The American Biology Teacher

Vol. 8 MARCH, 1946 No. 6

Snail Studies in Elementary Biology

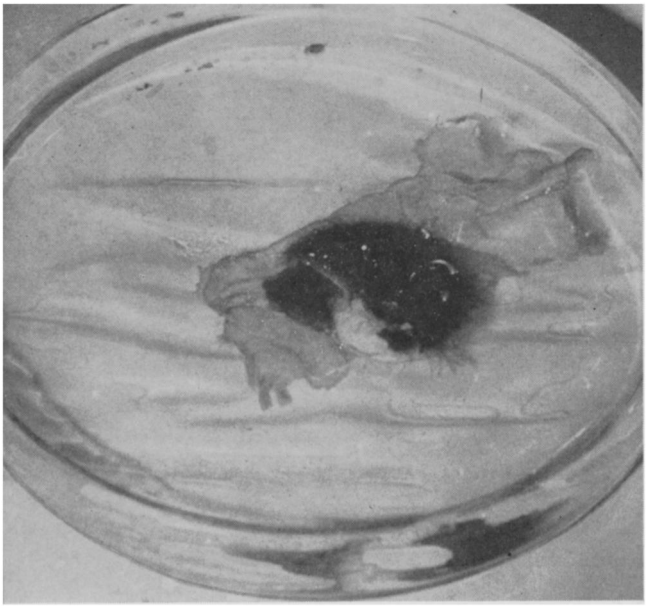
KARLEM RIESS
Tulane University, New Orleans, Louisiana

For many years the snail has been overlooked as a desirable specimen for elementary study. In the usual high school laboratory snails are found in every balanced aquarium. Their function as scavengers is mentioned briefly. Some instructors include the snail in the general classification system. That is just about all that the beginning student learns about them.

A survey of modern laboratory manuals and workbooks substantiates this. There is no mention of the snail as a specimen for student study. The usual reason given for this omission is that the snail is too difficult for the beginner to dissect. To overcome this a series of simplified studies has been devised for use in the high school biology course. These may be adapted to the junior college or college level. The studies were motivated by the general belief that the more familiar a laboratory specimen, the more interest is displayed by the students.

In most localities there is ample material available. All common land and pond snails are suitable for general observation. For dissection purposes the larger varieties are preferable. Most of the commercial biological supply houses are able to furnish a wide assortment. Some of the more familiar varieties for study are the land snail *Helix pomatia* and the fresh-water types *Physa* (pond snail); *Limnea auricularia* (African paper shell); *Limnea peregra* (wandering snail); *Limnea palustris* (marsh snail); *Planorbis corneus* (black or brown ramshorn); *Planorbis corneus rubra* (red ramshorn); *Paludina vivipara* (live-bearing snail); *Ampullaria gigas* (four-horned snail); *Viviparous (intertextus) contectoides* (Potomac green snail) and *Viviparous malleatus* (the black Japanese snail).

Snails of the land type are conveniently studied in a woodland terrarium. Woodland mosses, liverworts and native ferns, growing in humus or dampened leaf mold, serve as an adequate environment. Most of the land varieties enjoy shade and a little moisture. A number of these feed on the decomposing animal matter, or may be given fresh lettuce leaves.



Planorbis corneus, feeding on lettuce. This specimen, recently obtained from an outside pond, carries a growth of algae on the shell. A Petri dish is quite suitable for student observation. Photograph by A. E. Martin, Jr.

Aquatic snails may be kept easily in the balanced aquarium. They feed on algae, on prepared powdered fish food, on food not consumed by the fish, and on decomposing animal matter. For the smaller varieties dried powdered lettuce leaves or rice flour is suitable. Ramshorns like a little raw meat at the point of decomposition. Japanese snails enjoy powdered cuttlebone. *Ampullaria* prefer water plants.

Marine snails thrive in the salt-water aquarium. Marine algae, seaweeds and artificial foods may be used. These snails are more difficult to keep than the fresh-water varieties.

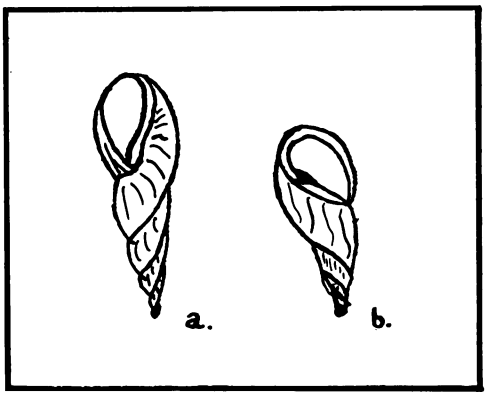
Suggested Studies

1. General Observations

An assortment of both types of snails may be used. This study should include detailed observations on (a) differences in external appearance; (b) method of locomotion; (c) method of feeding; (d) length of life; (e) differences between land and aquatic varieties.

2. Shell Structure

The rotation of the snail shell forms a unique study. The student of artistic nature may sketch many snail shells, and arrange according to type of rotation. The two types are dextral (right-handed) and sinistral (left-handed) coiling. For example, *Limnea* is dextral; *Physa,* sinistral. *Physa* has a short, spiral shell. *Planorbis* has a flat, spiral shell. If marine snails are available, the students may compare the shell formation of these with fresh-water varieties. If desired, the shells themselves may be preserved and arranged for display.



