

Studies on the Lymnaeid Snail, *Fossaria parva* (Lea).

PART II: SEASONAL LIFE HISTORY

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During the years 1935 and 1936, quantitative collections were made and field observations completed for a study of the seasonal life history of *Fossaria parva*. Material was collected from an intermittent stream at Peoria Heights, Illinois, in an area described in a previous paper (Hoff, 1936). Quantitative collections were made monthly from January, 1935 to June, 1935 and occasionally during the remainder of the observation period beginning December, 1934 and ending December, 1936. The population samples were taken during the second week of the month.

Method of Collection.—The method of taking the monthly samples varied with the seasonal habitat of the snail. During the winter months, material was collected from the bottom of the stream beneath the ice. This material with some water was removed to room temperature where, as the material and water warmed, the snails began to climb up the sides of the container. From a position near the top of the vessel, the snails could readily be removed. Considerable care was taken to secure a representative sampling; the nature of the population curves attests this accomplishment. During the spring, the adults could be hand-picked from the muddy flats. As the young are of small size during this period, it is necessary to immerse soil, from the muddy flats, in water and remove the snails when they climb to the tops of the jars. Because of the difference in collection of samples, the resulting data do not give the proper numerical ratio between the parent and progeny generations. In each sample, a hundred individuals of each generation present were considered sufficient as far as this study was concerned.

The monthly collections were supplemented by direct field observations. Field trips were taken weekly during much of the observation period; although less frequent field trips were necessary when the snails were in aestivation. Pertinent facts concerning the first appearance of eggs, death of the adult generation, details of habitat, and the like were gathered by field observation. Often it was found that more accurate and decisive data might be secured from direct observations than from population sampling, although the latter lends itself excellently to methodical analysis.

Seasonal Life History; Influence of Climatic Conditions.—Collections made during the winter and early spring show that only one generation is represented in the samples as the population curves for January to April (inclusive), 1935, are unimodal (Fig. 1). The growth indicated by the difference between the January and April, 1935, population curves occurs largely after the March collection as there is little growth preceding the first part of March. During the winter period, the snails are rather inactive and may be found on the bottom of the stream under the ice. After the middle

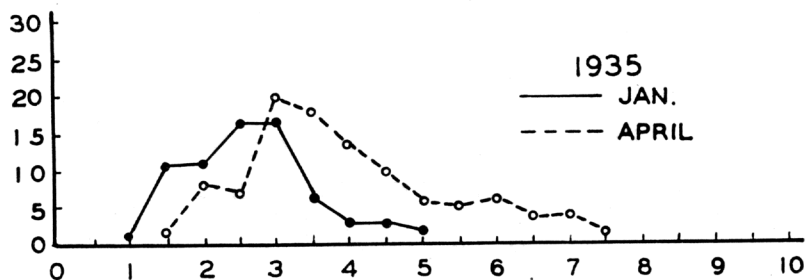


FIG. 1

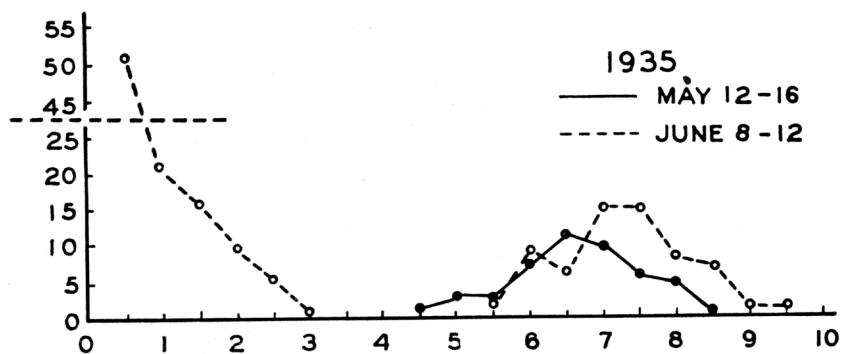


FIG. 2

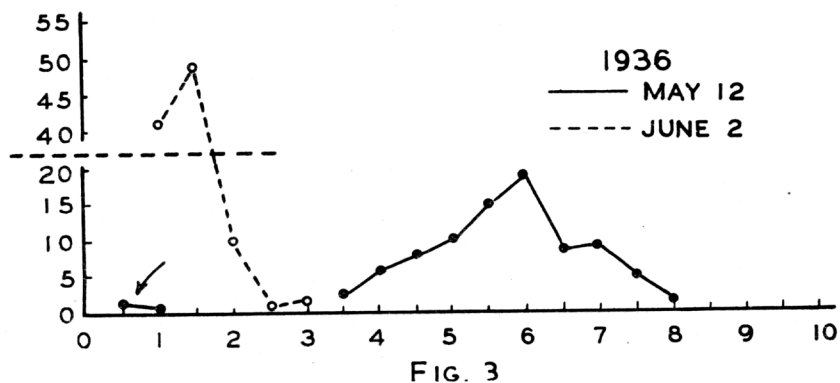


FIG. 3

EXPLANATION OF FIGURES

Distribution of the population in the months and years. The ordinate represents the number of shells dispersed in size-groups of $\frac{1}{2}$ mm. based on height of shell as indicated in mm. along the abscissa.

