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AN ANNOTATED LIST OF THE SNAILS OF DALLAS COUNTY TEXAS*

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Although great advances have been made in the study of many groups of Texas animals, the knowledge of the Mollusca is still very meager. Among the most outstanding papers giving treatment to the snails are Binney's classical "Manual of American Land Shells" (1885), Singley's Report on "Texas Mollusca" (1892), Baker's "Lymnaeidae of North and Middle America" (1911), Strecker's account of the "Mollusca of McLennan County, Texas" (1908) and Pilsbry's, Ferriss' "Mollusca of the Southwestern States" (1906).

Singley's pioneer contribution offers the basis for future faunal studies on Texas Mollusca. The valuable records which he was able to present were based principally on personal collections made over a period of sixteen years, and on those of his associates, H. J. Askew and G. H. Ragsdale. Since Singley's material came, essentially, from the southern part of Texas, his account does not convey a broad or intensive knowledge of the species that inhabit the state as a whole. This is especially true of the land snails which frequently occur in great abundance, both as individuals and as species. More recently, Strecker amplified Singley's work through his useful report on the "Mollusca of McLennan

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County" in the north central part of the state. Thus, it is apparent that the study of Texas snails is only just begun and that there exists a need for careful and continued collecting in numerous counties. A molluscan survey of individual counties has been started by the senior author with the hope of ultimately bringing together a large mass of data to support a comprehensive and authentic treatment of the snails of Texas.

In our work we have found that the individual species occur with great regularity in all suitable environments in the county, if due allowance be made for the element of chance in collecting. Therefore we have not encountered apparent colonies. Local variations are fairly common in certain of the more plastic forms that are able to live in a variety of habitats. In this connection it may be stated that the shells of land snails such as *Vitrea indentata, Zonitoides singleyana* and *Strobilops labyrinthica texasiana* are decidedly darker in color in individuals adapted to life in dense woods when compared directly with those selecting more open places to carry on their life processes. A parallel differentiation exists in that the inhabitants of the woods show a perceptibly thinner, more fragile shell than do those that are more exposed. Speaking generally, the repetition of like environments tends to produce like variations with mathematical precision, so that the different variational phases are in themselves subjected to a confusing geographical repetition and checkering, if viewed entirely from the standpoint of one not thoroughly familiar with conditions that produce these morphological types. This leads us to point out that variations that can be proved, through the agency of careful studies in the field or in the laboratory, to be purely environmental in nature should not be given full and lasting credence as distinguishing characters in the diagnoses of species and subspecies. They are to be regarded as helpful only when correlated with contrasts that are apparently genetic or germinal in nature.

The data at hand are the result of five years of collecting in Dallas County. In the majority of cases the stations cited have been visited many times and at different seasons of the year. Thus, it is believed that our collections have

been made from as great a diversity of habitats and conditions as the county affords.

The snails upon which this present account is based are in the Biology Museum of Southern Methodist University, where a basic series will be kept, but a duplicate set, including representatives of nearly all of the forms, will be deposited at an early date in the collections of the University of Michigan Museums, Ann Arbor, Michigan.

Thanks are due Mr. Calvin Goodrich for identification of the land snails, and to William J. Clench for the identification of the physids.

Collecting Stations

Collections of snails have been made at 21 stations. These are given their respective numbers in the following account, and are described below. Soil data used in these descriptions have been consistently obtained from Carter's "Soil Survey of Dallas County, Texas" (1924). The accompanying map (Fig. 1) shows the precise distribution of our stations in Dallas County.

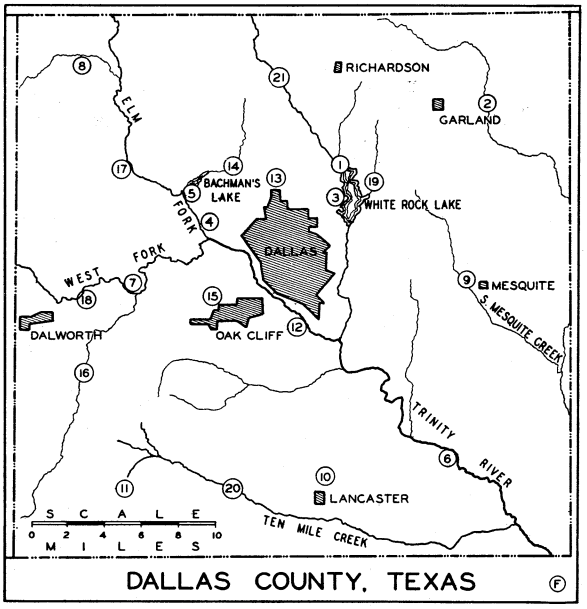

Fig. 1

Station No. 1—The soil of this station consists of Trinity Clay which follows the immediate vicinity of White Rock Creek, and is fringed on either side with Lewisville Clay and the shallow phase of Houston Clay. The land is low and marshy in the region next to White Rock Lake. This entire area is heavily wooded and has an abundance of fallen, decaying logs and stumps which serve as an admirable protection for snails. An abundance of drift along the creek and the lake is very productive from the standpoint of the minute species inhabiting the region.

