

THE UNIONIDE OF THE OHIO RIVER. BY R. ELLSWORTH CALL.

[ABSTRACT.]

There are now recognized in the freshwater molluscan fauna of North America more than one thousand representatives of the great family of Unionidae, or freshwater mussels. A few of these forms, which constitute a peculiarly well-marked division of the family, occur in Mexico and in Central America. Less than a score of species are found in Canada. The rest are peculiar to the United States and, for the greater part, are found east of the Rocky Mountains. More than ninety per cent. of all known forms are from the regions east of the Mississippi and south of the Ohio Rivers. The center of distribution for the described southern forms is the great central plateau region of Middle Kentucky and Tennessee, Western North and South Carolina, and Northern Georgia and Alabama. Within the area as above limited, occur nearly all the species that are known—outside of the great Unionide group known as the *complanatus* division. In all the larger streams, and in most of the smaller, throughout all this region, the members of the family flourish in both great numbers of individuals and species. About eighty per cent. of all described North American forms come from this area, and some thirty per cent. of all are from Tennessee, Alabama and Chattahoochee Rivers, and their tributaries.

This singular, but interesting fact, has never yet received the attention it deserves, for geographic distribution, abundance in individuals, and diversity of form are herein correlated clearly with certain geologic factors. For instance, the family is a very ancient one, and dates back to Devonian times at the latest. The region under consideration has constituted a unique land-mass since a very early period in the history of the continent. It has scarce been subjected to glaciation—at least has not since the geologic record exhibited in its country rock began. The very great diversity of form and the great abundance of these modern representatives of a very ancient type, appear plainly to be related in no small degree to these factors.

In investigating in this field, for some twelve years or more past, the species and distribution of these mollusks, attention was necessarily directed to that peculiar Unionine fauna which lies on the northern border of this area. This was rendered necessary, in the first place, by the fact that the Ohio River had itself furnished most of the earlier described types. The literature of the subject reveals some sixty species, distributed unequally among the three Unionine genera, *Unio*, *Anodonta* and *Margaritana*, and shows the forms distributed among these genera in an abundance which has the relation just given, viz.: *Unio* has the greater number of species and *Margaritana* the least.

It was further discovered that as the Ohio River forms of *Unio* are traced over the regions southwards and their geographic and geologic environment becomes changed, that a large number of them sensibly change their external particular characters and grade into forms to this time regarded as peculiar to the region. At once here was opened up the great question of synonymy, with all the consequences which are involved in a wholesale reduction of species.

This study, then, in its final form, will seek to investigate the synonymy—First, of the shells which have been described from the Ohio River. Second, it will select the most marked species of these river mussels and about them, as types, attempt a natural grouping of the Unionine fauna of the valley and the region south. Third, it will attempt to eliminate the synonyms which have been so multiplied by earlier students who were misled by inadequate data or by the older notions of what constituted a species. It will, further, explain in a measure the way in which the different forms assumed by the sexes came to be regarded as species—an unfortunate condition which the *dilettante* of the present day are making worse. It will, fifth, seek to collect, for convenient reference, all figures and descriptions, in the hope that in this way the historic importance of the earlier descriptions may become apparent. These will be arranged chronologically. The Ohio River constitutes historic conchologic ground; from it must begin, as began the old, the new study of the *Unionida*.

THE STREPMATIDE OF THE FALLS OF THE OHIO. BY R. ELLSWORTH CALL.

[ABSTRACT.]

The *Strepmatid molluscan fauna* of the Falls of the Ohio is one that is very rich in numbers, but rather poor in species. Including some which will eventually pass into synonymic lists, the total number comprizes but ten species which are distributed among four genera, to wit: *Pleurocera* with three nominal species, *Lithasia* with one species, *Anculosa* with two species, and *Goniobasis* with four species.

The falls mark the line of junction of the Silurian and Devonian strata, which may here be differentiated with very great success and ease. For a distance of some five or six miles the bed of the river is very rocky, with numerous islets of rock, which are always exposed at low water. From one end to the other are innumerable pools in which flourishes a very rich *conferroid flora*, and which furnish a very variable but favorable station for these forms. In numerous places the changes in the current are so marked that at different seasons of the year the

Strepomatid fauna varies with it. For instance, in some places where muddy bottoms, and an abundant flora co-exist, the several members of the genus *Pleurocera* abound. At another, where the bottom is clean rock, or is rock with abundant confervoid vegetation, the genus *Anculosa* occurs in the greatest profusion. At the numerous small falls over the rocky flats, where the water is indifferently swift, and the bottom is either clean or with scanty vegetation, are found great numbers of the four species of *Goniobasis*. At another time in the year, when the stage of the water is changed, a rather different distribution, locally, may be noted. These relations exhibit a certain dependence on local conditions that vary, and, perhaps, serves to explain the very different character of the shell fauna at the same place, at different periods of the year.

