NOTES ON THE UNIONIDÆ OF FLORIDA AND THE SOUTHEASTERN STATES.

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(With Plates XLIX–LXXIV.)

INTRODUCTION.

For some years past I have made a special study of the *Unionidæ* of Florida and the southeastern States, their variation and distribution, and I have been led to prepare the following catalogue and notes principally for two reasons:

First. There are undoubtedly very many so-called species of unios from this region that are merely trifling variations of valid forms or actual synonyms, and which only serve to cumber our literature and embarass the student. Dr. Lea, our great authority, seemed in many instances to fully understand this wide variation, and he has often grouped together under a single name shells which at first sight seem to be distinct, but which, when carefully studied with other material, are seen to be but varieties of one thing. But in other cases he has founded species on trifling and inconstant characters, and has repeatedly given different names to what are evidently identical forms.

More recently the Wrights (Messrs. S. H. and B. H.) have collected in the lake region of Florida, they have made a study of the *Unionidæ* of the State, and have published quite a number of new species; but they do not appear to have worked up their material with sufficient thoroughness, as a number of their new unios are certainly varieties of well-known forms or actual synonyms of hitherto named species from Georgia, Florida, and the Carolinas.

Secondly. Much confusion exists among collectors and students regarding the material in their collections, a considerable proportion of the shells from this region having been sent out under wrong names. Fully one-half these species are not understood, and the cabinets of conchologists in general exhibit the most deplorable confusion in this matter.

It is my desire in this list to considerably reduce the number of so-called species by showing that they vary into each other, or that many of them have without proper study simply been assumed to be new and renamed, and to give such descriptions and notes as will materially assist in properly determining material.

Little is known regarding the variation and distribution of the mollusks of this region, as but a very small part of it has been explored. No doubt many allied forms, which from want of sufficient material I have not felt justified in reducing to synonymy, will have to be united when we have thoroughly worked up the mollusks of all the southeastern States, and there are probably some valid species as yet undescribed. Perhaps my opportunities for studying the *Unionidæ* of this region are as good as can be had at the present time. I resided four years in southwest Florida, and the collection I made at that time is very nearly complete as to species. I have had for study all the material belonging to my friend the Rev. A. Dean, of Muncy, Pa.; the magnificent set of southeastern unios belonging to Mrs. George Andrews, of Knoxville, Tenn., including the shells collected by F. Rugel; the equally complete lot of material in the cabinet of Mr. William A. Marsh, of Aledo, Ill., who owns the finest private collection of these shells in existence, and who has greatly aided me in my work with numerous valuable notes and suggestions. In the National Museum I have had constant access to our general collection, most of which has been studied and named by Dr. Lewis and Mr. R. E. Call. This includes a large and nearly complete series of Mr. Wright's new species, donated to the Museum by that gentleman. Besides this there is the unequaled collection of Dr. Lea, which includes most of the types from this region and a large number of valuable duplicates, as well as most of Dr. Gould's species, which were sent by their author to Dr. Lea.

A few words may not be out of place concerning the distribution of the *Unionidæ* in the United States. There are two tolerably well defined areas of distribution in northern North America which contain very distinct assemblages of species, and each of these has a subregion peopled to some extent with different but allied forms.

First. The Mississippi drainage area, embracing a territory of 1,250,000 square miles. Within this region the *Unionidæ* attain a finer development than in any other part of the world, not only in the number of species, but in the magnificence of their forms and the perfection of individual specimens. It is here, where the streams flow over vast beds of limestone and where food is abundant, that the conditions for unio life are most favorable and nature has fairly reveled in the creation of the beautiful, the ponderous, and the grotesque. Here the genera *Unio* and *Margaritana* assume a variety of forms that are odd and strange; here are developed species with winged hinges, strong corrugations, knobs, and sinuses.

South and west of this, in the streams running mostly through Texas and the eastern slope of Mexico into the Gulf, is found a small assemblage of forms not met with in the Mississippi Valley, though closely related to the species found in that region. They have for the most part finely developed shells, and their relationship to those of the area just mentioned and the fact that many of the species of the great valley are found in Texas and Mexico lead me to consider this merely a subregion.

Second. From the mouth of the Mississippi, extending to the southern extremity of Florida, northward into the British possessions, and again westward to include all the St. Lawrence drainage, and embracing all the streams in this territory that fall into the Atlantic and the Gulf of Mexico, there is found a set of *Unionidæ* possessing very different characters from those of the area first mentioned. Here the species, as a rule, are moderate in size and neutral in color, and but few odd or striking forms are found; though *Unio spinosus* and *U. collinus*, the only shells known bearing true spines, belong here. The change in forms from Nova Scotia to Florida is very slight; in fact some groups, such as that of *Unio complanatus*, extend throughout the whole region, and if they can be said to break into good species, the variation is certainly very gradual and specific lines are very difficult to determine. Quite a number of forms seem to be confined to the State of Florida, though, perhaps, when we have a thorough knowledge of their distribution, we shall find their range much extended. It is probable that the State was peopled with *Unionidæ* from the region just north and west of it; that here has been a migration as the land arose from the Appalachian chain southward and eastward. The fact that the Florida species differ from those of southern Georgia, Alabama, and the lowlands of the Carolinas is due, perhaps, to a milder climate, and to some extent, no doubt, to the existence of a remarkable system of small clear lakes in the former State, in which the *Unionidæ* have attained a high state of development.

In the vicinity of the mouth of the Mississippi and for some distance along the territory just north of the Gulf there is a mingling of forms of the two areas, and the same thing is again seen in the region of the Great Lakes, while in the middle ground the Appalachian chain has acted as a much more effective barrier between the species.

There is but a very limited development of the *Unionidæ* throughout the Rocky Mountain region and the Pacific slope; a couple of species of unios, *Margaritana margaritifera*, and three or four anodontas. Several so-called species of west coast anodons of the group of *A. Californiensis* are considered by Dr. Stearns (who perhaps has a better knowledge of the mollusk fauna of western America than any other man living) mere local races of *A. cygnea*, of Europe, a form which he believes to be circumboreal. (See paper on History and Distribution of the Fresh Water Mussels, and the identity of certain alleged species, Proc. Cal. Acad. Nat. Sci., Nov. 20, 1882.) In this opinion I am inclined to concur. *Ano. angulata*, so different normally, is shown by photographs from specimens made by that indefatigable collector, Mr. Henry Hemphill, as well as by material in the National Museum, to be very closely related to the species I have mentioned. The two unios are not strongly characterized, but show evident relationship to the species of the Atlantic drainage. I believe the *Unionidæ* of this region to be much more intimately connected with those of the Atlantic system than the Mississippi valley, and I consider this a subregion of the former. Perhaps in the whole United States not over one hundred valid species will be found to be extra limital. It is worthy of note that while these areas seem to confine the *Unionidæ* within given bounds, they present no perceptible barriers to the *Corbiculidæ* or the fresh-water univalves which are everywhere found with them.

Lea's arrangement of the *Unionidæ* in two great divisions—symphynote and non-symphynote; the former including those species in which the dorsal margin is more or less produced into a wing, the latter those without it—and the subdivision of these groups into smaller ones, first on peculiarities of sculpture, and secondly according to form, is a simple, comprehensive one, but it is an arrangement which is certainly artificial and not in accordance with all the facts of nature. We often find shells which are entirely destitute of the dorsal wing, which by sculpture, form, texture, and general characters are evidently closely related to those which are symphynote, and there is even the greatest possible variation in this character in the individuals of the same species. Lea himself acknowledged that this character was of little value in classification. The same species may be either absolutely smooth or strongly pustulate, as in *Unio infucatus*, or *U. pustulosus*, which, in the variety *Schoolcrafti*, is often entirely destitute of nodules; it may be strongly sulcate or entirely plain, as *U. negatus*, a shell with well-marked concentric ridges, which graduates imperceptably into *U. rubiginosus*, a perfectly plain form; and *U. Estabrookianus*, *stramineus* and others exhibit precisely the same variations. So far as form goes as a character by which to classify, Mr. Lea has, in order to conform to it, been obliged to widely separate members of such well-characterized groups as those of *U. Buckleyi*, *U. complanatus*, and *U. luteolus*.

In arranging I have attempted to place the species in natural groups, putting those together as far as possible which seem to have a more intimate relationship, and which have probably sprung from a common ancestry at a recent date, and yet doing as little violence as possible to Mr. Lea's general arrangement. I am aware that these groups are not as a rule of great importance, that they often imperceptibly merge into others, and that any lineal arrangement of them must be artificial, as many of them show about equal relationship to several others. In grouping, sculpture, form, color of epidermis and nacre, the teeth, general facies, and texture, as well as locality, have all been taken into consideration.

I have for the most part given a set of outlines drawn from the valves of the shells, to illustrate the form and variation and to assist in the determination of the species. In a paper like this the cost of figuring so large a number of forms would be too great, and it is believed that these outlines, often drawn from the type-shells, which I have found very useful when sent to students, will prove a great aid in comparing with specimens, giving an accurate idea of dimensions and form. I have attempted to indicate in the text the degree of inflation, sculpture, character of epidermis, and color pattern, character of teeth, nacre, and other points of interest.

I have followed Mr. Lea in the terms used in measurement and designation of parts of the shell, calling that part of it which is in the advance when the animal is traveling the anterior, and the opposite end, which bears the ligament, the posterior. The distance from the anterior to the posterior margins Mr. Lea calls the breadth or width; that from the base or ventral region to the beaks the length. I prefer the arrangement of Broderip and Sowerby, which is followed by Conrad and other American conchologists, of terming the distance from the forward to the hinder part of the shell the length, and that from the umbones to the base the height or width, but have thought it perhaps best to use the terms of our great authority on the *Unionidæ*.

I have only described such species as to my knowledge have been collected in the State of Florida, as it was necessary to fix some limit to the list. Many other species, however, are noticed in outlining the groups to which the Florida shells belong.

There are no doubt errors in the work I have undertaken, since much of this is a matter of judgment, and human judgment is liable to error in the determination and arrangement of many of these exceedingly close and puzzling forms. My aim has been to reduce to order the chaos in which I found our southeastern *Unionidæ*, and throw some light on the limits of the species, their relationships, and distribution.

GENUS UNIO.

GROUP OF UNIO INFUCATUS.

The species which typifies this group seems to stand alone among American unios. *U. corrugatus* of India resembles it somewhat in sculpture and general form, but is more inflated and has a less solid hinge. *U. infucatus* in general form is very close to *U. lenticularis* and *U. chickasawhensis*, but is characterized by peculiar chevron-shaped and more or less nodulous corrugations, in some cases covering the entire shell. The former species varies greatly in the amount of sculpture, even to specimens which are nearly smooth, much as *U. pustulosus* varies into the smooth forms of *Schoolcrafti*, and it is possible that the present group should be merged with that of *U. chickasawhensis*.* The general form is lenticular, the color dark brown to black, the teeth and hinge plate rather solid, with nacre varying from white to lurid purplish.

Unio infucatus Con.

Unio infucatus Con. (Plate XLIX. Figs. 1, 2, 5.) New F. W. Shells, pl. III, fig. 2.

Unio Kleinianus Lea. (Plate XLIX. Fig. 6.) Obs. V, p. 21, pl. XVII, fig. 18, Mar. 5, 1852. Type, Suwanee R., Fla., collected by Maj. Le Conte, West Florida; coll. of Wm. A. Marsh.

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*Since writing the above the examination of a large amount of additional material has convinced me that this species groups with *U. chickasawhensis*.

Lea attempts to separate his species from Conrad's on the ground that the latter is not figured as a folded shell; that his differs in having larger plications, which are more interrupted, and in the color of the epidermis, which in *infucatus* when old is quite black. Yet in his own collection some of the specimens of *Kleinianus* are nearly without sculpture, and others are almost jet black, while those of *infucatus* vary from almost absolutely smooth to strongly corrugated throughout. Among hundreds of duplicates in the Lea collection from many localities I find every gradation, from inflated forms having a well-marked posterior ridge to those which are lenticular; the sculpture varying from absolutely smooth to completely corrugated, and a range of color from shining black to fulvous, and even green on young specimens.

So far as I know the species is confined to the waters of Georgia and northern Florida.

GROUP OF UNIO CRASSIDENS.

Mostly solid triangular shells, with heavy epidermis, and a prominent ridge running from the beaks to the posterior ventral region, the posterior slope of which is usually slightly folded, with nacre varying from white to salmon and purple.

U. crassidens, an abundant species in the Mississippi drainage basin, is one of the largest and most ponderous of Unios. The other species are distributed through the southeastern States.