Station No. 2.—The soil in this area consists of Trinity Clay, Lewisville Clay and Bell Clay, with a preponderance of the former. Collections were made among the trees that border Rowlett Creek and on the hillsides under limestone rocks, in small patches of drift, and under a few scattered rotting logs.

Station No. 3.—This station was very barren, with the soil consisting of Lewisville Clay, Bell Clay and a small off-shoot of Trinity Clay. The latter element projects from White Rock Lake by following a small ravine. Several snails were collected in drift along the lake, but an intensive search for them along the hillsides revealed very few.

Station No. 4.—This habitat is diversified by a mixture of Cahaba Fine Sandy Loam and Trinity Clay adjacent to the Trinity River; and by Leaf Fine Sandy Loam, Lewisville Clay and the low phase of Bell Clay above these Trinity deposits. The wooded sections along the river shelter many snails. This productivity is undoubtedly due to the excellent protection afforded by an abundance of rotting wood, which practically covers the region in many places.

Station No. 5.—The soil in this place is almost identical with that of Station No. 4. While the terrestrial forms were not as abundant here as in Station No. 4, a larger series of aquatic forms were collected. Most of the aquatic snails were secured in low swampy land just below Bachmans Lake. Here the small, spring-fed pools, which were partly filled with abundant food material such as *Spirogyra, Mougeotia* and *Zygnema,* acted as veritable reservoirs for *Helisoma lentus, Physa halei* and a few specimens of *Gyraulus parvus.*

Station No. 6.—This area, entirely composed of Trinity Clay, revealed a number of forms which normally inhabit heavily wooded areas. These were found under leaves and logs that were relatively exposed. This occurrence may

be accounted for, however, by the exceedingly damp soil which apparently does not dry out so readily as in certain other locations along the river.

Station No. 7.—The soil in this section is made up of Frio Clay, Frio Loam and Trinity Clay. A relative barrenness was noticed outside of the immediate surroundings of the stream. The trees are restricted to a very close margin next to the tortuous course of the West Fork of the Trinity River.

Station No. 8.—The soil in this vicinity is made up of Ellis Clay, Catalpa Clay and Lewisville Clay. Very good representative collections were made in drifts along the small meandering Grapevine Creek, which drains this region. The area is very productive in aquatic forms, due to the shallowness and sluggishness of the stream, and to the richness of plant food in the form of algae. Very few living terrestrial snails were collected since the protection available to them here is inadequate.

Station No. 9.—The soil at this place is composed exclusively of Houston Clay. Here the gently sloping hillsides, with their scattered limestone rocks, sheltered but very few forms of snails. The species present are those which are apparently the most resistant to drouth. A few *Physa halei* and *Helisoma lentus* were collected along small water courses which emptied into a rather large ponded area where protection in the form of trees and decaying logs was markedly scarce.

Station No. 10.—The soil in this station is made up of Houston Black Clay. This locality is very rolling, with limestone and sandstone rocks occurring abundantly on the hillsides. Along small ravines the trees are numerous and under thick blankets of leaves below their branches many living forms of the more minute species of snails were found. *Physa anatina* and a few *Helisoma lentus* were collected in a small creek which drains this area.

Station No. 11.—The soil in this region consists of the shallow phase of Houston Clay and Chalk. The country is very rolling and the hillsides are covered with limestone rocks. A few of the hardier snails were found under these rocks. Along the bed of Cedar Creek (which is apparently filled only during periods of heavy rains) a good representative series of the snails inhabiting this general region was gathered in drift.

Station No. 12.—This habitat is directly comparable to Station No. 6. The area is comprised of the same type of soil and the two places exhibit a striking correlation in their type of plant and animal life. With the exception of the Cahaba fine sand area, which extends into a very small corner of this locality, and is barren from the standpoint of the snail fauna, the same forms were collected in both places.

Station No. 13.—The soil in this area is composed of Houston Black Clay. Collections were made along Turtle Creek, which is a rather small spring-fed stream with alternating pools and riffles in the water which flows over a limestone bed. *Physa anatina* and *Helisoma lentus* are very abundant throughout the entire year in this locality. Sparsely distributed trees along the creek were found to harbor very few land snails. However, a good representation from the region drained by the creek was obtained in drift at this point.