The earliest forms that have been described from the Falls are now unknown. They were discovered and studied by the unfortunate Professor Rafinesque, and have long since been merged into synonymy by other students, who were unwilling to allow his claim to original discovery. The attempt lately has been made, with indifferent success, to fix these forms. What result more extensive study of the literature of conchology will finally justify must be left for another time and place. Here it is simply the purpose to place on record the forms which occur, their synonymy as now understood, and a study of those changes in form and habit which manifestly result from the environment of the various representatives of the family.

The species of *Pleurocera* are the following; *Pleurocera canaliculatum*, *P. moniliferum* and *P. elevatum*. There are many specimens which are so difficult of determination, when studied in large series, that one is inclined to the view that forms of extreme variation, but really specifically related, have been given species names which ought to have been not even recognized as varieties. A species monger could erect, by carefully selecting his examples, a dozen or more species from the simple variations in coloration alone, and, strange to relate, this has been done. Thus *Pleurocera canaliculatum* has occurred in abundance with one, two, three and even four revolving purple bands. Many specimens have been secured which are entirely purple, and with no semblance of distinctness in the banding. Hundreds of individuals have been taken that are bright, honey-yellow, and have no tendency to other coloration whatever. Many present the character of channeled whorls, on which the specific name is based, while as many more are found that have plain and well rounded whorls, without any indication of the so-called characteristic grooving. The form called *P. elevatum* itself is a beautiful illustration of the effects of different environment. If taken from swiftly flowing water,

and found attached to rocks, the shells are short and stubby, whorls well thickened and with incrassate aperture. The same shells obtained from pools where the water does not flow at all, and where vegetation flourishes in great abundance, are elongate, thinner in texture, thinner about the aperture, have the lines of growth far apart and well marked. These are the points on which the supposed distinct species have been based, but are thus seen to be but a reflex of the conditions of environment.

The *Goniobases* present the same facts, but since they are often found attached to the faces of vertical rocks, from which they do not migrate very far, there is a very characteristic modification of the aperture which results, evidently, from the effects of gravitation. The final paper will present many facts which tend to this explanation of the different forms of aperture, which, as is well known, determines the real form of the shell.

A few important observations on the animals themselves have been made, but these regard chiefly minor anatomical details and possess little general interest. Enough has been learned, however, to determine that several species, at least, have been based upon the sexes. This difference is seen in the general outline of the female shell, which has always characteristically well-rounded whorls, a condition itself a result of the positions of certain organs within the body of the animal.

Several of the forms found at the Falls of the Ohio are of wide geographic distribution. These limits have been determined and a study made of the shells as expressive of differences in the conditions of the several stations.

The most abundant species of *Aenulosa* found at the Falls ranges to the rivers of middle Alabama, and occurs over all the region of east Tennessee, in the larger streams. Coincident with this wide distribution there is a great diversity of form, and thus there has arisen a rather large synonymy, which it is the purpose of this study to establish. Not less than twenty times has *Aenulosa prurosa* been described by as many different conchologists who published from scanty material and with the understanding that every stream had its own forms. My own studies in this connection are based upon extensive collecting over all this wide region and on very large quantities of the shells of the several species. The material from the Falls of the Ohio alone, which has passed under observation, comprises something over two bushels of shells. In the quantity one who does not recognize, as Lea did not recognize, the modern notions pertaining to species and the extent to which they respond to geographic factors, might erect forty species with as great propriety as one.

A word or two on the great profligacy of nature in this form of life. During the period of receding waters on the Falls, in the spring and summer, myriads of these mollusks are left in small pools and rills. Later in the season these pools entirely dry up, and the shells, of course, die. It is no exaggeration for me to say that a hundred wagon loads a year, for the past three years that these falls have been under observation, have perished in this way alone, and this has annually occurred for centuries. One is constrained to ask why it is that nature is so profligate of life, and to question whether, after all, the ordinary conception of its sacredness is not one which the facts of nature do not conserve. The fact needs explanation. Certain it is, however, that if these forms reached maturity, and in turn produced their kind in the enormous numbers that the Strepomatids do reproduce, very soon the waters of the river would be dammed by a living, moving mass of animals, which in some situations are so tenacious of life as to have completely occluded large water mains and led to enormous cost to effect their removal.