Unio Forbesianus Lea.

(Plates XLIX, Fig. 3, Plate L, Figs. 2, 3.)

Unio Forbesianus Lea. Obs. V, p. 20, Pl. XVI, Fig. 17, Mar. 5, 1852. Type, Savannah R.

Unio Moussonianus Lea. (Plate L, Fig. 4.) Obs. V, p. 24, Pl. XVIII, Fig. 22, Mar. 5, 1852. Type, Georgia; Barrett.

Unio restitus Lea. (Plate XLIX, Fig. 3; Pl. L, Fig. 1.) Obs. IX, p. 11, Pl. XXV, Fig. 259, Dec. 24, 1861. Ogeechee R., Ga.; Le Conte and Anthony.

U. Forbesianus and *restitus* were described from young specimens, and in a careful examination of the types in Lea's collection, as well as that of *U. Moussonianus*, I can not see any difference worthy of even varietal names. These shells bear considerable resemblance to the well known and abundant *U. crassidens*, but are less solid and do not attain the size of that species. *U. Forbesianus* has been collected by F. Rugel in Lake Monroe and Black Creek, Florida; these specimens, which now belong to Mrs. George Andrews, having been compared by the writer with Lea's types.

Unio monroensis Lea.

(Plate LI, Fig. 1.)

Unio monroensis Lea. Obs. IV, p. 37, Pl. XLI, Fig. 8, Aug. 18, 1843. Type, Lake Monroe, Fla., collected by Dr. Budd.

U. monroensis is very close to the last species, differing from it only in being slightly less solid, in having more compressed teeth, and in being rather higher colored. I think it quite probable that when large series of this are compared with *U. Forbesianus* they will be found to be mere variations of one species.

Unio pusillus Lea.

(Plate LI, Figs. 2, 6.)

Unio pusillus Lea. Obs. IX, p. 19, Pl. XXVII, Fig. 36, Oct. 2, 1840. Ogeechee R., Ga.; Maj. Le Conte.

Unio buxeus Lea. (Plate LI, Fig. 3.) Obs. V, p. 17, Pl. XV, Fig. 13, Mar. 5, 1852. Abbeville Dist., S. C.; J. P. Barrett.

Unio Anthonyi Lea. (Plate LI, Figs. 4, 5.) Obs. IX, p. 19, Pl. XXVII, Fig. 266, Feb. 5, 1861. Fla.; Anthony.

Dr. Lea described *U. pusillus* from specimens he had long thought the young of some other known species. *U. buxeus* was described from three shells, only one of which he considered adult. I do not see how it is possible to separate these from the types of *pusillus*, as they agree in size, form, color of epidermis and nacre, and in the teeth, and all appear to me to be young shells. His type of *U. Anthonyi*, a single specimen, probably adult, had been varnished and otherwise injured. It is a tawny yellowish green, with very faint rays, and is hardly as solid a shell as some of the young of *buxeus* and *pusillus*. A young specimen of *U. Anthonyi* which Mr. Lea afterwards obtained of Maj. Le Conte, from the Ogeechee River, is quite conspicuously rayed, and is almost precisely like some of the specimens of the above named species.

Unio dorsatus Lea.

(Plate LI, Fig. 7, Plate LII, Figs. 1, 2.)

Unio dorsatus Lea. Obs. XII, p. 60, Pl. XLV, Fig. 112, June 2, 1868. Type, Catawba R., N. C.; C. M. Wheatley.

A very variable and puzzling species. There is much difference in the solidity, width, and form of individuals. A specimen is before me from the cabinet of Wm. A. Marsh, labeled "*U. Anthonyi* Lea, Florida," and another from Mrs. Andrews, collected in Florida, by Rugel, without locality, which are, I believe, *U. dorsatus*. In all the examples I have seen, the epidermis is dull tawny brownish and squamose, the substance of the shell rather thin, and the nacre shaded purple. The form of the shell, its dorsal ridge, and the slight plications of the posterior slope probably place it here, but it has affinities with the *Complanatus* group.

GROUP OF UNIO COMPLANATUS.

Unio complanatus, which is one of the most abundant species in the United States, may be taken as the type of an extensive group which is distributed from Canada to northern Florida, and from the Appalachian Chain to the Atlantic. Mr. Lea recognized the immense variation of this species, as is shown in his collection, where the most diverse forms from Canada, New England and the Middle States are placed by him under the name of *U. complanatus.* But he seems to have fixed its southern limit with some rare exceptions somewhere about the State of Virginia, and has applied specific names to every variation found south of that. One can almost exactly duplicate in his immense series of *complanatus* such forms as *roanoakensis*, *savannahensis*, *Postellii*, *neusensis*, *Hallenbeckii*, *napeanenssi*, *hopetonensis*, and a dozen others, and the conviction becomes strong with any one who attempts to study or name the members of this puzzling group that if the diversified forms in the more northern States are mere variations of one species, most of those in the South are nothing more. There is an immense amount of this material, numbering thousands of specimens, in Dr. Lea's collection and among his duplicates, contributed largely by Dr. Emmons, C. M. Wheatley, Girard Hallenbeck, Dr. Lewis, J. Postell, Bishop Elliott, and Dr. Barrett. The accompanying notes, the names written on the shells and erased, and the controversies among these earnest students of a past generation concerning their proper identification, show how hopeless was the task of attempting to satisfactorily determine these varying and puzzling forms.

It may be said in general terms that the species of the group are wide and rhomboidal, with usually a well developed posterior ridge, are somewhat compressed, with an epidermis varying from smooth and shining to squamose, and in color range from tawny yellow through greenish to black, either with or without rays. The nacre is not often iridescent, and varies from white or yellowish to deep purple.

Unio hopetonensis Lea.

(Plate LII, Fig. 3, Plate LIII, Fig. 1.)

Unio hopetonensis Lea. Obs. II, p. 29, Pl. IX., Fig. 24, Feb. 5, 1836. Hopeton, Ga.; Prof. Shepard.

Dr. Lea described this species from a young individual (diameter, 9; length, 1.7; breadth, 3.4 inches), which but imperfectly showed the characters of the adult shell. I have been strongly tempted to place *Unio dariensis* in the synonomy, for though selected specimens of the latter differ in a marked degree from the former, yet among the large amount of material that has passed under my hands there are examples which may as well be placed with the one as the other. The species is one of the largest found in the southeastern States, often attaining a length of 3 inches, a width of 5½, and a diameter of 2 inches. As a rule it is a smoother shell than the allied species, is less inflated, and has not so decided a posterior ridge.

Unio dariensis Lea.

(Plate LIII, Fig. 2, Plate LIV, Fig. 1.)

Unio dariensis Lea, Obs. III, p. 84, Pl. XXVI, Fig. 61, Oct. 21, 1842. Darien, Ga.; J. H. Couper.

Some of the specimens of this species are so greatly inflated and possess such a strong posterior ridge that they would seem to belong to the *crassidens* group, and from these there is every gradation to forms which would undoubtedly be placed with *U. complanatus*. The nacre varies from silvery to dark purple, and the cardinals from compressed to transverse. A young shell which I refer to this species, labeled "Florida," and belonging to Mrs. Andrews, is before me. This and the allied species, so far as I know, have only been reported from Georgia.

GROUP OF UNIO SPISSUS.

In form the shells which I have placed in this small group are related to *U. ochraceus* and the species which belong with it, but they differ in being wider, and in having the epidermis and nacre more like that of *obesus*. *U. splendidus* has the form of *Downiei*, *spissus*, *geminus*, and the rest of the group, but in coloring approaches *ochraceus*. This assemblage seems to naturally include a few species ranging from North Carolina to Florida, among which *U. Downiei* has been obtained at several localities in the latter State. *U. borealis* Gray, of Canada, though perhaps a small form of *luteolus*, closely resembles in shape some of the species which belong here.

Unio Downiei Lea.

(Plate IV, Figs. 1-3, Plate LVI, Fig. 5.)

Unio Downiei Lea, Obs. VII, p. 28, Pl. XXV, Fig. 91, July 6, 1858. Buck Lake, Satilla River, Ga.; T. C. Downie and J. Postell.

A fine species, of which the Lea collection contains numerous examples from various localities. The Georgia specimens are quite solid and inflated, with a peculiar lurid nacre, having a tint of purple something like that of *Unio Jewettii*.

Eight specimens of a unio from several localities in Florida are before me, which have been a veritable stumbling block to students and over which I have been greatly puzzled. Some of them have been received as *U. Anthonyi*, but they are not at all like that species in any respect. Others have been labeled *U. Hinkleyi* by collectors, and there is some resemblance in all of them to *U. monroensis*. One of these, belonging to Mrs. Andrews and collected by F. Rugel, in Florida, is as large as any of Lea's specimens of *Downiei*, but is thinner and wider and has a more purplish nacre. From this there is an unbroken series down to what seem to be adult shells not quite 1½ inches in length and 2½ in width, which are rather thin, are not greatly inflated, and have the nacre strongly violet tinted. I had thought some of these must be an undescribed species, but as the form throughout is more like *U. Downiei* than any shell I know of, and as there is a complete series connecting with that species, I believe them to be but a southern form of the Georgia shell. In all of them the ventral outline is considerably inflated, though sometimes slightly constricted nearly opposite the beaks; there is more or less of a posterior ridge; the dorsal region is full; the anterior cicatrices deep, and the nacre is rather dull colored. Three of these specimens, which are among the smallest and farthest removed from the type, were sent from Lake Woodruff, Florida, by Berlin H. Wright, and labeled by him *U. Anthonyi.* Another from the same lake, in Mrs. Andrews' collection, though of small size, approaches nearer to Dr. Lea's shells from Georgia and South Carolina.

GROUP OF UNIO MODIOLIFORMIS.

This assemblage of unios, which contains quite a number of nominal species, ranges from North Carolina to Tennessee, west, perhaps, to Mississippi, and south to middle Florida. The group consists of oblong shells, rather thin in structure, more or less inflated, and rounded before and behind; varying from tawny yellow or brown to greenish, and always more or less rayed, often beautifully so. They approach the *parvus* group in some characters, but are larger, rather wider, and usually thinner in structure, but often have the same brilliantly iridescent nacre. The line is not very distinct between these species and the group of *nashvillensis.* The latter are usually solider shells, have often reddish or lurid and rarely iridescent nacre, and are more pointed at the posterior end, which is usually somewhat angulated in outline. Individuals are very numerous, and as a consequence the species are quite variable.

Unio modioliformis Lea.

(Plate LVI, Figs. 2, 3, 6.)

Unio modioliformis Lea, Obs. I, p. 209, Pl. XIII, Fig. 40, Feb. 7, 1834. Santee Canal, South Carolina; Ravenel.

Unio exiguus Lea (Plate LVI, Fig. 1), Obs. III, p. 29, Pl. VII, Fig. 1. Dec. 1, 1838. Chattahoochee River, Columbus, Ga; Dr. Boykin.

Unio nigrinus Lea (Plate LVI, Fig. 4), Obs. V, p. 40, Pl. XXIV, Fig. 44. March 5, 1852. West Florida; Maj. Le Conte.

Unio rutilans Lea (Plate LVII, Figs. 2–5), Obs. VI, p. 59, Pl. IX, Fig. 41. Nov. 4, 1856. Othcalooga Creek and Columbus, Ga; Bishop Elliott.

Unio subellipsis Lea (Plate LVII, Fig. 1), Obs. VI, p. 62, Pl. X, Fig. 44. Nov. 4, 1856. Creeks near Columbus, Ga.; Bishop Elliott.

Unio Averillii B. H. Wright (Plate LVII, Fig 6), Proc. Acad. Nat. Sci., Phila., 1888, p. 115, Pl. III, Fig. 2. Lake Ashby, Volusia County, Fla.

A handsome, widely-distributed, abundant, and very variable species. It ranges north to North Carolina, south to central Florida, and I found it among Lea's duplicates, with shells sent by Spillman, said to be from Columbus, Miss. Lea described *U. modioliformis* from a fully adult female specimen, which accounts for the spreading out of the posterior part of the shell of which he speaks. A fine male example belonging with the type exhibits almost nothing of this expansion. Four of his specimens are rather more inflated than anything I have seen of the other species I have placed in the synonomy, though scarcely more so than some *subellipsis*, while other examples which Mr. Lea has placed with this species can not be distinguished from *rutilans* or *exiguus*. As a rule, *exiguus*, which was described from a young specimen, is not quite so wide as *rutilans*, but there is in the material I have examined every possible variation in width.

