Le Hon, H. *Préliminaires d'un Mémoire sur les Poissons tertiaires de Belgique* (Brochure de 15 pages, Bruxelles) 1871.

Locard, A. *Description de la faune des terrains tertiaires moyens de la Corse.* Paris and Geneva, 1877. Faune. Tert. Moy. Corse, 1877.

Priem, F. *Sur les poissons de l'Éocène Inférieur des environs de Reims.* Bull. Soc. Geol. France (4) **1**: 477–504, *pls. 10–11, 10 text-figs.* 1901.

Priem, F. *Etude des poissons fossiles du bassin parisien.* Mémoir published by Annales de Paleontologie, pp. 1–144, *pls. 1–5, 74 text-figs.* 1908.

Quenstedt, F. A. *Handbuch der Petrefactenkunde. Dritte umgearbeitete und vermehrte Auflage.* Tübingen, 1885.

Woodward, A. S. *Notes on some fish remains from the lower Tertiary and upper Cretaceous of Belgium, collected by Monsieur A. Hougheau de Lehaie.* Geol. Mag. **8**: 108. 1891.

Wyman, Jeffries. *Remarks on teeth of fossil fishes from Richmond, Virginia.* Proc. Boston Soc. Nat. Hist., **3**: 246–247. 1850.

ZOOLOGY.—*The snail* Pseudosuccinea columella *(Say) as a potentially important intermediate host in extending the range of* Fasciola hepatica *Linn.*[1]

Wendell H. Krull, Bureau of Animal Industry. (Communicated by Maurice C. Hall.)

In an attempt to find a prolific snail which could be easily raised in the laboratory and used for experiments involving the infection of individual snails with a single miracidium, a new intermediate host for the sheep liver fluke, *Fasciola hepatica,* has been discovered. This host is the snail, *Pseudosuccinea columella,* identified by Mr. Wm. B. Marshall of the U. S. National Museum. According to Baker,[2] *P. columella* has a wide distribution, "Nova Scotia west to Minnesota, eastern Kansas and central Texas; Manitoba and Quebec south to Texas and Florida," in ponds and streams where water is more or less stagnant, a habitat in which lily pads or cat-tails (*Typha*) occur, being especially favorable. This distribution makes this snail an important host for *F. hepatica* east of the Mississippi river.

In a recent paper by Krull,[3] another new intermediate host, *Fossaria modicella,* was reported for the United States. With these snails and the snails previously reported by other authors as intermediate hosts of *F. hepatica,* it is apparent that the range of distribution of suitable host snails provides a factor favorable for a wide range of distribution of the parasite. Its present known range involves the West Coast States, the Rocky Mountain States, the South-west, the Gulf Coast States, Michigan, and probably Wisconsin. It is not known to be present in the East, and the records from the Middle West are

[1] Received March 30, 1933.

[2] Baker, F. C. *The fresh-water Mollusca of Wisconsin.* Wisc. Geol. and Nat. Hist. Survey Bull. **70**: pt. 1, 507 pp. 1928.

[3] Krull, W. H. *New snail and rabbit hosts for* Fasciola hepatica *Linn.* Jour. Parasit. (In press) 1933.

scattered and need further validation. Apparently the parasite's range could be extended throughout the greater part of the United States, and new enzoötic areas of fascioliasis in cattle and sheep may be expected to develop in the United States unless widespread control measures are undertaken and kept in effect. We have at least two species of snails in the East which will serve as hosts.

Not only does its wide distribution make *P. columella* a potentially important host snail, but observations concerning its ecology, both in its natural habitat and under controlled conditions, show that it might become an especially important host in some places because of its ability to tolerate acid water. The American snails previously incriminated as hosts have been species which prefer alkaline water. In the vicinity of Beltsville, Md., most ponds and streams are acid, and many ponds and streams with acid waters occur in the eastern United States. The pH of the water in the pond from which the writer collected the original stock of *P. columella* which were taken as a source for the laboratory-raised snails used in the experiment, has been recorded weekly for 8 months, July, 1932, to February , 1933, inclusive, and the pH has varied from 6.1 to 6.8, a reading of 6.4 having been recorded several times for as many as 4 consecutive weeks. The tolerance of this snail to acid water has been verified in the laboratory also. Colorimeters used in determining the above pH values were prepared by the LaMotte Chemical Products Company, Baltimore. Chlorphenol Red and Phenol Red were used for indicators.

P. columella has been raised in the laboratory for approximately 6 months. The original stock was collected from a small pond on the Bureau of Dairy Industry Farm, Beltsville, and consisted of only a small number of snails. These snails are very prolific and easily raised, a new generation having been produced about every two months under laboratory conditions during the winter months. These facts concerning the rearing of the snails are of some importance in that such information may prove to be valuable in correlating such factors as relative abundance of snails with such control measures as the application of copper sulphate to fields. For example, the effective reduction of the number of intermediate snail hosts over a given area would not be quite so easily accomplished with a snail having a short life cycle, such as *P. columella*, as with certain snails of the genus *Helisoma* in which the egg-laying period, as determined from laboratory observations is of comparatively short duration and occurs only once annually. Effective destruction of *P. columella* might necessitate re-

peated applications of copper sulphate, which might not be necessary in dealing with species of *Helisoma*.

In the experiment which resulted in the implication of *P. columella* as an intermediate host of *F. hepatica*, the third generation of laboratory-raised snails was used. All stock snails of this species have been kept in evaporating dishes in filtered water and fed on fresh lettuce. Twenty-three snails used in the experiment were hatched about December 8, 1932, and were transferred to a stender dish on December 25, 1932, when they were half grown. Several hundred miracidia were taken out of a container in which *F. hepatica* eggs were hatching, and transferred to the stender dish containing the snails. The 23 snails were left in the stender dish with the miracidia for about 4 hours and were then transferred to a fingerbowl of filtered water. Microscope observations previously made on this species of snail in the presence of miracidia, showed that the miracidia attached to and penetrated into the snail.

Two of the 23 snails in the experiment were dissected and examined for rediae January 11, 1933, and, apparently, were negative. Another snail was dissected January 24, 1933, and 8 mother rediae containing developing daughter rediae were recovered. The first of the 20 remaining snails shed cercariae on February 10, 1933, 47 days after being subjected to infection, and 17 of the remaining infected snails were shedding cercariae after 8 more days had elapsed. The 2 remaining snails were negative. The largest number of cercariae shed by a snail in a single day was 161. One snail which had been shedding cercariae for 2 days was examined and the liver contained 241 rediae and 356 mature cercariae. The results in the above infection experiment have been verified in subsequent experiments by the writer.

ZOOLOGY.—*Descriptions of two new parasitic nematodes from birds.*[1] EVERETT E. WEHR, Bureau of Animal Industry. (Communicated by BENJAMIN SCHWARTZ.)

The first parasite described in this paper was collected by E. A. Chapin from the gizzard of a whistling swan, *Cygnus columbianus*, which died May 5, 1924 at the National Zoological Park, Washington, D. C. This nematode belongs to the family Amidostomidae Baylis and Daubney, 1926, subfamily Amodostominae Travassos, 1920, genus *Amidostomum* Railliet and Henry, 1909. Since the species in

[1] Received April 22, 1933.