Some Snail Hosts for Flukes in Oregon Livestock

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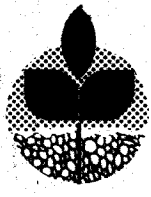

AGRICULTURAL EXPERIMENT STATION
OREGON STATE UNIVERSITY
CORVALLIS

Some Snail Hosts for Flukes in Oregon Livestock

J. N. SHAW
Professor Emeritus, Veterinary Medicine
Oregon State University

SUMMARY

This is a brief description of snail hosts for Oregon's liver flukes. The methods described for identification should be of some help to veterinarians and livestock men who might be involved in plans for control of these parasites.

"Oregon is a trematologist's paradise." This statement by Dr. David Sinitsin, Zoological Division, Bureau of Animal Industry, Washington, D.C., is a reasonably accurate summation of the facts. Dr. Sinitsin was, I think, justifiably excited about the Willamette Valley in western Oregon. During his work at the Department of Veterinary Medicine at Oregon State University some years ago, he confirmed the findings of *Lymnea bulmoides* as a snail host for the common liver fluke *Fasciola hepatica* and helped establish the host-vector relationship of this disease.

Recent studies have revealed some new information regarding snail hosts for *F. hepatica* that needs to be brought to the attention of Oregon veterinarians, livestock growers, and others interested in our ecology. Over the years, a number of snail species have been examined in an effort to determine their relationship to animal disease. The following is a summary of these findings.

(1) *Oxytrema silicula* (Gould). This snail was first studied in an effort to find the snail host for the *F. hepatica,* which is a common parasite of Oregon livestock. Instead of being the host for liver flukes, this snail later proved to be intermediate host for *Nanaphyetus salmoncola,* an intestinal fluke that carries the causative agent which produces so-called "salmon poisoning" in dogs, coyotes, and foxes.

The mature snail is dark in color and is about one inch long and one-half inch wide at the large end. The shell has five whorls which taper to a fine pointed spire, which in most adults is worn away. It is found in streams clinging

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to rocks on the sides and bottoms of the pools where the water is not so fast. If held with the spire upward, the shell turns clockwise with the opening on the right; thus, the snail is known as a right-hand snail. When this snail is described to fishermen, they will say, "Oh yes, the periwinkle," which, of course, is quite different (see Figures).

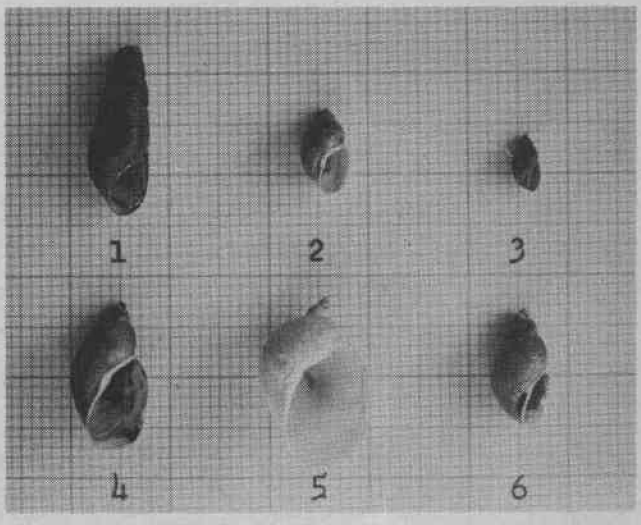

Figure 1. Photographs of the six snails described in the text with openings down.

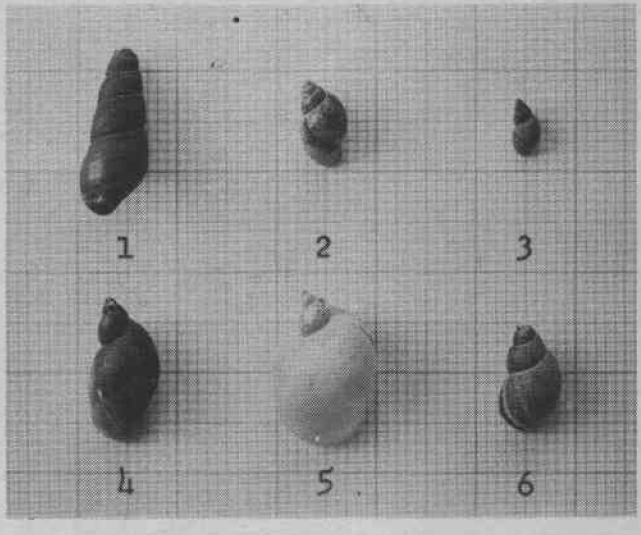

Figure 2. Same six species of snails as in Figure 1 with openings up and on the right, thereby showing the characteristic appearance of the "right-handed" snails.

O. silicula is found in Oregon and Washington from California to the south end of Puget Sound. It has not been reported from the eastern part of Oregon, and neither have authentic cases of salmon poisoning been reported from that area. The raccoon uses this snail for food and seems to be the most common reservoir host for the fluke that carries the organism that causes the disease in other carnivores.

Liver flukes infection, a common parasitic disease of cattle and sheep throughout the world and a less common disease of swine and man, has long been infamous as one of the great causes of financial loss to cattle and sheep raisers. The disease seldom kills an infected animal, although this can occur in atypical infections. The main loss comes from debilitation and condemnation of the liver by inspectors at packing plants.

