Activity and Insect Survival

WHILE laboratory experiments have revealed new facts of insect biology, some have given results which have been interpreted in such a way as to cause confusion. Experiments measuring longevity have often given ambiguous results. At present, much work is being done on the survival of the bed-bug, *Cimex lectularius*, and as this insect is a domestic pest usually found in confined spaces, it appears at first sight admirable for laboratory study. Imprisonment among paper in a tube differs little from the conditions of the normal environment. Yet the times of survival found by various investigators^{1,2,3} working under similar climatic conditions are so different that it is, for example, quite impossible to say how long bugs must be left in an unoccupied house with no sources of food before they will all die from starvation.

Recent experiments throw some light on the subject. When newly emerged, unfed and unfertilized females of *Cimex lectularius* were starved, singly, in 3 in. $\times$ $\frac{1}{2}$ in. glass tubes at 30° C. (86° F.) and 25 per cent relative humidity, in darkness except when examined, they survived on an average 134 days (limits 116 and 145 days, standard deviation 9.1). The insects seldom moved more than a few millimetres. Now if similar bugs after only one week's starvation were put on an open and well-illuminated surface, they would run about rapidly. If they were kept running for several minutes, and then allowed to feed, they survived; but if they were *not* fed, they died in a few hours. The extra activity due to running for several minutes was apparently sufficient to exhaust reserves which would have kept a resting bug alive for several months. In the longevity experiments mentioned above, I took particular care not to disturb the insects when examining them, and thus obtained a length of life far longer than that previously found by other workers under similar climatic conditions.

It is not unlikely that by using suitable methods we shall find that at temperatures comparable with those occurring naturally in Great Britain, bugs will be able to survive for years. The variability of previous workers' results appears to depend on the extent to which their technique disturbed the insects; in the field, conditions which affect activity will affect longevity, not only with *Cimex* but also with other species. Experiments must be planned to make allowances for this important factor. In the case of the bed-bug we must discover what internal and external stimuli cause activity and hunting for food, and how often unsuccessful individuals die from exhaustion.

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¹ Geisthardt, G., *Z. Parasitenkde.*, **9**, 151 (1937).

² Johnson, C. G., *Proc. Zool. Soc. Lond.*, **A**, 107 (1937).

³ Kemper, H., *Z. Morph. u. Okol.*, **19**, 160 (1930).

Occurrence of young *Ophiothrix fragilis* within the Genital Bursa of the Adult

It has been recorded by Mortensen^{1,2,3} that young specimens of the ophiuroids *Ophiothrix fragilis* Abildgaard, *O. triglochis* M. and Tr. and *Ophiactis Krøyeri* Ltk. are sometimes to be found clinging to the arm spines of the adults. The occurrence of the young individuals on the adults does not, in Mortensen's opinion, indicate a viviparous habit in these

ophiuroids since one, at least, namely *O. fragilis*, is known to have pelagic larvæ; rather, it is "quite by chance that the young ones, after their metamorphosis from the pelagic larvæ, happen to settle down on adult specimens in places where these latter occur in good numbers"².

In view of this 'accidental' appearance of the young ophiuroids on the arm spines of the adult, it would be unwise to assume that their presence, even within the adult genital bursa, was, in itself, an indication of a viviparous habit. Fedotov⁴, who found a specimen of *Gorgonocephalus eucnemis* M. and Tr. with a young individual in the depth of the bursa was inclined to regard *Gorgonocephalus* as viviparous, although he considered the question, on such evidence, as not being entirely solved.

While working at the Plymouth Marine Biological Laboratory in December last, I examined some two hundred specimens of *O. fragilis* and found that about 10 per cent of that number had young *Ophiothrix*, of a disk diameter of 0.25–0.5 mm., clinging to the spines and tube feet of the oral side of the arms. The number present on a single individual varied from one to fifteen. In five of these individuals, however, much larger specimens (of about 2 mm. disk diameter) were found *within the bursa*, one in each adult. The presence of young brittle-stars within the bursa of an oviparous species demonstrates conclusively that their presence does not necessarily indicate viviparity.

In the case of *O. fragilis*, the young post-metamorphic stages find shelter among the spines of the older individuals, from which they can only be dislodged with difficulty owing to their habit of wrapping round the spines and attaching themselves by means of their arm hooks. With increasing size, attachment becomes a matter of greater difficulty and it may be supposed that the larger specimens, in search of better shelter, occasionally move towards the openings of one of the bursæ and crawl inside, there to settle until they become too large to be housed in comfort. They would then leave the bursa and seek the shelter of a rocky crevice or stone as is the habit of the species.

On this assumption, the bursa would be regarded as a convenient habitation, rather than a nursery, for the post-metamorphic brittle-stars.

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¹ *Acta Zoologica*, **1–2** (1920).

² *Vidensk. Meddel. f. Dansk. naturhist.*, **93** (1932–33).

³ *Danish Ingolf Exped.*, **4**, Nr. 8.

⁴ *Trav. Soc. Nat. Petrograd*, **46** (1915).

Effects of Soft X-Rays upon Chaetopods

THE effects of X-rays upon *Tubifex tubifex* and some other members of the class Chaetopoda have been investigated by Stone, Turner, Zhinkin and others. They have reported, in general, that hard X-rays inhibited or destroyed the capability of regeneration, because it destroyed the neoblasts, although in appearance the general body tissue was little affected by their dosages.

It occurred to us to investigate the behaviour of *Tubifex tubifex* when irradiated with soft X-rays from a copper target X-ray tube operated at 30 kv. and 10 ma. The most intense part of the radiation had