Station No. 14.—This particular spot was very productive in land snails, especially in those that inhabit relatively dry regions. The soil here is composed of the shallow phase of Houston Clay, Chalk, Trinity Clay and Lewisville Clay. The land in the immediate vicinity of Bachman's Creek, which drains the area, is heavily wooded with many ravines breaking it into irregular sections. The sides of these ravines are covered with leaves, rotten sticks, and a few logs. Underneath this covering many of the more minute land forms were abundant and in the creek itself several species of aquatic snails were obtained.

Station No. 15.—In this area we expected to find the edible French snail, *Helix pomatia*, which was introduced by members of the French colony, *"La Reunion,"* that settled in this locality in 1854. An intensive search revealed none of these snails, although reports have come to us saying that the form has been found within this region in the past three years. The soil is composed of the shallow phase of the Houston Clay, Chalk and Ellis Clay. Most of the collecting was done along the White Rock escarpment which yielded a set of interesting specimens. This area is rather broadly exposed and the shells are of light coloration, no doubt due to bleaching. This phenomenon is noticed among the majority of shells collected along limestone cliffs and other exposed formations. Some protection is often afforded molluscan life in such places by a few trees that are scattered over the hillsides.

Station No. 16.—The soil in this vicinity consists of Catalpa Clay, Lewisville Clay and the eroded phase of Lewisville Clay. Most of the collections made here were from drift along the banks of Mountain Creek. The immediate region itself is comparatively barren of snail life. It may be characterized as an area of scattered trees on undulating ground, the interspaces on the hillsides being covered with short grass, or limestone rocks.

Station No. 17.—The soil in this part of the county consists of Trinity Clay, Catalpa Clay and Ellis Clay. Collections were rather easily made along the heavily wooded Trinity River, but very few snails were secured at a distance of two or three hundred yards from the stream. The majority of the snails were found under rotting logs or on the ground beneath a dense blanket of leaves which extends along the river bank. With the exception of life in a few isolated bayous and in an occasional pile of drift, the Trinity River, at this locality, is as devoid of Gastropods as the environs of any relatively large stream visited. However, certain of the dried up tributaries of the Trinity River, which are found at this point, indicate a rather large population of clams.

Station No. 18.—The soil in this region is composed of Trinity Clay, Frio Clay and the low phase of Bell Clay. The habitat is strikingly similar to that of Station No. 7. With the exception of land snails collected within fifty or one hundred yards of West Fork Creek, and those aquatic forms obtained in Horseshoe Lake, the adjacent territory was found to be relatively barren.

Station No. 19.—In total area this locality is larger than any other from which specimens were secured. As the result of no fewer than 24 field trips, the aggregate collection of aquatic snails from this region is decidedly greater than that from any other station. The soil at this point is composed of Trinity Clay, the shallow phase of Houston Clay, Lewisville Clay, Bell Clay and Houston Black Clay. The ground forming a bordering strip on either side of the creek of this section, which is known as Jackson's Branch and empties into White Rock Lake, is low and marshy. The amphibious genus *Succinea* occurs here in abundance, also, *Gyraulus parvus, Helisoma lentus* and *Physa halei.* Many small forms taken at this station inhabit the crevices and cavities of rotten logs or live in masses of damp, decaying grass. Others are found beneath the heavy blanket of leaves along the creek margin. Farther out in the outcrop-

ping of limestone rocks from the hillsides the hardier helicid forms are located.

Station No. 20.—The soil in this region is made up of Houston Clay and the shallow phase of Houston Clay. The surrounding country is similar to Station No. 11, with the exception that there is a much greater amount of lowland along Ten Mile Creek than along the stream mentioned in the discussion of Station No. 11. Many forms were collected in drift along the creek and in addition a series of succinids were found clinging to vegetation close to the water's edge. This locality was visited after heavy rains and the rushing water had washed many land snails into a large drift, which gave a wonderful representation of the snail fauna of the entire area.

Station No. 21.—The soil in this region is composed of Trinity Clay, Lewisville Clay, the shallow phase of Houston Clay, the low phase of Bell Clay and Chalk. This particular area is not far from the source of White Rock Creek. Although the vegetation is not as abundant as along the stream nearer to White Rock Lake, a good representation of snails was obtained from the woods, as well as from drift along the stream. The forms collected were very similar to those found in Station 14.

(Concluded in our next issue)

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A COMPARISON OF HARDNESS IN DALLAS WATER BEFORE AND AFTER TREATMENT IN THE CITY WATER PLANT

W. D. Frazell and Henry Lewelling

A measurement of the change in hardness produced in raw water by the usual treatment in the city purification plant of Dallas, Texas, was a project undertaken by the class in elementary quantitative analysis. The treatment which would affect the hardness was the addition of ferrous sulphate and lime at the time the water was pumped into the settling basins, and filtration through gravel. In making this comparison, the total alkalinity, temporary hardness, and permanent hardness of raw water and water