Liver flukes pass through a complex life cycle in which snails play a key part. Eggs laid by the mature flukes pass through the intestines and to the outside. These eggs hatch under favorable conditions within 9 days, but hatching may be delayed as long as 13 months. The hatch, which normally takes place 20 to 90 days after the eggs leave the infected animal, are known as miracidia. These seek out an appropriate snail species and burrow through its flesh and into its body. Inside the snail the miracidia undergoes several transformations, ultimately becoming small milk-white, tadpole-shaped organisms called cercaria. A single snail may contain as many as 500 of these cercariae. Infected snails have been found at all times of the year except September, October, and February.

The cercaria leaves the snail either spontaneously or through injury to the snail, swims rapidly to grass, sticks, floating leaves, or weeds, then attaches and promptly forms cysts. In the process the whiplike tails are lost, and the cyst, now called a metacercaria, remains dormant until it is eaten by a susceptible animal. Attachment to floating objects can cause the metacercariae to spread for miles downstream from their point of origin.

Upon being eaten, the cyst wall dissolves and the metacercaria becomes an immature fluke and migrates through the body to the liver where it matures in the bile ducts and lays eggs to continue the life cycle.

The first snail host for the common liver fluke to be found on this continent was identified as *Lymnea bulimoides* (2). Identifications were made by several well known conchologists, including Morrison of the Smithsonian Institution and Dr. C. A. Wright, an experimental taxonmist for the British Museum of Natural History.

Many of the early identifications did not agree because they were based upon examinations of the shells only and there is considerable variation in size and shell markings. When the animals were examined, agreement was reached. Snails of this species have been collected from all parts of the state, and it is by far the most common of the snail hosts for *F. hepatica.* When grown in the laboratory and exposed to live fluke eggs, many cercaria are produced. The snail has been used extensively for determining the life cycle and transmission studies of liver fluke infestation of cattle and sheep.

(2) *L. bulimoides* is brown in color and varies in size up to 1cm in length and 5mm in width. It has a large body whorl and when held with the spire up, the opening is on the right side, another "right-hand snail." This snail, like others studied, deposits eggs in clusters. The number of eggs depends on the age and size of the snail. During dry spells, *L. bulimoides* burrows into the ground and estivates until the rains come in the fall, when it emerges and feeds on the leaves and dead grass. Lettuce serves well as food for snails raised in the laboratory.

Dissection of snails from various parts of the state revealed infested snails on only three farms. All three sources had serious fluke losses in sheep (Rifer, Science (2), 19-29). This snail also serves as a host for the *Fascioloides magna,* the large American fluke. This fluke has been observed in cattle, sheep, deer, and elk in Oregon and seems to be on the increase, especially in cattle (Knapp).

(3) *Lymnea ferruginea.* This snail is much like *Lymnea bulimoides* and is found in the same sort of habitat. When mature, it is about the same size but varies some in shape. The body whorl is not as large as *Lymnea bulimoides* and it has more whorls and a sharper spire. The opening is narrower and is also on the right-hand side when the snail is held with the spire pointed up.

When taken to the laboratory and exposed to the miracidia of *F. hepatica* and *F. magna* it produced cysts in about the same time as *Lymnea bulimoides.*

(4) *Pseudosuccinea columella* (Say). This snail, now known to some conchologists as *Lymnea columella,* has been collected in only a few places in Oregon. It seems to be more of a pond snail than most of the other snails studied.

When mature, it is 10mm in length and the body whorl is 5mm in width. Two smaller whorls and a small spire are included in its length. Those shells studied are

dark brown in color. This snail has been collected mostly from areas bordering the lower Columbia River. Experimentally, *L. columella* has proven very satisfactory as an intermediate host for *F. hepatica* and *F. magna.*

(5) *Radix auricularia.* This snail has been collected from three different places, all associated with ponds. In one pond used as a bass raising project, it seemed to thrive and was not being used for food by the fish. This snail has been incriminated as a snail host for *Fasciola gigantica,* the liver fluke that has also been found in cattle in Hawaii. The snails when exposed to *F. hepatica* miracidia failed to produce cercariae. The young snails used were obtained from a state bass hatchery. These snails did not do well in the laboratory and all succumbed before cercariae had a chance to develop.

(6) *Lymnea palustris.* This snail, somewhat larger than other snail hosts found in this state, is present in many small ponds and ditches draining such ponds. It does well in the laboratory, but when exposed to miracidia has failed to produce fluke cysts. However, the snail had been incriminated by Swales, W. E. (3), of Canada as an intermediate host for the common liver fluke.

The finding of three additional species of snail hosts for liver flukes widen the potential spectrum of fluke infection in Oregon livestock and increases the possibility of economic loss. Control measures should probably be considered more seriously than they are at present and more intensive research efforts should be aimed at both control and therapy of liver fluke infection before the economic loss becomes intolerable.

References

[1] Knapp, S. W., and Shaw. J. N. Occurrence of *Fascioloides magna* (Bassi) in Oregon Cattle and Deer. *J. Parasitol.,* 49 (1963): 339.

[2] Shaw, J. N. and Simms, B. T. Galba Bulimoides Lea as Intermediate Host of *Fasciola hepatica* in Oregon. *Science,* 69 (1929): 357.

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