U. subellipsis is generally somewhat solider than the other forms, but there is every grade in Lea's suite, to shells of the most fragile character. In Florida the species seems to become smaller, the epidermis is often a tawny or brownish color, slightly rayed, and the shells are hardly so wide as the typical *rutilans* or *modioliformis*. One such a specimen, which is unusually dark, Dr. Lea named *U. nigrinus*, but on holding it up to the light it is seen to be distinctly rayed with green and yellow. *U. Averilli* is the same thing, but more brilliant in color. The Florida form is quite commonly sent out as *U. floridensis* Lea, the latter being the thin southern form of *U. anodontoides*, and an entirely different thing. I have examined many hundreds of specimens of these shells from various localities in the Carolinas, Georgia, Florida, Alabama, and Mississippi, and I feel certain that I am right in uniting all these under one species. I have before me examples from Lake Ashby, Florida, collected by B. H. Wright, and sent by him to the National Museum as *U. Averillii;* Lea's type of *nigrinus* from West Florida; shells from St. Augustine, collected by C. W. Johnson, and from numerous other localities in the State, and they are certainly all forms of the more northern species.

ROUP OF UNIO SUBANGULATUS.

Unio subangulatus is a peculiar shell, rather wide-oval in outline, and brilliantly rayed with blackish green on a yellow or straw-colored ground. The posterior portion in adults is often much produced and quite pointed; the ventral region is very full, and the shell usually considerably inflated. It is placed with *U. sparus* and *scitulus* by Dr. Lea and probably groups with them; though they have the peculiarities I have noticed much less developed. They inhabit Tennessee, Alabama, Georgia, and Florida.

Unio subangulatus Lea.

(Plate LVIII, Fig. 1.)

Unio subangulatus Lea, Obs. III, p. 47, Pl. XIII, Fig. 23, Oct. 2, 1840. Chattahoochee River Columbus, Ga.; Dr. Boykin.

Lea's types were young shells, as the one he figures is but 1 inch in length and 1.7 inches in width, and do not show the great ventral inflation nor the development of the posterior point as older specimens do. The cardinal teeth are rather compressed, the laterals straight, and suddenly truncated at the posterior end; the nacre varies from silvery white to salmon red, and when colored shows through the epidermis, and is often beautifully iridescent. One of Lea's specimens measures nearly 3 inches in width by 1¾ in length. A magnificent specimen is before me from the cabinet of Mrs. Andrews, collected by F. Rugel, and by him labeled "*U. radians*, Lea, Othcalooga River, Florida," which nearly equals Lea's largest specimen in dimensions, and is elegantly and distinctly rayed.

GROUP OF UNIO NASHVILLENSIS.

A widespread group represented by many species, ranging from North Carolina to Iowa, and south to Texas and Florida. The species vary from oblong to wide, are usually rather thin in structure, the posterior end is generally pointed, and more or less angulated in outline, and the posterior ventral region is always well developed in the females, sometimes greatly so. The general outline of the shells is much like that of the *luteolus group*, but they are smaller, less solid, and often have dark nacre, varying from lurid reddish to deep purple. With few exceptions the epidermis is rayed.

Unio concestator Lea.

(Plate LVIII, Figs. 2, 3, 4.)

Unio concestator Lea, Obs. VI, p. 66, Pl. XII, Fig. 48, Feb. 17, 1857. Creeks near Columbus, Ga.; Bishop Elliott.

I have only seen a single specimen of this species from Florida, which belongs to the Rev. A. Dean, of Muncy, Pa., and was collected in Lake Harris by Mr. Wright. It is a female, strongly developed in the posterior ventral region, with silvery iridescent nacre, and dark ash-colored epidermis varying to yellowish and greenish and slightly rayed. It does not agree in color with any specimen of *concestator* I have seen, but does in general form, and is probably an extreme variety. At any rate I do not care to found a species on a single specimen possessing no stronger distinctions than mere color markings. It is not very different from some of the specimens I have seen of *nashvillensis*, but the distribution of *concestator* is southeastern, while the former is found in the central Southern States. It is probable that a number of the species of this group, such as *fallax*, *nashvillensis*, *lienosus*, and the one under consideration, as well as some others, are merely varying forms of one and the same thing.

Unio tenerus Rav.

(Plate LVIII, Figs. 5, 8.)

Unio tenerus Rav., Ravenel's catalogue, p. ——, 1834.

Several specimens of this species are in the collection of Mrs. George Andrews, labeled "Florida," without locality. It is close to *nash-*

villensis in form, but differs in being quite thin and having a yellowish ground quite strongly rayed with dark green. It is found in Georgia.

GROUP OF UNIO BUCKLEYI.

Unio Buckleyi may be taken as the type of a very extensive group, distributed along that part of the Atlantic slope from North Carolina to south Florida. The shells are oval to oblong in outline, generally rounded before and behind, with rarely a conspicuous posterior ridge, and usually shining epidermis, varying from yellowish to chestnut or black, often greenish and beautifully rayed, especially in young specimens, but sometimes becoming squamose or lamellated and dull-colored when old.

The teeth vary from thin and compressed to quite solid; the nacre is generally brilliant, and varies from silvery white to coppery or deep purple. In a number of species of this group, as in that of *obesus*, the old shells become greatly developed at the posterior ventral point, so that the ventral outline is either straight or arcuate. There is a tendency in some of the more compressed forms to biangulation in the posterior region.

Unio Buckleyi, Lea.

(Plate LVIII, Figs. 6, 7; Plate LIX, Figs. 1, 2; Plate LX, Fig. 2.)

Unio Buckleyi Lea, Obs. IV, p. 34, Pl. XXXIX, Fig. 2, Aug. 18, 1843. Lakes Monroe and George; S. B. Buckley.

Unio Buddianus Lea (Plate LX, Figs. 3, 4), Obs. IV, p. 35, Pl. XL, Fig. 5, Aug. 18, 1843. Lakes Monroe and George; S. B. Buckley.

Unio Dorei B. H. Wright (Plate LXI, Fig. 3), Proc. Acad. Nat. Sci., Phila., 1888, p. 115, Pl. III, Fig. 1. Lake Monroe; B. H. Wright.

Unio Simpsoni B. H. Wright (Plate LIX, Fig. 3; Plate LX, Fig. 1), Proc. Acad. Nat. Sci., Phila., 1888, p. 117, Pl. V, Fig. 1. Lake Woodruff, Volusia County.

Unio Dalli B. H. Wright (Plate LXI, Fig. 2), Proc. Acad. Nat. Sci., Phila., 1888, p. 119, Pl. VI, Fig. 1. Lake Beresford, Volusia County.

Unio Orcuttii S. Hart Wright (Plate LXI, Fig. 1), West Am. Scientist, Vol. IV, No. 36, p. 60.

A protean species, very abundant throughout the greater portion of the State of Florida. Lea's figured type represents a fully adult shell, and one that may be considered a fair average of the form under consideration. Mr. Lea says in his description:

> A number of specimens are before me, and they present many different forms, differing in many respects, as the varieties of the *U. complanatus* do from each other. The prevailing color of the nacre, which is very brilliant, is salmon, but many are purple; two only are white. The epidermis of all the older specimens is dark-brown, some are nearly black and without rays; the younger are smooth and polished on the outside, with numerous obscure green rays, larger on the posterior slope. The general outline of most specimens is like that of *U. batavus* (Lam.), but some individuals approximate to that of *Unio ovalis* (Flem.).

There can be no doubt on examining the Lea series that he had a very good knowledge of the wonderful variation of this species. It ranges from oval to arcuate, and there is a considerable amount of difference in the degree of inflation. Some individuals, which are apparently adult, are thin, and consequently have compressed teeth; others are quite ponderous with transverse cardinals. The epidermis is not always dark in adult specimens, as has been stated by Dr. Lea, for I have before me a tray containing four examples belonging to Mrs. Andrews, collected by F. Rugel in Black Creek, the largest of which is 2 inches in length by 3 in width, and is quite smooth, a *tawny yellow faintly rayed*, and having a brilliant coppery violet nacre. One of these shells, fully adult, is a *bright green, with yellowish rays;* the others are *bronzy green.* These specimens passed under the inspection of Mr. S. H. Wright, and were labeled by him *Unio Websteri*, but I believe that species to be merely a form of *U. obesus.*

Throughout the lake region *Unio Buckleyi* seems to attain its highest development, and is often highly colored externally with yellow, salmon, coppery, bronze, or green, and the nacre is sometimes dazzlingly bright. *U. Simpsoni*, from Mr. Wright's figure and description, appears to be one of these forms. I can tell but little about it from the specimens sent out. Four shells in Mrs. Andrews' collection from Lake Monroe, to which he has given this name, are young *Jayanus*, and another lot of three adults to which he has given the same name are adults of the last-named species, and are *exactly typical.* Three other *Simpsoni* (according to Mr. Wright) in this collection from the same lake are *U. aheneus*, and specimens he has sent to Mr. Marsh, and others to the writer, are certainly *Buckleyi.*

U. Buddianus differs in no character from the species under consideration, and I can not understand why Mr. Lea should have named it, as he described the two at the same time. Part of his *Buddianus* are placed in his collection with *Buckleyi* and *occultus*, the remainder near *orphaensis* and *symmetricus*, several hundred numbers farther on. *U. Dorei* seems to be only a synonym, by Mr. Wright's figure and description, and three specimens before me belonging to Mrs. Andrews, which he has so labeled, are Simon-pure *Buckleyi.* *U. Orcuttii*, of which the writer sent Mr. Wright examples from Myakka Lakes, Manatee County, is exactly like some of Lea's typical shells. *U. Dalli*, from description, figure, and specimens which Mr. Wright has sent the Museum (Museum No. 91126) and others he has labeled in Mrs. Andrews' collection, appears to be a depauperate *Buckleyi.*

All the shells I have seen of the last-named species are eroded, or have very dirty black epidermis; the nacre is dull, lurid, purplish, and blotched, and they are evidently diseased. *U. Whiteianus* Lea, from the Savannah River, is doubtfully distinct.

Unio Jayanus Lea.

(Plate LXI, Fig. 4).

Unio Jayanus Lea, Obs. II., p. 28, Pl. IX. Fig. 23, Feb. 5, 1836, Florida; Dr. Jay.
Unio Marshi, B. H. Wright (Plate LXII, Fig. 2), Proc. Acad. Nat. Sci., Phila., 1888, p. 118, Pl. V, Fig. 2; Lake Woodruff, Volusia Co.
Unio Tryoni, B. H. Wright (Plate LXII, Fig. 1), Proc. Acad. Nat. Sci., Phila. 1888, p. 120, Pl. VI, Fig. 2, Lake Woodruff.

Lea described this species from single opposed valves of two individuals. At the present time there are in this collection a single normal pair about half grown, and an adult right valve, neither of which is the specimen he has figured. This species is very closely related to *U. Buckleyi*, so much so that it is often difficult to separate it, especially the young, yet Mr. Lea has placed it with *aheneus*, and *Emmonsi*, in the *Fisherianus* group, a long way from the former. In general terms it may be said to be wider, thinner, more attenuated at the posterior point, and more inflated at the ventral region, than that species. The form which Mr. Wright has called *Unio Marshi* is no doubt a synonym. I have examined a specimen in the possession of Mr. Marsh, who received it from Mr. Wright, and by whom it was so labeled, and it is certainly *Jayanus*. *U. Tryoni* is only a rather wide, large form of the species under consideration, having usually a blackish, rough epidermis. Five specimens are in the Museum collection (Museum No. 91129), received from Mr. B. H. Wright, and collected in Lake Woodruff, labeled by him *Unio woodruffensis* Wright, and afterwards changed to *Unio Tryoni* Wright, which are typical *Jayanus* and are identical with two specimens he has sent the Museum (Museum No. 91144) from Lake Beresford, to which he has given the latter name. Nor do they differ materially from eight specimens he has sent the Museum (Museum No. 91141) labeled *Unio leonensis* Wright, Lake Woodruff, near De Leon Springs. (Plate LXII, Figs. 3, 4).

Unio coruscus Gould.

(Plate LXIII, Figs. 1, 7.)

Unio coruscus Gould, Proc. Bost. Nat. Hist. Soc., Vol. VI, p. 15.
Unio Fryanus. B. H. Wright. (Plate LXIII, Fig. 3.) Proc. Acad. Nat. Sci. Phila., 1888, p. 113, Pl. II, Fig. 1. Lake Ashby, Volusia County, Fla.

