black, and the larval hairs at first damp and curled, sprang erect as they dried.

Newly-hatched larvae were greyish-fawn with black heads and dark grey hairs. Numerous long white hairs (up to 0.25 cm long) were present on the last three or four segments. After the first ecdysis the skin became dark grey and the hairs black and more numerous, the most posterior being 0.4 cm in length on a larvae itself only 0.5 cm. During subsequent larval instars, the skin became black and the hair sufficiently long and dense almost to obscure it. (The bristly hair is arranged in rosettes, and tends to have a lie towards the posterior end. In mature larvae (Fig. B), the hair length graduates from about 0.5 cm long at the sides to 1 cm at the posterior end.) Most specimens in this collection had several extra long hairs often paler in colour than the remainder arising from about the last four abdominal segments. Moreover, the hair of all these larvae was reddish-brown on the ventral surface and ranged from very dark brown (almost black) to khaki-fawn elsewhere. Towards the end of each larval instar some specimens showed a certain amount of bleaching of the hair, but bleaching alone would not account for the colour variation shown.

The larvae are normally sluggish, but will move rapidly if agitated or subjected to strong light.

About the beginning of May, hibernation commenced. At first for a period of about two weeks, the larvae would feed under warm conditions only. Then for a long period lasting until the third week in August, no feeding at all took place, the larvae remaining quiescent under leaves or pieces of bark. In spring, with warmer weather, hibernation ceased. The newly-active larvae averaged 1.6 cm in length. (Note: rearing of the larvae was not easy. Towards the winter too many fatalities seemed to be occurring among the larvae kept in an unheated room at Nenthorn. However, once the hibernating larvae were transferred to

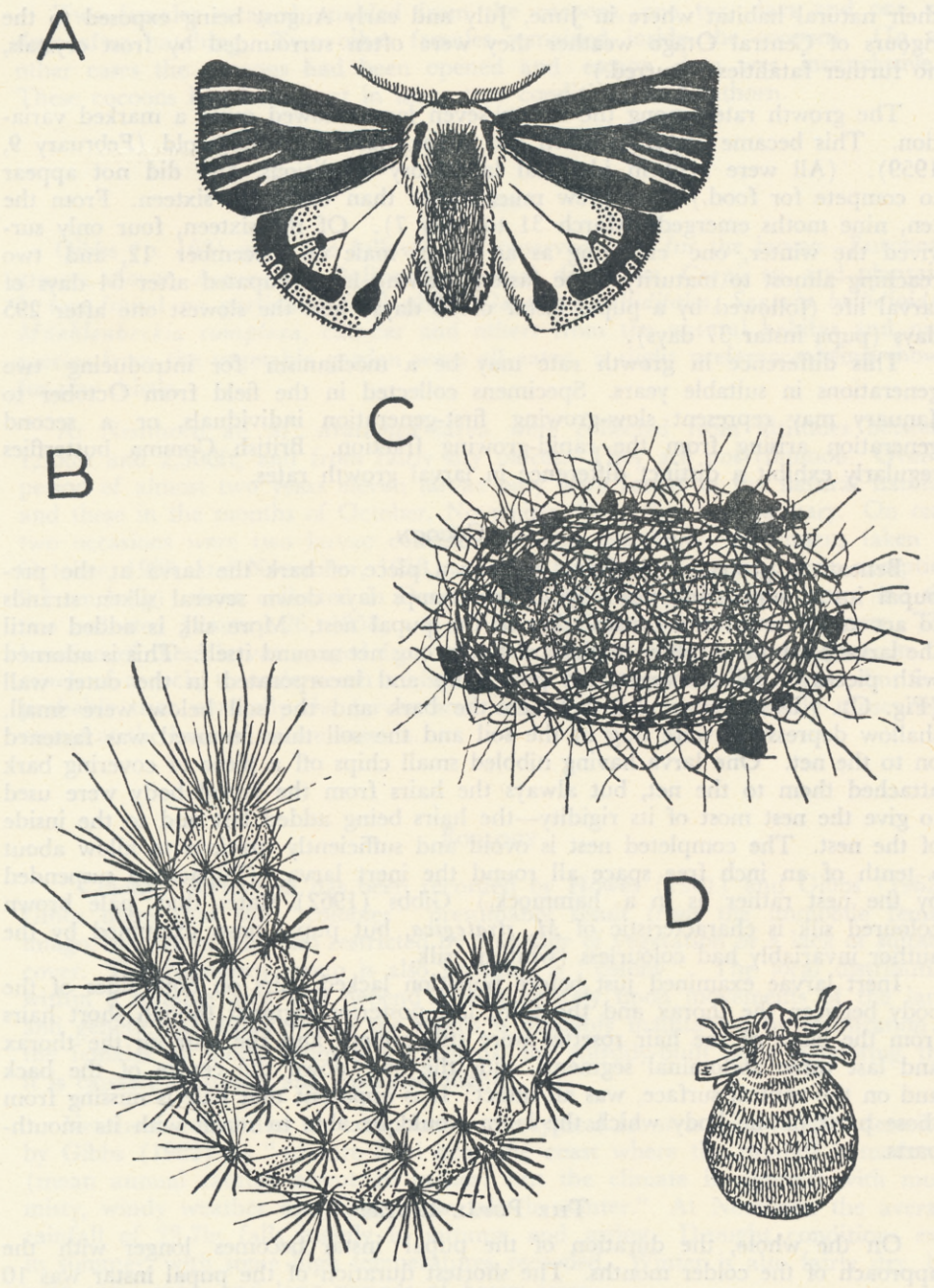

FIG. A.—Adult male of *M. strategica* showing distribution of orange pigment (stippled) and the extra black spot near the centre of the hind wing × 2.

