

THE SNAILS OF SNAIL SHELL CAVE¹

GEORGE DAVIS, ARLIE A. O'KELLY, AND DOROTHY BACHTEL
STATE TEACHERS COLLEGE, MURFREESBORO

This particular paper concerns itself with the identification and chemical analysis of the snail shells of Snail Shell Cave. This cave is located in Rutherford County, Tennessee, ten and a half miles southwest of Murfreesboro and about two miles north of the Eagleville road. The cave is in what is believed to be the Ridley limestone of the Ordovician system, and so far as is known has never been described in any paper or publication. It is, therefore, little known except locally.

Snail Shell Cave proper is simply the channel of an underground stream. This stream flows across the bottom of an oval sink or depression which is from eighty to a hundred feet deep and approximately two hundred feet wide and three hundred feet in length at the brink. There is but little area in the bottom. Much of the wall of this sink is a perpendicular cliff of massive limestone. The bottom and the sloping part of the wall are covered with large boulders which have evidently fallen in from the top layers. In this paper "Snail Shell Cave" refers to this sink and not specifically to the stream channel. The channel being large, has been followed a mile down stream, but up stream the water is so deep that the cavity cannot be easily followed without a boat.

Over the sloping face of the depression, trees and various other plants are growing in the rocky, gravelly soil. On the greater part of the sloping face there is a covering of leaves and other plant remains in all stages of decomposition. The direct rays of the sun rarely ever reach the bottom of the sink and the soil is always more or less moist and cool.

The shells herein reported probably do not include every species which may be found at this cave, but collections were made at widely scattered areas and at several different times during all seasons of the year. In all, three orders, six families, nine genera, and seventeen species of shells have been identified. Many of the species are rather abundant while others are somewhat rare and but few specimen were collected. Only one species, *Goniobasis semicarinata* (Say) was

¹For some years the members of the Tennessee Academy of Science have been interested in the caves of Tennessee and Kentucky. At the Chattanooga meeting of the Academy in April of 1930, a symposium on caves was given. Dr. Berlen C. Moneymaker of the department of geology, University of Tennessee, read a paper on the Nature and Formation of Caves; Dr. Erwin B. Pohl of Vanderbilt University gave a paper on Underground in Tennessee and Kentucky; J. D. Ives of Carson-Newman College discussed Cave Animals of Tennessee; P. E. Cox, State Archaeologist, gave a paper on Cave Men of Tennessee; and John L. Morris, Teachers College, Murfreesboro, presented a paper on Tennessee Caves in Historical Times. In addition to these papers, there was published in Volume V, number 3 of the Journal of the Tennessee Academy of Science an article on Caves in Mythology by Dr. Charles E. Little of George Peabody College for Teachers.

taken directly from the water. All others were taken from among the soil and plant remains and no shells were found in the dark part of the stream channel that were not also found in the outer light part. The shells taken from the darker part were, therefore, believed to have been washed there by the stream. In his report on Cave Animals of Tennessee, Ives (1930) lists only one Gastropod (undetermined) and this was found in the twilight region and not in total



Fig. 1. The Stream in Snail Shell Cave.

darkness. This suggests that snails do not live in the darker parts of caves.

The kinds of snails found and the chemical analysis of their shells are given in table 1. The chemical analyses demonstrated that snail shells of the same species may not all have identical composition. By grinding two or more shells together and therefrom taking a sample the authors have been able to obtain fair results. The variance of

the calcium content between two shells of the same species was in some cases as great as two per cent. In few cases, however, was the total analysis of such a nature as to approach that of a shell of another species.

These analyses show that calcium oxide is the most abundant constituent of the shells, ranging from 33.29 to 65.50 per cent, while silica appears to be the least abundant of the constituents, ranging from 0.00 to 5.61 per cent. The percentage of calcium oxide reported may appear too high because of the fact that in pure calcium carbonate only 56 per cent is calcium oxide. We have observed that with the high percentages of CaO recorded there is not enough carbon dioxide found to account for all the calcium being present as carbonate. It is, therefore, possible that calcium is incorporated not only as the carbonate but also as a complex combination with other metals and compounds present as a union with iron and aluminum. A qualitative test for manganese was obtained in samples of certain species but failed to appear in other samples of the same species. It is accordingly omitted from the list given.