A single specimen of this species is in Mr. Lea's collection, presented to him by Dr. Gould, and collected in the St. Johns River by the donor. It is a small shell about 1 inch in height and 1.3 inches in width; oval in outline, rather solid, and apparently adult, or nearly so, and quite inflated. The epidermis is shining and varies from yellowish chestnut at the posterior end to greenish brown, and is slightly rayed. The posterior end has a manifest ridge, and shows slight traces of biangulation; the nacre is bright purplish salmon, varying to brilliantly iridescent posteriorly. The shell is peculiar in being somewhat truncated or squarely built at the anterior end, and this character is constant in all the specimens I have seen of this very variable species. I have before me six shells sent by Mr. B. H. Wright to the Museum (Museum No. 91133) from Lake Ashby, labeled by him *U. Fryanus*, that agree essentially with his figure and description of that species, which I am sure are only a variety of *coruscus*. They are larger than Lea's specimen, somewhat less inflated, and not quite so solid. Yet in general outline, color of epidermis, nacre, and teeth there is no essential difference, and they have the remarkable truncation of which I have spoken. Mr. Wright sent nine unios to the Museum (Museum No. 91135) from Lake Dias, which he labeled *Unio diasia*, five of which are no doubt *U. tetricus* and the remainder a form of *coruscus* with a dark epidermis. He also sent five shells, which he labeled *Unio Waltoni*, from Lake Ashby (Museum No. 91132), which are not that species, but a form of *coruscus* slightly drawn out at the posterior end and having a rough epidermis. Another shell is before me collected by Dr. Stimpson, and labeled by him "*Unio tetricus* Lea, Tampa Bay" (Museum No. 73182), which is very much like the last, but is rather narrower across the anterior end, and is no doubt the species under consideration. Specimens in Mrs. Andrews' collection, which Mr. Wright labeled "*Unio coruscus* Gld.," are almost exactly like those he has called *U. Waltoni*, to which I have referred.

I have no less than fifteen different lots of unios before me, sent under various names, collected in numerous localities from the St. Johns to Tampa, which I am satisfied are all forms of the present species, as I find no characters among them on which to base a separation.

Unio occultus Lea.

(Plate LXIII, Figs. 5, 6.)

Unio occultus Lea. Obs. IV, p. 37, Pl. XLI, Fig. 7, August 18, 1843. Black Creek and Lake Monroe; S. B. Buckley.

This species approaches very close to some specimens of *tetricus*, but is usually larger, not so wide, is not so much disposed to be biangulate behind, and is rather more lenticular than that shell. Some of the young are very close to young *fuscatus*, but are hardly so wide and, as far as I have seen, are darker and solider. It is hard to separate, when young, from half-grown specimens of *denigratus*, but the latter is in general more rhomboid in form. The epidermis is usually rather dark and feebly rayed, the nacre bronzy or coppery, and not very bright.

Unio fuscatus Lea.

(Plate LXIII, Figs. 2, 4.)

Unio fuscatus Lea. Obs. IV, p. 31, Pl. XL, Fig. 4, August 18, 1843. Black Creek; S. B. Buckley.

Much confusion exists concerning this species as well as the preceding and following. Certain forms of *tetricus* approach very close to the young or nearly adult *fuscatus*, and are generally sent out under the latter name, and for years I have been perplexed as to the two. This seems to be a somewhat rare shell, while the former is very abundant It is a rather wide thin species, slightly biangulate posteriorly, generally light chestnut colored, slightly rayed, and having a pale chocolate non-iridescent nacre. Old specimens sometimes become produced at the posterior ventral region until the outline of the shell is arcuate.

Unio tortivus Lea.

(Plate LXIII, Fig. 8; Plate LXIV, Figs. 1, 3, 4.)

Unio tortivus Lea. Obs. III, p. 42, Pl. XII, Oct. 2, 1840. Chattahoochee River, Georgia; Dr. Boykin.

Unio tetricus Lea. (Plate LXIV, Fig. 2.) Obs. VII, p. 13, Pl. XXII, Fig. 78, June 23, 1857. Flint River, near Albany, Ga.; Bishop Elliott.

This small species is abundant in the Atlantic drainage of Georgia, extending into eastern Alabama, and throughout the greater part of the State of Florida. I found thousands of specimens in Horse Creek, Manatee County, of the latter State, in about latitude 27°. It is as variable a species as *U. Buckleyi;* specimens often being found in Georgia greatly compressed, extremely wide and arcuate; or it may be oblong, oval, and considerably inflated.* The wide flat forms are exceedingly close to *U. arctatus*, or even *U. Lazarus*, and it is doubtful whether they are really distinct; while the more rounded specimens approach *fuscatus* and *occultus*. The adult shells of this species so far as I have seen are invariably dark; the epidermis ranging from chestnut brown to black; sometimes feebly rayed when young; the nacre is chocolate or dark coppery, and usually dull.

The species is better known as *U. tetricus*, but *tortivus* is the older name, and an examination of hundreds of specimens from Lea's collection and elsewhere convinces me that there is no dividing line between them. As a rule, *tortivus* is more compressed in general form, and *tetricus* more inclined to posterior biangulation, but this does not always hold good. I have before me in one tray four specimens received from Mr. B. H. Wright (Museum No. 91134), collected in Lake Beresford, and labeled by him *U. coruscus*, which I have been much puzzled over. They are considerably inflated, wide, black, rather solid shells, with a single posterior ridge, slightly inclined to biangulation, and bluish chocolate nacre. In the lot sent to the Museum under the name of *U. diasia*, by Mr. Wright, from Lake Dias (Museum No. 91135), are five more, which are evidently the same. They seem to stand between *U. tortivus* and the form which Mr. Marsh has named *U. Ferrissii*, and are, I think, a variety of the former.

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* Since the above was written the writer has received a very large and enormously swollen specimen of the above species, collected at Cowan Swamp, near St. Augustine, Fla., by Mr. Chas. W. Johnson, of the Wagner Institute, of Philadelphia, and of which two natural sized outlines are given.

Unio denigratus Lea.

(Plate LXV, Fig. 1.)

Unio denigratus, Lea. Obs. VII, p. 18, Pl. XXIII, Fig. 83, June 23, 1857. Streams near Columbus, Ga.; Bishop Elliott.

This species is close to *U. tortivus*, and the young can hardly be separated at times, but it seems to differ constantly in being more rhomboid when adult, approaching the form of *Margaritana calceola*. I have it before me from Lake Monroe and St. Augustine, collected by F. Rugel, and now in the collection of Mrs. Andrews.

Unio insulsus Lea.

(Plate LXV, Figs. 1, 5.)

Unio insulsus Lea. Obs. VIII, p. 57, Pl. I, Fig. 199. Roanoake R., N. C.; Prof. Emmons.

A small, inflated species, greenish brown, and obscurely rayed, and, as Dr. Lea remarks, very closely related to *U. confertus*. I am inclined to believe it but the young or a small form of the latter, as the differences seem to be that *U. confertus* is larger, and with age becomes black, and is in some examples not greatly inflated. Lea has a specimen of the species under consideration from Savannah. In Mrs. Andrews's collection there is a shell collected by Rugel, and labeled "Florida," which is evidently this.

Unio Cunninghami B. H. Wright.

(Plate LXV, Fig. 6.)

Unio Cunninghami B. H. Wright. Proc. Acad. Nat. Sci., Philadelphia, 1883, p. 58, Pl. I, Figs. 1, 2, 3, and 4. Sumter County, Fla.

This species is very commonly sent out as *Unio Buddianus* or *Buckleyi*, but is really one of the most distinct in Florida.

It is a solid, greatly inflated, triangular shell, wide at the anterior end, and rapidly tapering from just behind the beaks to the posterior ventral region; the dorsal line being curved, the ventral straight or even arcuate. The color varies from greenish or yellowish ash to chestnut black, generally shining, and *very rarely faintly rayed;* the teeth are strong and ragged; nacre brilliant, and varying from silvery to purple. One specimen before me labelled "Florida," and belonging to Mr. Marsh, is almost jet black, 1.25 inches in length and 1.80 inches wide, and is as ponderous as any adult *crassidens*. Young shells are sometimes very much like *Unio micans*, but are generally solider. So far as I know the species is confined to the lake region.

Unio micans Lea.

(Plate LXV, Fig. 3.)

Unio micans Lea. Obs. VIII, p. 63, Pl. III, Fig. 207. Catawba R., N. C., C. M. Wheatley and Dr. Genth.

It is also in Mr. Lea's collection, sent by Dr. Barrett from South Carolina. An elegant little species, something like a miniature *Buckleyi*, but wider. The epidermis in the dozen specimens before me varies from tawny yellow or greenish to fulvous brown. All are rayed, and the young are particularly bright colored. The nacre in the anterior of most of the shells is dull and sometimes lurid; that of the posterior is iridescent. One small shell and a larger right valve belonging to the Museum (Museum No. 25146), from the Kidder collection, labeled "*Unio trossulus* Lea, Sumter County, Florida;" though less wide than Lea's specimens, I refer to this species. It is very close to *U. perlucens, Lea.*

Unio Hinkleyi B. H. Wright.

(Plate LXV, Fig. 4.)

Unio Hinkleyi B. H. Wright. Proc. Acad. Nat. Sci, Phila., 1888, p. 117, Pl. IV, Fig. 2. Lake Monroe, Fla.

A puzzling and doubtful species. Three specimens before me from Lake Monroe, sent by Mr. B. H. Wright to the Museum (Museum No. 91127) as *U. Hinkleyi*, are probably what he has described as that species. Two agree very well with his figure and description except that the nacre is coppery; the third approaches the form he has called *Dalli*, and has a lurid, blotched nacre. I have examined several other shells, some of which approached *Buckleyi* and others *monroensis*.

I let the species stand because I can not refer it to any known form. It seems to reach out in several directions, and to connect more or less with *Buckleyi*, *monroensis*, and *Downiei*, and to strongly hint that a large number of so-called species of the southeastern waters are but variations of an unbroken chain.

Unio Ferrissii Marsh.

(Plate LXVI, Figs. 1, 2.)

Unio Ferrissii Marsh. Joliet Weekly News (a newspaper), May 1, 1891. The Nautilus, Vol. V, No. 3, p. 30.

Shell oblong, inflated, smooth before, slightly plicate posteriorly, rather thick and solid; epidermis dark green or black and shining, with capillary rays, sometimes rayless; squarish before, pointed behind; umbonial slope raised, obtusely rounded. Cardinal teeth compressed, thick and solid, oblique, single in the right valve, double in the left, striate. Lateral teeth short and slightly curved; anterior cicatrices not confluent, very deep, posterior cicatrices distinct; nacre pink and iridescent. A small creek near Palatka. The above is the original description. A puzzling form allied to *U. Buckleyi* on the one hand and the *crassidens* group on the other. The specimens I have seen have quite a strong posterior ridge, and are subplicate on the posterior-dorsal slope. I can not connect it with any described species.

Unio obnubilus Lea.

(Plate LXVI, Fig. 3.)

Unio obnubilus Lea. Obs. VI. p. 84, Pl. XVII, Fig. 64, June 23, 1857. Buckhead Creek, Burke County, Ga.; Bishop Elliott.

Unio Nolani B. H. Wright. Proc. Acad. Nat. Sci., Phila., 1888, p. 116, Pl. IV, Fig. 1.

Lea's figure is that of a male which is not so produced in the posterior ventral region as the females. Mr. Wright's figure of *U. Nolani* is that of a female, and excellently represents dozens of female specimens of *U. obnubilus* before me, most of which have been labelled by Dr. Lea. Although he described his species as uniform in color, several specimens received by him later are rayed. Three are before me belonging to Mrs. Andrews, collected by F. Rugel in Black Creek, Florida, and labelled *Unio nolani* by Mr. S. H. Wright, which agree in every respect with Lea's types of *obnubilus*. Another shell from the same locality and collection, which is identical with this, Mr. Wright has labelled *U. Tuomeyi*. The color of the epidermis and nacre is much like *occultus*, but the form is more quadrate, and it is a larger species, yet the young are very like those of the latter.

Unio lugubris Lea.

(Plate LXVI, Fig. 4; Plate LXVII, Fig. 1.)

Unio lugubris Lea. Obs. II, p. 30, Pl. IX, Fig. 25, Feb. 25, 1836. Hopeton, near Darien, Ga.; Prof. Shepard.

A species allied to *ocumulgeensis*, *Geddingsianus*, *Whiteanus*, and to some forms of *U. Buckleyi*, and which does not possess any very decided characters. The young shells are often blackish green and rayed; the adults become brownish black; they lose their luster, and are sometimes arcuate when old. Lea's figure poorly represents the species. Several young shells from Black Creek, collected by Rugel and now in Mrs. Andrews's collection, are undoubtedly this species.

