

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

Part I: Winter Habits

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During the winter of 1934-1935, the writer made monthly collections of the Lymnaeid Snail, *Fossaria parva* (Lea) for the purpose of studying the life history. Information relating to the winter habits was also gathered during twenty-six field trips in the period between December 18, 1934, and May 16, 1935, and six trips from November, 1935, to March, 1936.

Collections of *Fossaria parva* were made from an intermittent stream which has a maximum depth of about twelve inches and a maximum width of two feet. Clear, cool surface water fills the stream from the middle of November until the last of June. At times of excessive rain, the stream may spread over the bottoms which are 50-75 feet wide. The discharge, however, is so rapid that the bottoms are inundated for only short periods. The stream is located in what was formerly a meadow at Peoria Heights, Illinois.

The molluscan fauna of the stream consists of a single species, *Fossaria parva*. The only other aquatic mollusc in the vicinity is *Physa halei* which is found in large numbers in an artificial pond located out of the bottom area, about fifty feet from the stream, and at an elevation of about eight feet higher. Although the overflow from this vernal autumnal pond runs into the stream, it is a significant fact that no *Physa halei* have been taken from the stream.

The margins of this stream furnish a characteristic habitat for *Fossaria parva* which is said to inhabit wet, marshy places, generally out of the water on sticks, stones, or muddy flats (Baker, 1928, p. 287). In the specific locality in which the study was made, this statement applies during certain months of the year; but the writer has found that *Fossaria parva* lives almost entirely in the water from December to March of each year. This fact apparently does not contradict the statements of other writers, but rather illustrates a definite lack of information regarding the winter habits of the species.

The presence of *Fossaria parva* in this locality was first discovered on December 18, 1934, when several snails crawled up the sides of a jar containing bottom material from the stream. In the autumn of 1935, the snails were observed in the stream during the first week in December. At that time, water had been flowing in the stream for only ten days,

as the stream had been dry since July 1, 1935. Early in December, the snails were found in the quiet, shallow areas of the stream but as ice began to form permanently on the surface of the water, each increase in the extent and thickness of the ice caused a migration of the snails to deeper water where there was no danger of being frozen in the ice. During periods of partial thaw, the ice receded and the snails returned to more shallow water.

Throughout January, in both 1935 and 1936, snails were collected through holes chopped in the ice which covered the stream and in severe weather stopped the flow of water. The snails were found only in the quiet, deep pools where there was a layer of water under as much as six to eight inches of ice. Snails have been taken from bottom mud in pools whose surfaces have been continuously frozen for a month. During the periods of ice cover, the water is far from being devoid of oxygen because of the development of dense growths of the filamentous alga, *Schizomeris*. Being rather inactive and requiring small amounts of oxygen, it is possible that the oxygen required by the snails is absorbed directly by the bodies of the animals.

It is evident, during the months of January, February, and part of March, that *Fossaria parva* feeds very little if at all. This statement is the result of the observation of the following facts: (1) Collections of the buoyant, bottom-anchored *Schizomeris* showed that very few of the snails inhabited the algal growths but they were found beneath the growths on the bottom mud. This would indicate that the filamentous alga was not being used as food. Examination of the bottom mud indicated a lack of food until the last of March, where there was a development of uni-cellular forms such as diatoms and *Euglena*. (2) Examination of the alimentary canal of snails taken during the period showed no indication of recent feeding and no snails collected during January and February voided feces after their capture. (3) Studies of size distribution of individuals of the monthly collections show that there was little growth. The mean and the median of the individual collections showed an increase of 0.3 mm and 0.27 mm respectively between the January 6-7 collection and the March 8-10 collection in 1935. As the distribution curves in both cases are uni-modal and there was no increase in population due to birth or decrease due to natural death, it is evident that actual growth is indicated by the progress of the arithmetic mean and the median. As snails 8 mm in length are very common during certain months, it is clear that a growth of only 0.3 mm in two months is very small in comparison with the growth which takes place during more favorable seasons of the year.

Associated with *Fossaria parva* during December, January and February are the invertebrates characteristic of the intermittent stream. These include copepods, *Planaria*, and the larvae of the caddis-, horse-, soldier-, and midge-fly. The nymph of the stone-fly, *Perla*, is also

found. It is not until the second week in March that collections include the Isopod, *Asellus*.

During the year 1935, the first week in March marked a radical change in the physical condition of the stream. The corresponding change occurred, during 1936, in the last week of February. At this time, most of the ice disappeared from the stream except in the quiet pools and along the shore. Collections made on the 8th and 10th of March, 1935, showed that *Fossaria parva* was no longer found in the deep pools but had migrated to the more shallow areas. Here the snails remained, evidently feeding to some extent, until the warm days of late March when they were seen along the edges of the stream out of the water. They are never found out of the water, however, unless the water is free from ice and the atmospheric temperature is 40 degrees Fahr. or above. A change in the temperature of the air to less than 40 degrees appears to furnish the stimulus required for a return to the water. After cool nights, especially when a thin sheet of ice has been frozen along the shore, the snails will be found in the shallow water immediately under the layer of ice. As the ice melts under the action of the sun, the snails migrate from the water, only to return again when the nocturnal temperature falls below 40 degrees. This migration from water to land and back again is often a daily occurrence during the last two weeks of March and most of April.

As a check on field observations, experiments were performed to demonstrate the reaction of *Fossaria parva* to changes in temperature. Snails taken with bottom material in March and placed in jars at room temperature crawled out of the water and up the sides of the jars. When these containers were placed in a refrigerator, the snails returned to the water. At another time, fifteen snails, including both mature and juvenile individuals, were picked from mud flats during June and placed in shallow water in a large beaker cover. In less than one-half hour, all of the snails had crawled out of the water. The cover was then quietly removed from room temperature and placed directly on ice in a refrigerator. In less than three-fourths of an hour, all of the snails had crawled back into the water. The cover was then removed to room temperature and the experiment twice repeated with the same individuals. During the last repetition, many of the snails became moribund, evidently as a result of the rough treatment received by the radical and sudden changes in temperature.

As a result of heavy rains, a flood occurred on May 1-2, 1935, and the snails were scattered over a considerable portion of the flood plain. On May 12, the stream was well within its banks and the bottom was examined for the presence of snails. It was found that the occurrence of snails in the water was very rare and that they were concentrated about a foot from the water, on muddy flats consisting of silt carried in by the flood. These flats were small areas of one to two square feet, isolated by strips of grass, and between six and twelve inches above the

surface of the stream. In damp weather, snails could be found on such areas as far as ten feet from the stream. The snails apparently avoid vertical banks or areas with a slope greater than thirty degrees. After the middle of May, the snails remain, almost without a single exception, on these bare, muddy flats.

It is obvious that the winter aquatic habitat of *Fossaria parva* is of distinct advantage to the species, especially since the individuals found during the winter are immature and of a small size. Such a protective measure is in direct contrast to the condition found in the closely related species, *Fossaria modicella*, as observed by VanCleave (1935, p. 103) who states that there was no evident tendency for *Fossaria modicella* (living on vertical sandstone cliffs in Turkey Run State Park) to seek shelter during the winter. Such a contrasting condition which exists between two related, often confused (Baker, 1911, p. 245) species might offer another character for specific distinction between the habits of the two snails. Such a general statement, however, must not be made until there are further investigations of the species from other localities.

The writer wishes to thank Mr. F. C. Baker for determining the identity of *Fossaria parva* and *Physa halei* from specimens submitted to him and T. Dale Foster and Dr. H. J. VanCleave for many helpful suggestions.

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