Shell rotation
(a) *Limnea* (dextral).
(b) *Physa* (sinistral).

3. Water Effect

Snails are familiar trouble-shooters in the fresh-water aquarium. They tend to stay close to the edge of the water if it is foul or improperly seasoned. They object to excess oxygen in water.

For the more advanced students, or for a special project, the relationship of the *pH* of the aquarium water to the normal activity of snails is an interesting area for study. Using pond snails or any of the ramshorn varieties the effect of water of *pH* ranging from 4.0 to 12.0 may be investigated. This necessitates a rapid method for determining *pH,* such as commercial *pH* papers, or the spot-plate tests with indicators and color charts. Either of these is accurate enough for elementary work. The slight changes in acidity or alkalinity necessary may be produced with dilute hydrochloric or acetic acid, or with sodium or ammonium hydroxide. The effect on the shell, on locomotion, general health, feeding habits, color, length of life, etc., may be noted. Similar observations on the plants in the aquarium may be made.

This study may be extended, using rain, pond water, river water, artesian water, etc.

4. Reproduction

The snail illustrates two types of reproduction, egg-laying and live-bearing. These may be compared, using live specimens. The reproductive organs may be studied through dissection. A study of the development of the embryo would complete the analysis.

The Japanese snail is live-bearing. The young are born fully developed, quite small, and able to take care of themselves. The sexes are easy to identify. The right horn of the male is slightly longer than that of the female. Females once impregnated seem to remain fertile for the remainder of life.

The *Ampullaria* lay masses of large, beautifully colored eggs on the side of the aquarium, above water. The egg mass is about ¾ by 2 inches. The young fall into the water as the eggs hatch.

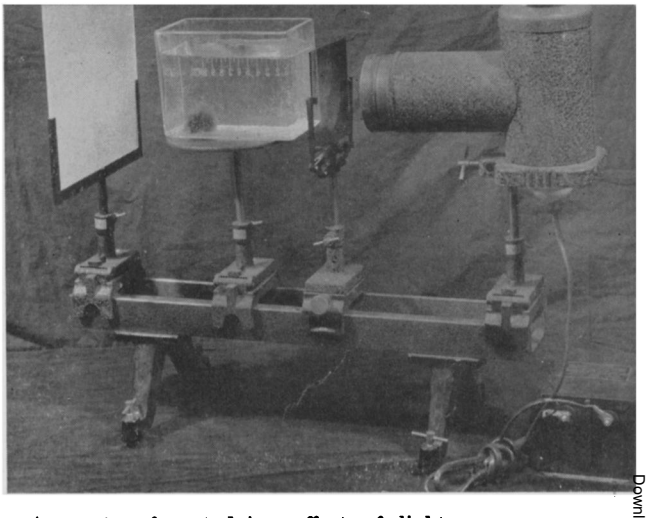
The African paper-shelled snail is a very rapid breeder, but short-lived. The young of the Africans and ramshorns should not be kept with large fish. Their eggs have transparent jelly capsules. The development of embryos may be followed with hand lens or microscope. A detailed, step-by-step study is an excellent project. The stages should be recorded by drawing and appropriate explanation. If the development proceeds too rapidly, low temperatures may be used to retard it.

5. Preservation

Snails may be killed by heating in water, or by dropping directly into a dilute solution of formalin. These two methods are convenient, simple and useful. Specimens thus treated may be studied at leisure. The water method may be used to clean shells for mounting. Various strengths of formalin may be used, and the effectiveness compared, 6%–10% being the preferred range of concentration.

6. Anatomy

The snail is classified as a representative of Phylum Mollusca, Class Gastropoda—that is, a mollusc with a head, a one-piece shell, and a body more or less spirally coiled.



Apparatus for studying effect of light on snails. A mercury arc source is mounted on an optical bench, with a holder for suitable filters and a ground-glass screen. The specimen is a large Japanese snail. The entire apparatus should be screened from external light. Photograph by A. E. Martin, Jr.

This coiling renders the dissection somewhat difficult. The large *Helix pomatis* is well suited for dissection.

The following parts should be identified: (a) head, with tentacles and eyes; (b) foot; (c) mantle cavity and mantle; (d) mouth, esophagus, stomach, salivary glands, buccal cavity, liver, intestine; (e) cerebral ganglia; (f) dart sac, vas deferens, penis sac, sperm duct, oviduct, vagina, testis, ovary; (g) heart.

7. External Effects

Interesting work may be done testing the influence of heat and effect of light on the behavior of snails. Regulated temperature "cells" with a wide range of temperature change may be used. Observations of the habits of the specimens may be recorded for set temperatures.

Terraria or aquaria may be illuminated by various types of light. With the many sources available today, an alert student may build up a profitable project. Comparison of the activity of the snails with respect to incident radiation may be made. This may be broadened for the advanced student by the insertion of various filters to allow the passage of limited wave lengths.

CORONET announces four new color films with sound; two of them dealing with camouflage in nature. Among the supervisors of these films are A. M. Bailey, Colorado Museum of Natural History and O. S. Pettingill, Carleton College, both former contributors to *The American Biology Teacher*.