Unio ocmulgeensis Lea.

(Plate LXVII, Fig. 5.)

Unio ocmulgeensis Lea. Obs. VIII, p. 89, Pl. XIV, Fig. 243, Feb. 5, 1861. Little Ocmulgee R., Ga.; S. M. Wilson.

Lea's figure is from a badly eroded specimen, though the form is characteristic. Some of the young shells are green, or blackish green and chestnut, elegantly rayed and polished, and resemble *U. Buckleyi*, but many are a dull uniform blackish, and in outline are much like *U. Jayanus*. In most of the specimens the nacre is not brilliant save at the posterior end, where it is richly iridescent. One shell belonging to Mr. Marsh, and collected by Mr. Upson, of Rockford, Ill., is before me, and another, collected by Rugel, among Mrs. Andrews's shells, both labeled Florida, are undoubtedly this species.

GROUP OF UNIO PARVUS.

A group of small and usually well characterized shells, distributed throughout the entire Mississippi Basin, the Gulf drainage, and in that portion of the Atlantic Slope from South Florida to North Carolina. In form they are oval, or obovate to oblong, usually rounded before and behind, rather inflated, with generally dark and lusterless epidermis, though it is sometimes smooth, shining, and rayed. The beaks are undulate; the teeth usually compressed and often curved; the nacre is almost always brilliant, silvery, bluish, and iridescent, though a few of the species have dark and lurid interiors.

Unio minor Lea.*

(Plate LXVII, Fig 2.)

Unio minor Lea, Obs. IV, p. 34, pl. XXXIX, Fig. 3. Aug. 18, 1843, Lakes Monroe and George; S. B. Buckley.

An interesting species and one of the very smallest, an adult before me from Lake Monroe, one of Lea's types, being 0.9 inch in width and 0.6 inch in length, while others from the same locality, in Mrs. Andrews's collection, are 1.50 inches in width by 0.80 inch in length. The species is regularly obovate in form, inflated and wedge-shaped when viewed from the base; being of greatest diameter in the neighborhood of the beaks and tapering to the posterior end. The epidermis is rough and black; the nacre bluish and iridescent behind; the teeth are rather strong, as the substance of the shell is quite solid.

This shell is sometimes mistaken for *U. marginis*, but is darker colored, solider, more inflated, and rather wider. Dr. Lea did not know whether the beaks were undulate or not, and all the numerous specimens I have seen are so eroded I can not tell certainly, but it is probably like the rest of the group in this respect. Three shells before me, belonging to Mrs. Andrews, are from the Edisto River, South Carolina, and I found it in Horse Creek, Manatee County, in latitude 27°.

Unio vesicularis Lea.

(Plate LXVII, Fig. 4.)

Unio vesicularis Lea, Obs. XIII, p. 41, pl. XII, Fig. 34. Sept. 15, 1873, Okechobee; Dr. Budd and C. M. Wheatley.

Lea described this species from very poor material, two worn, badly eroded opposing valves and a smaller pair in poor condition. These vary from light to dark olive green and are slightly rayed. A worn specimen in Lea's collection from Lake George, labeled by him *Unio amygdalum*, scarcely differs from the opposing valves which are his type of *vesicularis*. It is a trifle less wide and not quite so inflated. I

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* There are two Unios in the Museum collection (No. 91130) from Blue Springs Landing, Fla., received from Mr. B. H. Wright and labeled by him *Unio Stearnsiana* Wright, which are typical examples of *Unio minor* Lea.

found this species rather abundant in Horse Creek, Manatee County, and these specimens had a rough, dark epidermis, and were wedge-shaped when viewed from the base. Five shells from the St. Johns, donated to the Museum by Mr. B. H. Wright (Museum No. 91137) are much like those from Horse Creek, but show a dark-greenish ground with feeble rays when wetted or held up to the light. The species is larger, not quite so obovate, less inflated, and thinner than *U. minor*. A specimen in Mrs. Andrews's collection from F. Rugel, and labeled by him "Alabama," I regard as this species.

Unio amygdalum Lea.

(Plate LXVII, Fig. 3.)

Unio amygdalum Lea, Obs. IV, p. 33, pl. XXXIX, Fig. 1. Aug. 18, 1843, Lake George; S. B. Buckley.

It is quite probable that this species and the one preceding and the one following it are forms of the same thing, yet with the limited material I have I hardly feel justified in uniting them. Several of Lea's specimens of this are very thin, yellowish ash, quite strongly rayed, and are fringed at the posterior end by the frayed outgrowth of the epidermis. Another in his collection, from Lake George (Mus. No. 86128), is wider, darker, and solider; closely approaching *vesicularis*.

It inhabits from Dooly County, Ga., to central Florida.

Unio lepidus Gould.

(Plate LXVIII, Fig. 1; Plate LXIX, Fig. 3.)

Unio lepidus Gould, Proc. Bost. Soc. Nat. Hist., vol. VI, p. 15. Creek near Lake Monroe.

From Gould's description this is very close to the last two species, as he says it is nearly allied to *U. trossulus*, but is larger, more fragile, and the cardinal teeth are more compressed. (Otia Conchologica, p. 222.) The species is not in Lea's collection, but there are among the Museum shells three fine examples from the St. Johns, donated by Mr. B. H. Wright (Museum No. 91140), and by him labeled *lepidus*, which are, no doubt, that species. They are a little wider than *vesicularis* or most of the examples of *amygdalum* I have seen; are more oblique; are yellowish, shading to dark green on the posterior portion, and more or less rayed throughout. The nacre is shaded salmon and bluish, and is iridescent posteriorily. I have other examples before me which are evidently the same.

Unio Singleyanus Marsh.

(Plate LXVIII, Figs. 4, 5.)

Unio Singleyanus Marsh, Joliet Weekly News (a newspaper), May 1, 1891. The Nautilus, vol. V, No. 3, p. 29.

Shell smooth, oval, slightly depressed; inequilateral; valves rather thick, squarish before, rounded behind; beaks small and flat; epidermis yellowish brown, shining, with or without rays; usually rayless. Cardinal teeth crenulate, oblique, single in the right valve, double in the left. Lateral teeth short and straight; anterior cicatrices small, deep, not confluent; posterior cicatrices confluent, slightly impressed; nacre white, iridescent. A small creek near Palatka. The above is the original description. This seems to be perfectly distinct from *U. marginis*, its nearest ally. Its smooth epidermis which, in all the specimens I have seen, is very light colored, even to yellowish, and the peculiar truncation of the anterior end, like *U. coruscus*, are its strongest characters. It is an undoubted member of the *parvus* group.

Unio papyraceus Gould.

(Plate LXVIII, Fig. 2.)

Unio papyraceus Gould, Proc. Bost. Soc. Nat. Hist., vol. II, p. 53· Aug. 20, 1845. Everglades.

There are in the Museum collection two trays containing seven specimens of this species given to Mr. Lea by Dr. Gould, labeled "Everglades, Cape Florida." Part of them have been stained a brownish tint by coloring matter in the water; the others are olive to ash, with greenish rays. They are as fragile as *Anodonta imbecillis*, and Gould compares them to *A. Couperiana*, but the form and external coloring, as well as the bluish nacre becoming richly iridescent posteriorly, are almost exactly like *U. amygdalum*, from which they seem to differ only in being more fragile.

Unio trossulus Lea.

(Plate LXVIII, Fig. 3.)

Unio trossulus Lea, Obs. IV, p. 36, pl. XL, Fig. 6. Aug. 18, 1843, Lake Monroe.

This species is quite different from *U. parvus*, the type of the group, but is related by *amygdalum* and *vesicularis* to *minor*, which is near to *parvus*. I have seen but one specimen of the present species, Lea's type, which is a somewhat peculiar shell, resembling in some respects the smaller, brighter forms of *amygdalum*, but it is *more oblique* and is quite small, being only 1.4 inches in width by 0.7 inch in length. It has the undulate beaks common to the group, as well as the silvery and iridescent nacre, but is *remarkably solid*, with rather strong, subcompressed, ragged cardinals and heavy roughened laterals.

GROUP OF UNIO CAMPTODON.

Wide, large, somewhat quadrate or rhomboid shells, of rather light structure; without well-defined posterior ridge; with epidermis varying from smooth, shining, and yellowish, to squamose, rough, and black. The nacre in the type is white, but it is often lurid or purplish in some of the species. The members of the group range from Virginia to South Florida, and west to Kansas and Texas.

Unio obesus Lea.

(Plate LXVIII, Fig. 6; Plate LXIX, Figs. 1, 2, 4; Plate LXXI, Fig. 3.)

Unio obesus Lea, Obs. I, p. 106, pl. XIII, Fig. 26. May 7, 1830. York River, Va.; Wm. Cooper.

Unio Blandingianus Lea (Plate LXX, Figs. 1, 2), Obs. I, p. 213, pl. XV. Fig. 44. Feb. 7, 1834.

Unio paludicolus Gould (Plate LXXI, Fig. 2), Proc. Bost. Soc. Nat. Hist., Aug. 15, 1845 Everglades.

Unio Jewettii Lea (Plate LXXI, Fig. 1), Obs. XII, p. 36, pl. XXXVII, Fig. 89, June 2, 1868, Sink of Noonans Lake; Col. Jewett.

Unio rivicolus Conrad., Am. Jour. Conch. IV, p. 280, 1868. Brook near Tampa, Fla.

Unio Websteri B. H. Wright (Plate LXX, Fig. 3), Proc. Acad. Nat. Sci. Phila, 1888, p. 113, pl. II, Fig. 2. Lake Woodruff, Volusia County.

This species, though varying less than many others, has unfortunately received a great number of names. The form is that described with the group; in the type it is somewhat inflated and rounded ventrally; the epidermis is never smooth, varying from ashy and greenish olive to jet black; the scaly or laminated covering of the very dark examples is often glossy. In Lea's collection of *obesus* some of the specimens have a reddish epidermis, and it is this variety, I think, that Mr. Wright has described as *U. Websteri.* A shell collected in Lake Woodruff, so labeled by him, and donated to the Museum (Museum No. 91128), is undoubtedly *U. obesus. U. rivicolus* Con., judging by his figures and description, is identical with the form Lea described as *U. Blandingianus;* the variety with rough, glossy epidermis, often becoming somewhat arcuate with age. *U. Jewettii*, though sometimes shaded with green and partially rayed, connects these forms with the type. *U. paludicolus*, judging from Gould's description and shells that he sent Lea from the typical lot, appears to be the young or perhaps a dwarf form of the species under consideration. Such a form, somewhat widened posteriorly, was found abundantly by the writer in Manatee County, and I have the same before me from several localities. Some of these from Spring Creek, belonging to Mrs. Andrews, have reddish chestnut epidermis and salmon coppery nacre, yet they are, no doubt, a variety of the above.* It is very doubtful whether *U. declivis* and *columbensis* are anything more than forms of this species. Both generally have a couple of shallow furrows running from near the beaks down the dorsal slope, but this feature is sometimes seen in the varieties I have noticed. The former is occasionally nearly smooth, suggesting *U. camptodon* and *manubius.* The latter is generally a wider shell than the type. It may be said that the *obesus* form is found along the Atlantic slope, from

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* I have recently received from Mr. Charles W. Johnson four specimens of what are undoubtedly *Unio obesus*, two of them from Pemberton's Ferry, on the Withlacoochee River, Florida, the others from a tributary of the St. Johns, the largest of which measures 1½ inches in width by seven-eighths inch in length; yet they are all quite solid shells and evidently adults. They are almost perfect representatives in miniature of some of Lea's very largest specimens of the species. I give a figure of one of them.

Virginia to Florida, *Blandingianus* and *Jewettii* in Florida, *columbensis* in the Georgia streams that drain into the Gulf, and *declivis* from the latter State west to Texas, though these limits do not always hold good.

I found thousands of the *Blandingianus* form in a little drain in the piney woods near Braidentown, which was always dry except during the rainy season, and its banks of slightly damp sand were full of dormant specimens. A number of these survived after lying out in the sun for months.

Unio squalidus Lea.

(Plate LXXI, Fig. 4.)

Unio squalidus Lea, Obs. XII, p. 26, pl. VII, Fig. 20, June 16, 1863, Neuse River, Raleigh, etc.; E. Emmons.