TABLE 1
Classification and Chemical Analyses of the Snails

NAME OF SHELL	CaO	MgO	(AlFe) O ₃	SO ₂	SiO ₂	CO ₂	P ₂ O ₅	Org. Mat.	Total
	%	%	%	%	%	%	%	%	%
<i>Polygyra hirsuta</i> (Say)	56.08	1.05	0.00	1.15	0.00	41.16	0.00	0.00	99.44
<i>Polygyra monodon fraterna</i> (Say).....	33.29	1.05	0.50	5.16	5.61	45.63	3.27	0.00	99.61
<i>Polygyra albolabr is</i> (Say)	60.20	7.25	1.57	0.50	0.00	30.20	0.00	0.00	99.70
<i>Polygyra zaleta</i> (Binney).....	65.50	1.35	1.35	0.40	1.25	28.82	0.00	0.72	99.40
<i>Polygyra fallax</i> (Say).....	46.80	0.00	11.15	17.45	1.80	20.50	1.21	1.09	100.00
<i>Polygyra elevata</i> (Say).....	58.00	2.60	0.00	11.20	0.00	25.52	2.61	0.00	99.90
<i>Polygyra troostiana</i> (Lea).....	58.97	4.50	3.43	3.05	0.50	28.80	0.86	0.00	100.10
<i>Polygyra infecta</i> (Say).....	49.10	0.90	20.65	0.90	2.70	21.60	1.25	2.57	99.70
<i>Anguispira alternata</i> (Pilsbry and Rhoads)	54.00	1.85	3.70	3.65	3.21	30.20	1.87	2.15	100.60
<i>Helico-discus parallel us</i> (Say)	54.21	5.16	12.14	1.22	0.00	26.85	0.00	0.05	99.60
<i>Retinella hammonis</i> (Strom)....	62.81	2.16	0.25	1.73	1.00	30.63	0.15	1.20	99.90
<i>Glyphyalinia, indentata</i> (Say).....	60.12	2.78	1.17	2.02	0.36	32.91	0.00	0.50	99.86
<i>Ventridens, suplesus</i> (Say) var.....	59.34	0.00	0.00	0.00	0.00	40.17	0.16	0.00	99.70
<i>Ventridens ligerus</i> (Say).....	58.11	0.00	10.17	15.17	0.11	16.54	0.00	0.00	99.90
<i>Pomatiopsis, lapidaria</i> (Say).....	60.53	0.50	9.35	2.92	0.00	26.63	0.00	0.00	99.90
<i>Helicina orbiculata</i> (Say)	58.96	10.15	0.00	0.00	0.50	29.60	0.25	0.50	99.90
<i>Goniobasis, semicarinata</i> (Say).....	60.70	1.50	0.50	8.24	0.00	26.71	1.57	0.50	99.70

An analysis of the soil in which the shells were found revealed the presence of those elements which were found in the snail shells. Cal-

cium was the most abundant of these but the percentage was much lower than that of the shells. This obviously indicates a concentration of the elements by the snail in building its shell.

Since these shells were all collected within the area of the sink, often only a few inches apart, it would seem that the variations in the chemical composition are due to the species or age of the specimen and not to the environment.

The authors wish to acknowledge the assistance given by David T. Jones of Bloomington, Indiana, in the final identification of the species of snails.

COLLEGE CONSERVATION

From a purely economic viewpoint the government must take cognizance of education—a \$2,500,000,000 industry directly affecting one-quarter of the national population. According to the 1930 census there are over 1,044,016 teachers of various kinds. In the classification of gainfully employed workers there were only seven groups out of 130 with more workers. . . .

From a social conception the government, as the instrument of society, is obligated to assume even a greater responsibility. The administration has provided for one group of the country's youth in the Civilian Conservation Corps. The impoverished college student has been left to his own resources. . . .

The student would not be the sole beneficiary of a national scholarship and loan fund. Increased enrollments would relieve the pressure now forcing colleges to curtail salaries and dismiss instructors. Many of the 80,000 unemployed teachers whom the NRA has so far ignored might regain their positions.

But there is a wider application—that in the interest of society. As the last line of defense against economic peril the education structure must be strengthened, not allowed to weaken. For in intellectual leadership lies the way out. The cost of a single battleship, an amount sufficient to finance many thousands of college men and women, would more than serve the purpose.—*The Dartmouth*.