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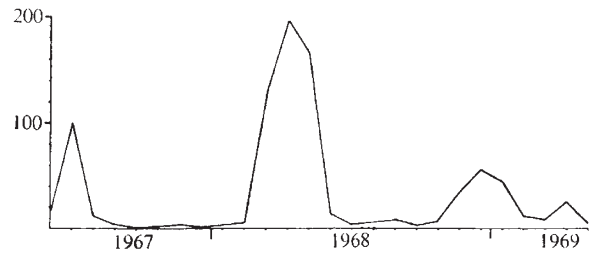

Fig. 2 Numbers of young *Agriolimax reticulatus*, weighing less than 25 mg, from soil samples.

The Leap-frogging Slug

PREVIOUS reports of the life cycle of the slug, *Agriolimax reticulatus* (Müller)[1,4], have maintained that there are two generations a year. A spring generation hatches in March to May and grows during the summer to give rise to an autumn generation which hatches in September to October and this grows during the winter to produce the next spring generation. In a recent study at Cambridge this pattern seemed to be confirmed. Outdoor cultures of *A. reticulatus* were kept on soil with adequate food and moisture and laid eggs within 5–7 months of hatching.

A field sampling study at the same time showed, however, that this pattern may not always be followed. Slugs in their natural environment do not always have adequate food and moisture so that their growth is slower. Moreover, the development time of their eggs can be considerable, particularly during the winter months, when *A. reticulatus* takes more than 3 months to hatch (Table 1). When these factors are taken into account, two complete generations a year would not always be possible.

Table 1 Mean Time taken by Egg Batches, kept Out of Doors, to Hatch

Period of egg deposition	No. of batches	Mean weeks to hatch
1 10 68–14 10 68	7	4
15 10 68–28 10 68	12	5
29 10 68–11 11 68	5	8
26 11 68– 9 12 68	5	12
10 12 68–23 12 68	4	13
24 12 68– 6 1 69	3	14
7 1 69–20 1 69	3	13
21 1 69– 3 2 69	1	12
4 2 69–17 2 69	1	11
18 2 69– 3 3 69	3	10
4 3 69–17 3 69	3	9
18 3 69–31 3 69	1	7
15 4 69–28 4 69	3	5
29 4 69–12 5 69	7	5
13 5 69–26 5 69	5	4

The field samples were taken every 4 weeks from an uncultivated plot near Cambridge. Twelve sampling units, each of 1 cubic foot of soil, were dug every 4 weeks and the slugs extracted from this soil by flooding[3]. The slugs were weighed, dissected and examined for maturity. The weights were divided into 50 mg categories and analysed by the method of Harding (1947) (ref. 2). By this method, it is possible to separate superimposed frequency distributions representing individual generations (Fig. 1). From this analysis, there seemed to be several overlapping generations at certain times of the year.

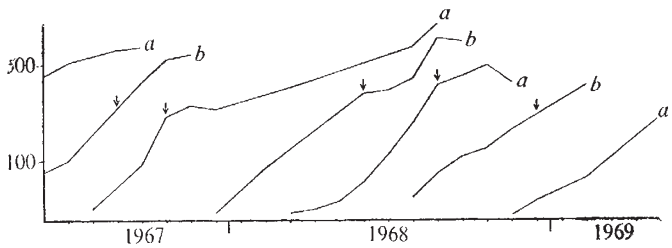

Fig. 1 Growth rates of *Agriolimax reticulatus* in a natural population. The arrow indicates the first appearance of mature slugs in each generation.

In general, there seemed to be two "leap-frogging" sets of generations: (*a*) a generation hatching in July 1967 giving rise to a generation in April 1968, which in turn produced a generation in December 1968 (Fig. 1*a*); and (*b*) a slug generation hatching in November 1967; this produced a small generation in August 1968 which in turn gave rise to a generation in April 1969 (Fig. 1*b*). This conclusion was confirmed when the numbers of newly hatched *A. reticulatus* in samples were considered separately (Fig. 2). Each peak in numbers of these slugs coincided with the appearance of a new generation so demonstrated above. Although this preliminary work demonstrates the possible basic pattern of the *A. reticulatus* life cycle, variation may occur in other years and in other regions. Also, there is probably considerable variation within each generation itself: some slugs may mature quickly enough to contribute to the generation immediately following it, as well as their main contribution to the next but one generation. Although many soil dwelling invertebrates have overlapping generations, it is unusual for an invertebrate to have a "leap-frogging" generation pattern like this, particularly when the generation interval is of 9 months.

A knowledge of the biology and ecology of these crop pests will be vital to their efficient control: many control systems are at present designed to reduce populations immediately before the breeding season and it may now be necessary to modify these systems.

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Extensions to the Study of Science Students' Divergent Thinking Ability

AN important aspect of creative performance in several fields of endeavour is the ready production of diverse ideas. Several paper and pencil tests have been devised to measure the