Lea's description of this shell seems somewhat contradictory, as he says it is smooth, and in his remarks that "it has that rough squamose epidermis which is generally found in the (*obesus*) group." His specimens, though rough, are somewhat glossy. It is a stunted-looking species, less wide than most of the *obesus*, and rather rhomboid in outline. In Mrs. Andrews' collection, shells labeled "Florida," by Rugel, are, I think, of this species. One of Lea's shells is faintly rayed.

GROUP OF UNIO ROTUNDATUS.

A small assemblage of more or less orbicular shells, which are often inflated and sometimes triangular. *Unio Beadleianus* on the one hand is nearly globose, while *U. lenticularis* is considerably compressed. Most of the species have a slight posterior ridge, though it is not constant; the epidermis varies from brown to chestnut; the hinge line is curved; cardinals somewhat ragged and compressed, and the nacre ranges from a silvery white to purple. The species are confined, for the most part, to the streams emptying into the Gulf, being found from the Suwanee to the Brazos, and to the Tellico River, Tennessee.

Unio succissus Lea.

(Plate LXXI, Fig. 5.)

Unio succissus Lea, Obs. V, p. 31, pl. XXI, Fig. 32, Mar. 5, 1852. W. Florida; Maj. Le Conte.

Unio cacao Lea (Plate LXXI, Fig. 6), Obs. VIII, p. 26, pl. LVI, Fig. 169, Mar. 10, 1859, Chocktahatchie R., Fla.; Maj. Le Conte.

Lea has singularly confused this and allied species. He described it from a single specimen, a somewhat obovate, compressed shell, with an ill-defined posterior ridge, a chestnut epidermis and chocolate purple iridescent nacre. It is rather solid in structure, and has quite a heavy hinge plate, with strong irregular cardinals and nearly straight laterals, slightly curved posteriorly. Subsequently he received another specimen from New Orleans, presented by Mr. Wheatley, which is more inflated, has compressed cardinals, and a narrow hinge plate, a shell I should refer to *chickasawhensis*. Another, a right valve, was entered with this species in the Museum collection (Museum No. 84574), and credited to West Florida; Maj. Le Conte, in the record book; but Lea does not mention this valve in his description, and states that but a single specimen was sent by Le Conte.

Sometime ago, in working over the Lea duplicates, I found a left valve that recalled *successus*, and, on comparing, saw that it belonged with the one said to come from west Florida. Dr. Lea had labeled it and the shells with it "*Unio rubiginosus* Lea, *cerinus* Con., Alexandria, La., Dr. Hale." It is not *rubiginosus* or *successus*, in my opinion, but agrees pretty well with the description and figure of Conrad's species, which is probably a valid one. *Unio cacao*, described from a single shell from west Florida seven years later, is merely a younger specimen of *successus*, and agrees with the type of that species in every respect. Lea has placed the latter in his collection with *chickasawhensis*, *rotundatus*, and *lenticularis*, and the former with *amabilis*, *tellicoensis*, and *glandaceus*, more than a thousand numbers distant.

GROUP OF UNIO ANODONTOIDES.

A striking assemblage of species typified in America by a common Mississippi Valley form, with a very wide and extra limital distribution, but which is quite constant in its characters throughout its entire range. The well-known *U. pictorum* and several European and west Asiatic species probably group with it.

Unio anodontoides Lea.

(Plate LXXI, Fig. 7; Plate LXXII, Figs. 1, 2, 4.)

Unio anodontoides Lea, Obs. I, p. 91, Pl. VIII, Fig. 11, May 7, 1830.
Unio floridensis Lea (Plate LXXII, Fig. 3), Obs. V, p. 30, Pl. XXI, Fig. 31, Mar. 5, 1852.
Chácktáhatchi River, west Florida; Maj. Le Conte

This species is so well known that it is scarcely necessary to comment on it. It is abundant throughout the Mississippi area, and over most, if not all, that part of the United States which is drained into the Gulf, as such localities as "Colorado River, Texas;" "Withlacoochee River, Florida;" "Marietta, Ohio;" and Lodge Pole Creek, Colorado, where it was collected by the writer, will show. In the Ohio River, Texas, and some of the other Southern States it attains large dimensions; in south Georgia and Florida it becomes more fragile, is of moderate size, and is often *more rounded on the posterior margin*, and this form is evidently what Dr. Lea has described as *U. floridensis*. Specimens collected by Mr. C. W. Johnson from the Withlacoochee River, now in the Museum (Museum No. 104037) agree exactly in outline with the figure and description of that shell in the fifth volume of the Observations. Lea speaks of this species as having remarkably small teeth, a character always found in *anodontoides*, and of its resemblance to the latter in color and peculiar texture. The single specimen from which he described the species was badly eroded and in poor condition, and is not in his collection, nor do I know where it is. I have specimens of *U. anodontoides* before me from various localities in southern Mississippi, Alabama, and Georgia, and the Withlacoochee River in Florida, collected by Johnson and Rugel, and by the latter from Simpson Creek, Florida.

GROUP OF UNIO NASUTUS.

Wide shells, of rather light structure; undulate beaks, and usually dark greenish, somewhat rayed, epidermis, with lurid purple, silvery, or bluish, often iridescent nacre. The posterior end is usually drawn out to a point; is sometimes more or less ridged and biangulate. *U. nasutus*, the type, is abundant on the Atlantic slope from Canada to southern Virginia, and is also found west to Illinois.

Unio aheneus Lea.

(Plate LXXIII, Fig. 6.)

Unio aheneus Lea, Obs. IV, p. 38, Pl. XLI, Fig. 9, Aug. 18, 1843. Black Cr., Fla.; S. B. Buckley.

Lea's type is a young specimen not over half grown. The epidermis is green and yellow, neatly rayed; the shell is compressed, very wide, rather narrow posteriorly, and somewhat widened behind, either biangulate or, in some specimens, ending in a single produced point. The nacre is usually lurid and coppery shaded, but specimens belonging to Rev. A. Dean, of Muncy, Pa., from Lake Ashby, are blackish almost without rays, and have dark purple nacre.

Unio Waltoni B. H. Wright.

(Plate LXXIII, Fig. 7.)

Unio Waltoni B. H. Wright, Proc. Acad. Nat. Sci. Phila., 1888, p. 144, Pl. II, Fig. 3. Lake Woodruff, Volusia Co.

This species is close to the last, as it is to several other members of the group. It is, however, a wider, larger species than *U. aheneus;* is more produced in the ventral region; has a rougher, darker epidermis; is slightly less solid, and has commonly a rather sharp point just in front of the beaks. It is probable that it may be found to connect with *aheneus*.

GROUP OF UNIO GIBBOSUS.

Wide, solid shells, with usually rough epidermis, varying from yellowish and green—in some species rayed or tesselated—to dark brown. Hinge plate heavy; teeth strong, the laterals well elevated and ending abruptly behind. Nacre varying from white, through salmon, to deep purple, variable in color often in the same species. There are in almost all the examples of the group one or more shallow furrows or depressions within, running from near the cardinals in a direction more or less parallel with the dorsal line toward the posterior ventral region. Several of the species are strongly humped, especially in old specimens, and by the thickening of the substance of the shell and its growth at the ventral posterior point, become very ponderous and somewhat triangular in outline.

Unio subgibbosus Lea.

(Plate LXXIII, Fig. 5.)

Unio subgibbosus Lea. Obs. VI, p. 53, Pl. VI, Fig. 36, June 23, 1857. Oostanaula and Etowah rivers, Ga. Rev. G. White.

A single undoubted specimen, a female of this species, is before me, belonging to Mrs. George Andrews, collected by Rugel in Lake Monroe. The species is close to *gibbosus* on the one hand and *luridus* on the other. It is less wide and smaller than the former and not so pointed posteriorly, and more inflated than the latter. I think it probable that it is only a small southern race of *gibbosus*, as the latter has a wide distribution and has been found at Columbus, Miss., Claiborne, Ala., and other points in the Gulf drainage.

Unio subluridus, n. s.

(Plate LXXIII, Figs. 3, 4.)

Shell small, elliptical, somewhat narrow and rounded before, with a slight tendency to biangulation behind; valves somewhat thin, slightly inflated; epidermis striated, rather roughened and shining, yellowish chestnut, lighter at the beaks, without rays; cardinal teeth not large, subcompressed, double in the left valve, single in the right; laterals slightly curved, roughened, not heavy or greatly elevated; anterior cicatrices well impressed; nacre coppery and slightly iridescent. Diameter .55, length .85, breadth 1.50 inches. Locality, Orange Springs, Volusia County. C. W. Johnson.

Three shells of this little form are before me, and while they do not possess any very striking characters, yet I find it absolutely impossible to refer them to any described species, and, in fact, I hardly know in what group to place them. I had considered this a rather thin form of *U. luridus*, but it differs from that species in having much less solid teeth and more elevated cardinals, in the color of the epidermis and nacre, and in being a less solid shell. It bears some resemblance to forms of *U. tetricus*, but is not so wide, and is a much more evenly elliptical shell. There are traces of the furrows in the nacre which I have mentioned in connection with this group, and these with the rather heavy isolated laterals, as well as a slight resemblance to *U. luridus* (Plate LXXIII, Figs. 1, 2), incline me to place it here.*

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* Since writing the above further study induces me to believe that this species groups with *Unio camptodon*.

GENUS ANODONTA.

GROUP OF ANODONTA IMBECILLIS.

Very thin, inflated, smooth, shining anodons, with undulate beaks, and having the epidermis brightly painted with shades of yellowish and green. The ventral region is well developed, the posterior end is rather pointed, the umbonal area is in most cases peculiarly flattened, and over it the delicate radiating lines of color are often beautifully undulated. The group is widely distributed, the type species being found from Rideau Canal, Canada, to Darien, Ga., and from Minnesota to Matamoras, Mexico.* The distinctions between the North American forms of anodons are very poor and ill defined. The northern specimens of *A. imbecillis* are wider and morecompressed at the beaks; in the south they are more inflated, of greater proportional length, with the umbonal region less depressed, until they seem to almost shade into *A. Henryana*, *A. Dunlapiana*, and *A. Couperiana*.

Anodonta Couperiana Lea.

(Plate LXXIV, Fig. 1.)

Anodonta Couperiana Lea. Obs. III, p. 65, Pl. XX, Fig. 46, Oct. 2, 1840. Hopeton, near Darien, Ga., J. H. Couper.

Anodonta Dunlapiana Lea. (Plate LXXIV, Figs. 2, 3.) Obs. III, p. 86, Pl. XXVII, Fig. 65, Oct. 21, 1842. S. Carolina; Mrs. Dunlap.

Dr. Lea claims that *A. Dunlapiana* is less oblique and more cylindrical than *A. Couperiana*, but his series of the former shows a gradual variation from one to the other. I doubt if *A. Henryana* from Mexico is more than a mere variety. In the younger shells the beaks are much compressed; in old specimens they become somewhat inflated.

EXPLANATION OF PLATES.

NOTE.—The figures are all the natural size of the specimens.

PLATE XLIX.

FIG. 1. *Unio infucatus* Conr. (U. S. Nat. Mus. register No. 84037); Georgia; light brown; p. 409.
2. The same (84034); Georgia; nearly smooth, black; p. 409.
3. *Unio Forbesianus* Lea; Georgia; type (84542); p. 410.
4. *Unio vestitus* Lea; Georgia; type (85333); p. 410.
5. *Unio infucatus* Conr. (84034); Georgia; smooth, black, inflated; p. 409.
6. *Unio Kleinianus* Lea (84081); Florida; brown; p. 409.

PLATE L.

FIG. 1. *Unio vestitus* Lea (85333); Georgia; p. 410.
2. *Unio Forbesianus* Lea (84542); Georgia; p. 410.
3. The same; Lake Monroe, Florida; p. 410.
4. *Unio moussonianus* Lea; type (85168); Georgia; p. 410.

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* *A. cygnea* Lam., of Europe, is no doubt a member of this group.

PLATE LI.

Fig. 1. *Unio monroensis* Lea; type (85169); Florida; p. 410.
2. *Unio pusillus* Lea; type (85241); Georgia; p. 411.
3. *Unio buxeus* Lea; type (85153); Abbeville, S. C.; p. 411.
4. *Unio Anthonyi* Lea; type (84986); Florida; p. 411.
5. The same; young (84985); Edisto River, South Carolina; p. 411.
6. *Unio pusillus* Lea; young (85241); Oguchee River; p. 411.
7. *Unio dorsatus* Lea (84494); Catawba River, North Carolina; p. 411.

PLATE LII.

Fig. 1. *Unio dorsatus* Lea (84496); Abbeville, S. C.; p. 411.
2. The same; Florida; p. 411.
3. *Unio hopetonensis* Lea (85390); Darien, Ga.; p. 412.