FIG. B.—Mature larva × 3.

FIG. C.—Cocoon × 2.

FIG. D.—Female × 2.

their natural habitat where in June, July and early August being exposed to the rigours of Central Otago weather they were often surrounded by frost crystals, no further fatalities occurred.)

The growth rate among the twenty-seven larva showed quite a marked variation. This became apparent when the larvae were thirty days old (February 9, 1959). (All were kept in identical laboratory conditions, and did not appear to compete for food.) Ten grew much faster than the other sixteen. From the ten, nine moths emerged (March 31 to May 7). Of the sixteen, four only survived the winter, one emerging as an adult male on December 12, and two reaching almost to maturity. The fastest growing larva pupated after 64 days of larval life (followed by a pupal instar of 16 days) and the slowest one after 295 days (pupa instar 37 days).

This difference in growth rate may be a mechanism for introducing two generations in suitable years. Specimens collected in the field from October to January may represent slow-growing first-generation individuals, or a second generation arising from the rapid-growing fraction. British Comma butterflies regularly exhibit a distinct difference in larval growth rates.

The Cocoon

Beneath a protective covering such as a piece of bark the larva at the prepupal instar supporting itself by its footstumps lays down several silken strands to act as struts for the construction of the pupal nest. More silk is added until the larva has built a rather haphazard but strong net around itself. This is adorned with pieces of soil or vegetation picked up and incorporated in the outer wall (Fig. C). If the space left between the bark and the soil below were small, shallow depressions were dug in the soil and the soil thus removed was fastened on to the net. One larva having nibbled small chips off a piece of covering bark attached them to the net, but always the hairs from the larval body were used to give the nest most of its rigidity—the hairs being added last and to the inside of the nest. The completed nest is ovoid and sufficiently spacious to allow about a tenth of an inch free space all round the inert larva. (Pupae are suspended by the nest rather as in a hammock.) Gibbs (1962) states that pale brown coloured silk is characteristic of *M. strategica*, but pupal nests examined by the author invariably had colourless (whitish) silk.

Inert larvae examined just before pupation lacked hairs on both sides of the body between the thorax and the third last posterior segment though short hairs from the bases of the hair rosettes were still present and the hair on the thorax and last three abdominal segments, plus the hair down the centre of the back and on the ventral surface, was all intact. It is apparent that hair is missing from those parts of the body which the larva would be able to reach with its mouthparts.

The Pupal Instar

On the whole, the duration of the pupal instar becomes longer with the approach of the colder months. The shortest duration of the pupal instar was 10 days, the average 22.5 days. The longest was 37 days in a larva, which, hatched in captivity, had hibernated over the winter.

During the hatching out of the adult the female pupal case was broken into fairly small pieces, the abdominal region in particular being divided into segmental rings, whilst the male pupal case was broken only by thoracic splitting, the abdominal region remaining intact. Escape from the pupal nest was effected through a hole made by the front legs.

Two females escaped unaided from the cocoons, one two days and one six days after hatching. Two other females remained inside the cocoons. (In all other cases the cocoons had been opened and escape data was inconclusive.) These cocoons had been kept in laboratory conditions at Nenthorn.

REMARKS

Gibbs (p. 163) gives the following as observed food for the larvae—European grasses, clover, *Acaena* sp., *Bulbinella hookeri,* dandelion, *Crepis* sp. and plantain. I, too, found no particular food plant, *Gentiana bellidifolia, Senecio bellidioides, Müehlenbeckia complexa,* cats-ear and others from the natural habitat and nine species from the vegetable garden were all eaten, a slight preference being shown for sow thistle.

At Nenthorn all *M. strategica* larva were collected from altitudes between 1,500ft and 2,300ft, and from fairly dry places. They are not common. Over a period of almost two years eleven larvae only were found in the natural habitat, and these in the months of October, November, December and January. On only two occasions were two larvae collected in close proximity. Specimens taken in October, 1958, and November, 1958, were 1.5 to 1.7 cm long (with one exception 2.7 cm long); those collected in December, 1959, were 2.0–3.0 cms long; and the one collected January 26, 1958, was of the maximum larval size, 3.0 cms. The location of these larvae ranged from the base of snow tussock, to dry grass in the crack of a rock, to underneath schist rocks, to the woodwork, of a gate, but is is probable that normally the larvae seek out shaded areas preferably those near stones at the base of native tussock.

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"Colony" formation has been recorded by Howes (1901) and Gibbs (1962). Gibbs notes that the "colonies" presumably result from the immobile female imago, but are usually also restricted by a change of vegetation or a lack of suitable cover. The Nenthorn group is also probably a "colony". The local distribution within a suitable area will depend almost entirely upon movements of the larva and genetic variability within the moths is probably maintained by fertilization of the females by moths from other regions, the sturdily-built male suggesting that it is capable of strong and sustained flight.

Nenthorn constitutes an exception to the typical *M. strategica* habitat described by Gibbs (1962) as "pasture land near the coast where the rainfall is moderate (mean annual rainfall about 40 inches) but the climate is rigorous with much misty, windy weather and light snow falls in winter." At Nenthorn the average rainfall of 23.7in falls mainly in autumn and spring. Drought conditions exist in summer, with some high temperatures recorded. Winter is also fairly dry, but with some snow and long periods of heavy frost.

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