of March, the snails become very active and pass freely in and out of the water in accord with changes in temperature of air and water. In the spring, the snails become terrestrial in habitat. Growth is very rapid during this period as may be seen from a comparison of the graphs for April and May, 1935 (Figs. 1 and 2), and May and June, 1935 (Fig. 2).

Field observations indicate that egg-laying begins about the first of April and continues for approximately one month. The young may be found after the second week in May and hatching continues until the second week in June; but both egg-laying and subsequent appearance of the young may vary considerably with the meteorological conditions of the particular year under consideration. In 1936, a few young were found on May 12 (Fig. 3); but in 1935, no young appeared in the May collection (Fig. 2). On June 10-12, 1935, snails were still being hatched while on June 2, 1936, hatching had been completed. This discrepancy between June, 1935, and June, 1936, may be readily explained by differences in the weather. In 1935, the spring was wet, thereby retarding egg-laying and appearance of the young; while in 1936, the spring was dry, the eggs were laid at an earlier date and through a shorter duration of time.

Climatic conditions also have a bearing upon the life span of *Fossaria parva*. In Fig. 2, the adult generation is shown in both May and June, 1935, while in Fig. 3, the adult generation is confined to the May, 1936, collection. The drying up of the muddy flats at an earlier date in 1936 than in 1935 evidently had a direct effect upon the death of the adult generation. It will be noted that the relative sizes of the adults in May, 1935 and May, 1936 are approximate so that the earlier death of the adults in 1936 may be attributed not to *Fossaria parva* having reached the maximum size of the species but to some change in environment brought about probably by a lack of moisture. That growth continues until the time of death is shown by the size distribution graphs for May and June, 1935, in which year the adult generation died in the week following the collection of the June sample. Continuance of growth until death is common in many molluscs although some snails, as the *Polygyra*, form a lip when maturity is reached. This lip marks the termination of increase of shell size although an increase in thickness of shell and weight of body is evident during the period of maturity (Foster, 1936).

After the hatching of the young in late May and early June, growth of *Fossaria parva* is rapid so long as the proper conditions of moisture prevail. When the stream ceases to flow and the surrounding area becomes dry, the snails resort to aestivation in order to avoid the effects of desiccation. During the driest part of the summer when the soil in the stream bed is caked, meager collections of the snails may be made by digging beneath the hardened upper layer and removing some of the under soil to moist containers. The aestivating snails respond to a gradual addition of water and may be captured when they seek air and come to the surface of the water in the container. Soil collected in the shaded areas of the stream bed contains more aestivating snails than soil taken from sunny places. Close to crawfish chimneys (plugged with pellets of dried mud at this season), it is often possible to secure fairly good summer collections.

The annual life history of *Fossaria parva* may be summarized as follows: (1) Each generation produces a single brood; (2) Eggs are laid in April and hatch in May and early June; (3) The adult generation dies in June; (4) The life span is twelve and one-half to thirteen and one-half months; and, (5) Growth is confined to definite seasons of the year, is influenced by climatic conditions, and ceases only with the death of the individual.

Annual Migratory Cycle.—Because of the direct correlation between periods of growth and physical conditions in environment, a summary should be made of the annual migratory cycle of this species. Although *Fossaria parva* occupies a different habitat than the larger Lymnaeid shells, the annual migratory cycle agrees in principle with the cycle of the lake *Lymnaea* as reported by E. P. Cheatum (Cheatum, 1934). However, the spring migration of the lake Lymnaeid shells is not so intense as that of *Fossaria parva*, because the former migrate only from deep to shallow water while *Fossaria parva* migrates from the deeper pools to shallow areas near the edge of the stream and eventually leaves the water to take up an abode upon the muddy flats. As previously shown (Hoff, 1936), this species is aquatic during the winter, amphibious from the middle of March to the middle of April, and terrestrial from the last of April until the fall rains begin. Aestivation extends from about the first week in July to October or November.

REFERENCES

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