PLATE LIII.

Fig. 1. *Unio hopetonensis* Lea (85392); Georgia; p. 412.
2. *Unio dariensis* Lea (85690); Georgia; p. 413.

PLATE LIV.

Fig. 1. *Unio dariensis* Lea (85690), Georgia; compressed form, slightly folded; p. 413.

PLATE LV.

Fig. 1. *Unio Downiei* Lea (84854); Georgia; p. 413.
2. The same; Buck Lake, Georgia; solid eroded specimen; p. 413.
3. The same; Florida; p. 413.

PLATE LVI.

Fig. 1. *Unio exiguus* Lea (84974); Georgia; p. 414.
2. *Unio modioliformis* Lea (85029); South Carolina; p. 414.
3. The same; South Carolina; p. 414.
4. *Unio nigrinus* Lea; type (86132); western Florida; p. 414.
5. *Unio Downiei* Lea (84854); Florida; p. 413.
6. *Unio modioliformis* Lea (85029); male; South Carolina; p. 414.

PLATE LVII.

Fig. 1. *Unio subellipsis* Lea (85095); Georgia; p. 414.
2. *Unio rutilans* Lea (85090); Georgia; like fig. 3, pl. LVI, p. 414.
3. The same; Mississippi; like *nigrinus* and *Averillii;* p. 414.
4. The same; Georgia; male; somewhat solid, like *subellipsis;* p. 414.
5. The same; Georgia; p. 414.
6. *Unio Averillii* Wright (91142); Lake Ashby; Florida; p. 414.

PLATE LVIII.

Fig. 1. *Unio subangulatus* Lea; Florida; p. 415.
2. *Unio concestator* Lea (85102); Georgia; female; p. 416.
3. The same; Florida; female; p. 416.
4. The same; Columbus, Ga.; male; p. 416.
5. *Unio tenerus* Lea (85030); South Carolina; male; grows larger; p. 416.
6. *Unio Buckleyi* Lea (85234); Lake Monroe; Florida; p. 417.
7. The same; Enterprise, Fla.; p. 417.
8. *Unio tenerus* Rav. (85032); Georgia; female; p. 416.

Plate LIX.

Fig. 1. *Unio Buckleyi* Lea (85235); Florida; like *Dalliana;* p. 417.
2. The same; Black Creek, Florida; very large and highly colored; p. 417.
3. *Unio Simpsoni* B. H. Wright. Author's collection, p. 417.

Plate LX.

Fig. 1. *Unio Simpsoni* Wright; p. 417.
2. *Unio Buckleyi* Lea (85237); Florida; young *Buddianus;* p. 417.
3. *Unio Buddianus* Lea (85606); Florida; very large and old; p. 417.
4. The same; type (85607); St. Johns River; p. 417.

Plate LXI.

Fig. 1. *Unio Orcuttii* S. H. Wright; Florida; p. 417.
2. *Unio Dalli* B. H. Wright (91126); Florida; p. 417.
3. *Unio Dorei* B. H. Wright; Black Creek, Florida; p. 417.
4. *Unio Jayanus* Lea (86031); Florida; p. 419.

Plate LXII.

Fig. 1. *Unio Tryoni* B. H. Wright (91129); Florida; p. 419.
2. *Unio Marshi* B. H. Wright; Florida; p. 419.
3. *Unio leonensis* B. H. Wright; (91141); Florida; male; p. 419.
4. The same; Florida; p. 419.

Plate LXIII.

Fig. 1. *Unio coruscus* Gould, (85239); Florida; p. 419.
2. *Unio fuscatus* Lea (85244); Florida; old specimens; p. 420.
3. *Unio Fryanus* B. H. Wright; Florida; p. 419.
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5. *Unio occultus* Lea (85249); Florida; male; p. 420.
6. The same; type (85247); Florida; p. 420.
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8. *Unio tortivus* Lea (85674); Georgia; p. 421.

Plate LXIV.

Fig. 1. *Unio tortivus* Lea; Georgia; extremely close to fig. 4, pl. LXIII; p. 421.
2. *Unio tetricus* Lea (85655); Georgia; p. 421.
3. *Unio tortivus* Lea; Florida; remarkably inflated; p. 421.
4. The same; dorsal view; p. 421.

Plate LXV.

Fig. 1. *Unio denigratus* Lea; type (85568); Georgia; p. 422.
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5. *Unio confertus* Lea (85633); South Carolina; young; p. 422.
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Plate LXVI.

Fig. 1. *Unio Ferrissii* Marsh; type; Florida; p. 423.
2. The same; dorsal view of type; p. 423.
3. *Unio obnubilus* Lea (85646); Georgia; female; p. 424.
4. *Unio lugubris* Lea; type (85638); Georgia; p. 424.

Plate LXVII.

Fig. 1. *Unio lugubris* Lea (85631); old specimen; p. 424.
2. *Unio minor* Lea; type (85310); Florida; female; p. 425.
3. *Unio amygdalum* Lea; typical (86128); Florida; p. 426.
4. *Unio vesicularis* Lea; type (85292); Florida; p. 425.
5. *Unio ocmulgeensis* Lea; type (85901); Georgia; p. 424.

Plate LXVIII.

Fig. 1. *Unio lepidus* Gould (91140); Florida; female; p. 426.
2. *Unio papyraceus* Gould; typical (86125); Florida; p. 427.
3. *Unio trossulus* Lea; type (84705); Florida; p. 427.
4. *Unio Singleyanus* Marsh; type, Florida; p. 426.
5. The same; dorsal view; p. 426.
6. *Unio obesus* Lea (85370); South Carolina; p. 428.

Plate LXIX.

Fig. 1. *Unio obesus* Lea (85368); Georgia; p. 428.
2. The same; (85366); Georgia; p. 428.
3. *Unio lepidus* Gould (91140); Florida; male; p. 426.
4. *Unio obesus* Lea (85366); Georgia; p. 428.

Plate LXX.

Fig. 1. *Unio Blandingianus* Lea (85714); Florida; p. 428.
2. The same; Sarasota, Fla.; depauperate; p. 428.
3. *Unio Websteri,* B. H. Wright (91128); Florida; p. 428.

Plate LXXI.

Fig. 1. *Unio Jewettii* Lea; type (85374); Florida; p. 428.
2. *Unio paludicolus* Gould; typical (85713); Florida; p. 428.
3. *Unio obesus* Lea; Florida; adult; p. 428.
4. *Unio squalidus* Lea; type (85375); North Carolina; p. 429.
5. *Unio succissus* Lea; type (84574); Florida; p. 429.
6. *Unio cacao* Lea; type (85724); Florida; p. 429.
7. *Unio anodontoides* Lea (40718); Georgia; male; p. 430.

Plate LXXII.

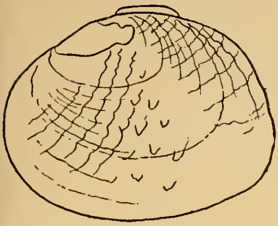
Fig. 1. *Unio anodontoides* Lea (104037); Florida; p. 430.
2. The same; female; p. 430.
3. *Unio floridensis* Lea; female drawn from Lea's type figure; p. 430.
4. *Unio anodontoides* Lea (25925); Georgia; female; p. 430.

Plate LXXIII.

Fig. 1. *Unio luridus* Lea (85253); Georgia; p. 432.
2. The same; type; Georgia; female; p. 432.
3. *Unio subluridus* n. s. (104002); Florida; female; p. 432.
4. The same; type; dorsal view; p. 432.
5. *Unio subgibbosus* Lea (86099); Alabama; female; p. 432.
6. *Unio aheneus* Lea; type (86030); Florida; p. 431.
7. *Unio Waltoni* B. H. Wright (91145); Florida; p. 431.

Plate LXXIV.

Fig. 1. *Anodonta Couperiana* Lea (86671); Florida; p. 433.
2. *Anodonta Dunlapiana* Lea; type (86564); South Carolina; female; p. 433.
3. The same; South Carolina; male; p. 433.



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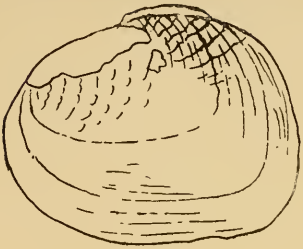

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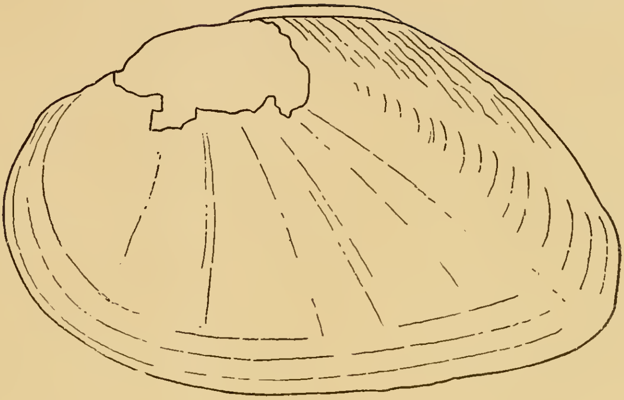

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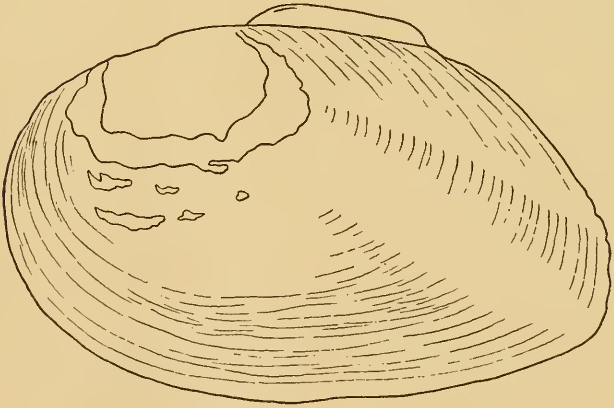

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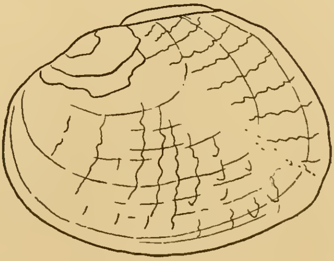

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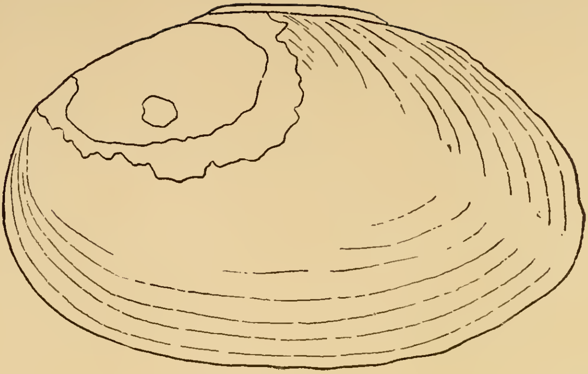
Florida Unios.



