Influence of Larval Environment on Adult Size and Fecundity in the Moth *Panaxia dominula* L.

THE scarlet tiger moth, *Panaxia dominula*, is to-day found only in southern parts of the British Isles. Since it was at one time a little more widespread¹ the present distribution may be due to the action of environmental limiting factors rather than to the lack of opportunity to colonize more northern parts of the country. Evidence is presented here which supports this assumption.

The wing-span of moths caught in several English colonies was measured from the tip of the right wing to the centre of the thorax on pinned specimens. There is considerable variation in size between different colonies, insects from Devon being significantly larger than those from Berkshire (Table 1a). (For the difference between Axmouth and Cothill: males, $t = 10.37$, $P < 0.001$; females, $t = 10.89$, $P < 0.001$). When larvae were collected late in development and reared to maturity under similar conditions it was not manifested (Table 1b). For the males, $t = 0.23$, $P > 0.80$; for females, $t = 2.11$, $P = 0.05-0.025$. It seems likely, therefore, that the differences in size between wild-caught insects are determined primarily by environmental dissimilarities between the colonies rather than by the genetic constitution of the individuals in them.

The number of eggs produced by bred females was counted and their wing-span measured. When productivity is plotted against wing-span it is seen that there is a significant positive correlation between them in a sample of 22 from Cothill ($r = 0.604$, $P < 0.01$), and in a sample of 6 from Kingsdown, Kent ($r = 0.852$, $P < 0.05$). The correlation is just below the 5 per cent level for 28 specimens from Axmouth ($r = 0.347$. With 28 points the 5 per cent value is 0.374). The data are shown in the graph (Fig. 1). It may be that in Nature environmental conditions do not affect the mean number of eggs to the same extent, but the range in size in the experimental régime was considerably less than that between naturally emerging insects from the Devon and Berkshire colonies, so that the results strongly suggest that size differences in them are accompanied by a corresponding variation in egg production. Similar data from other insect species are discussed by Klomp². In this example the smallest individuals come from

Fig. 1. Regression of number of eggs on wing-span of female parent. ○, Cothill; ●, Axmouth; △, Kingsdown. In this series the size was measured from wing-tip to the join of nervures 1 and 2

Table 1. a, SIZE IN MM. (TO NEAREST HALF MM.) FROM TIP OF WING TO CENTRE OF THORAX IN INSECTS CAUGHT WILD

	No.	Mean and standard deviation	Range
Cothill (Berks) ♂♂	27	23.30 ± 1.15	21.0-26.0
Cothill ♀♀	25	22.78 ± 0.98	21.0-24.5
Sheepstead Hurst (Berks)	15	24.10 ± 1.15	22.5-25.5
Bradfield (Berks)	4	25.75 ± 0.65	25.0-26.5
Newbury (Berks)	4	25.88 ± 1.32	24.0-27.0
Burgate (Hants)	8	25.81 ± 1.12	23.5-28.5
Axmouth (Devon) ♂♂	68	25.96 ± 1.07	23.5-28.5
Axmouth ♀♀	42	25.54 ± 1.04	23.0-27.5

Table 1. b, MEASUREMENTS (TO THE NEAREST HALF MM.) ON ADULTS BRED FROM FOURTH INSTAR LARVAE

	No.	Mean and standard deviation	Range
Cothill ♂♂	16	24.81 ± 1.48	21.5-26.5
Cothill ♀♀	22	23.82 ± 1.66	22.0-27.0
Axmouth ♂♂	20	24.70 ± 1.42	22.5-27.0
Axmouth ♀♀	31	24.71 ± 1.28	21.5-27.0

colonies near the edge of the present range. They probably lay fewer eggs than those from south-west England, so that reduced productivity may be one of the limiting factors.

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¹ Cook, L. M., *Entomologist*, 92, 232 (1959).

² Klomp, H., *Arch. Neerland. de Zool.*, 13, Supp., 319 (1958).

Localization of Esterase in the Cuticle of the Nematode *Ascaris lumbricoides*

THE cuticle of nematodes, because of its obvious skeletal functions and its importance as a barrier to nematocides, has recently been the subject of much research. Bird and Deutsch¹ and Bird² have greatly increased our knowledge of the structure of the cuticle of *Ascaris lumbricoides* and various other workers have added to our knowledge of the chemical composition of the cuticle³⁻⁵. Although Fairbairn⁶ states "it would seem wise to regard the integument as a fully integrated living tissue, rather than as an inert horny sheath" there has been no evidence to show that the cuticle of nematodes is metabolically active.

Frozen sections (50μ) of *Ascaris lumbricoides* (from pigs), fixed in 10 per cent neutral formol saline at 4° C. for 24 hr., were tested for non-specific esterase activity by two methods as described by Pearse⁷ (1), the naphthol AS acetate-fast red TR salt and (2), the 5-bromo-indoxyl acetate methods.

A positive result was obtained, with both methods, in the homogeneous, or matrix, layer of the cuticle but not in any of the other layers. The colour was most intense at the anterior and posterior ends of the nematode. In transverse sections there is a narrow gap in the deposit of stain in the homogeneous layer at the lateral lines.

There was complete inhibition of colour formation after incubation with 10⁻³ M silver nitrate; 90-100 per cent inhibition after 10⁻⁴ M E600 (diethyl p-nitrophenyl phosphate); 50 per cent inhibition after 10⁻³ M cupric sulphate and 90-100 per cent inhibition after boiling for 15 min., but 10⁻⁴ M eserine appeared to have no inhibitory effect.

Lipids are known to be present in the cuticle of *Ascaris* and certain other nematodes^{8,9}. Contrary to the findings of Bird¹⁰, a weakly positive result for lipid was obtained with oil red O in the homogeneous layer of the cuticle. Thus the distribution of non-specific esterase coincides with the distribution of lipid in the homogeneous layer of the cuticle of