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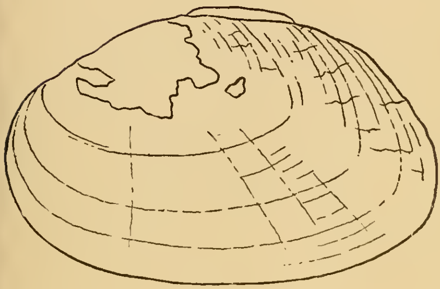

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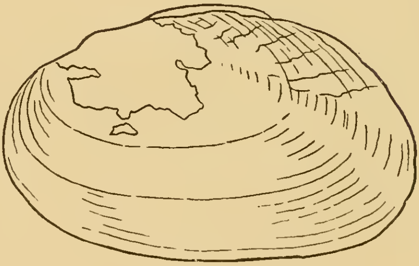

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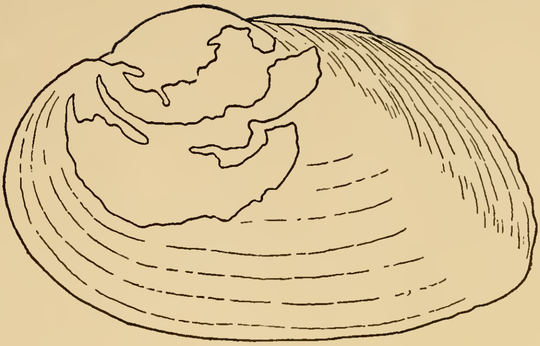

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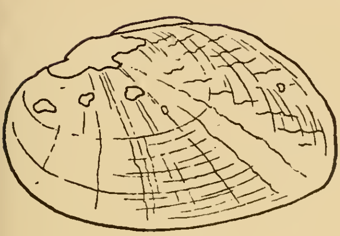

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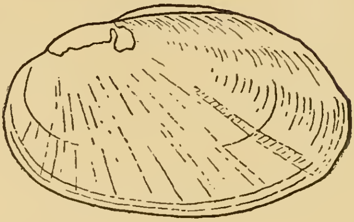

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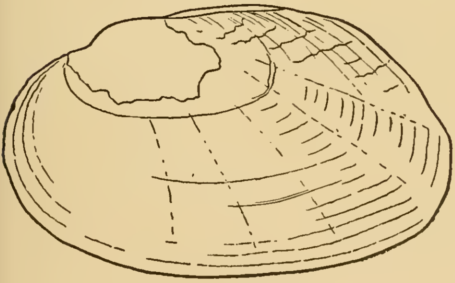

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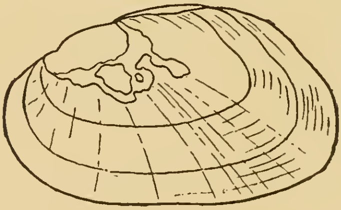

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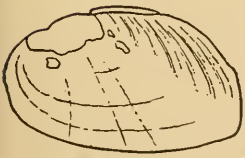

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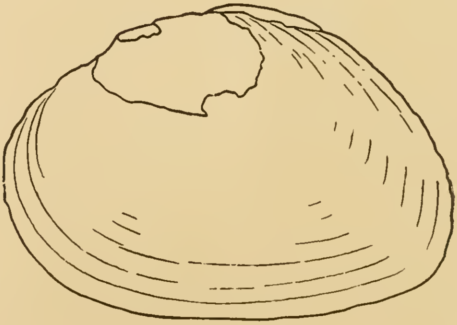

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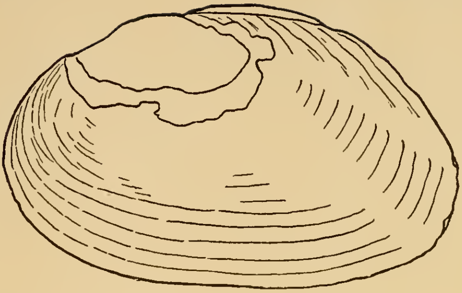

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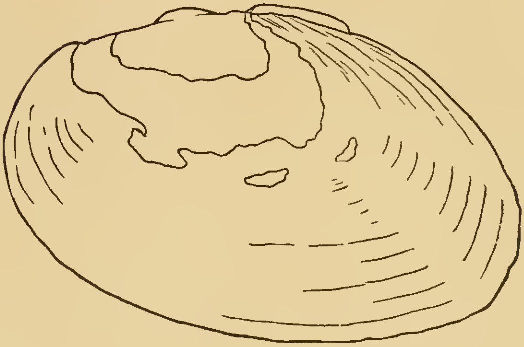

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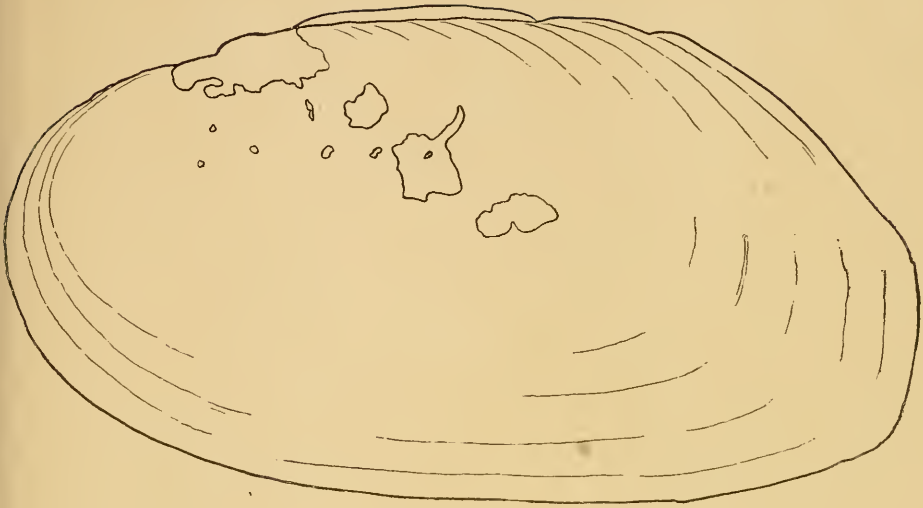

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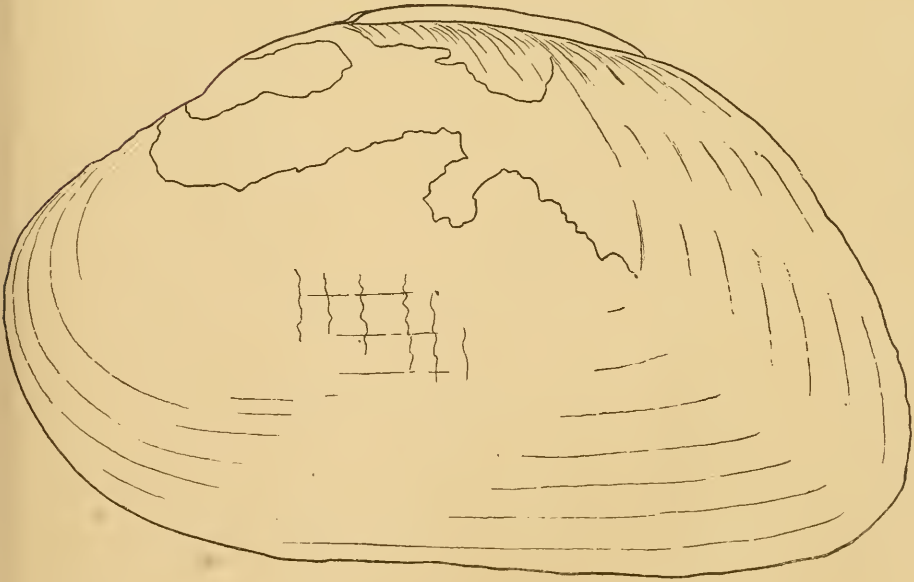

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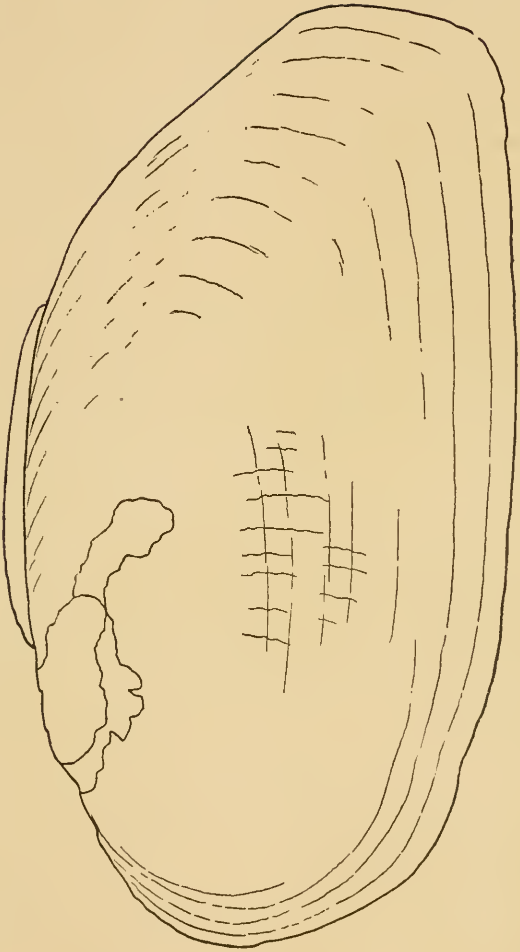

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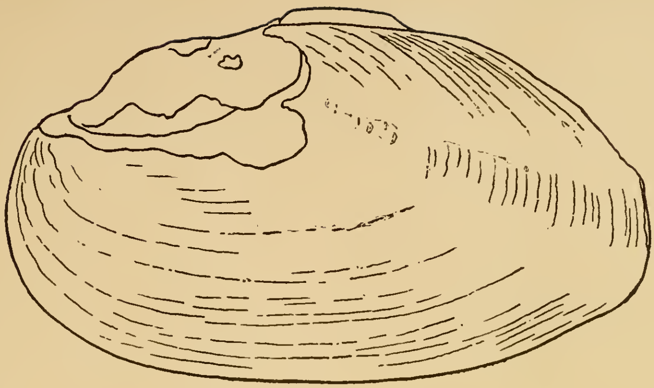

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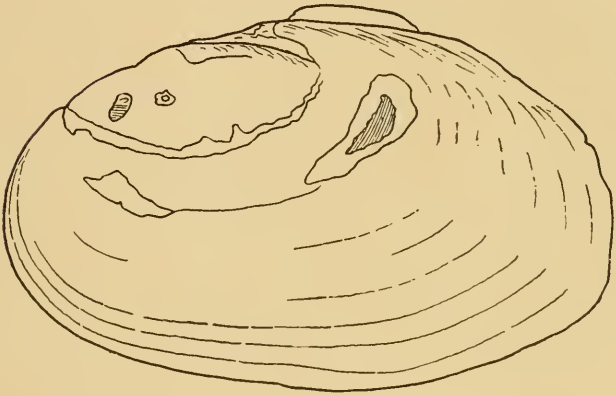

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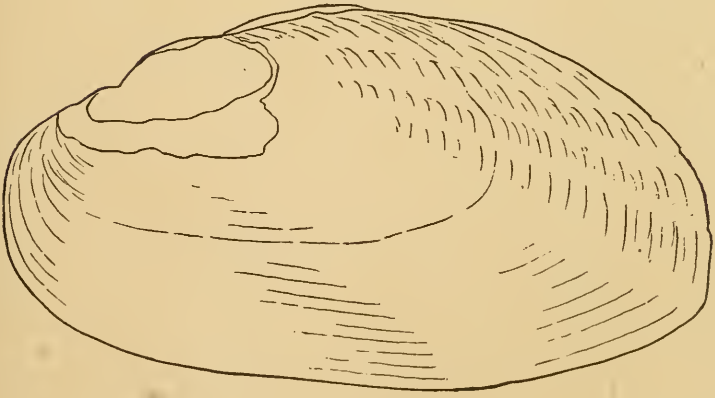

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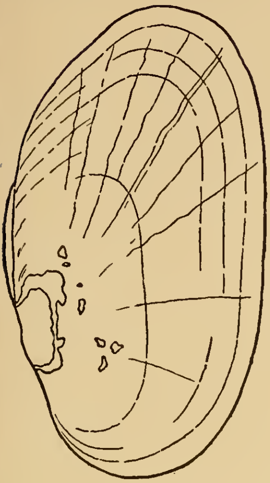

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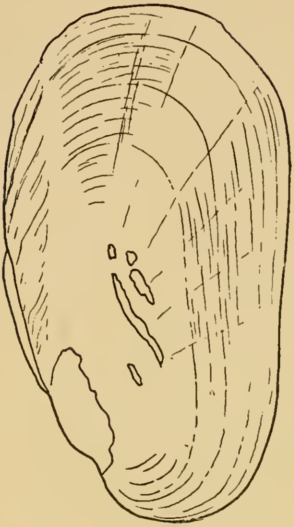

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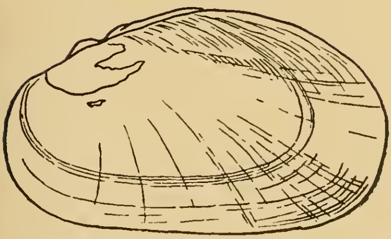

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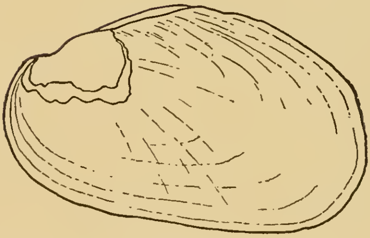

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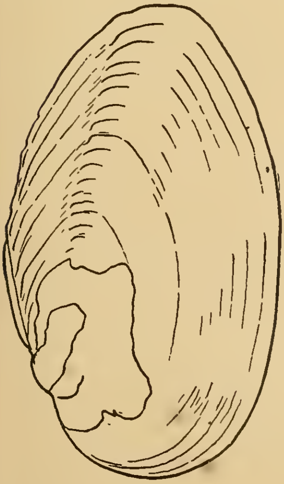

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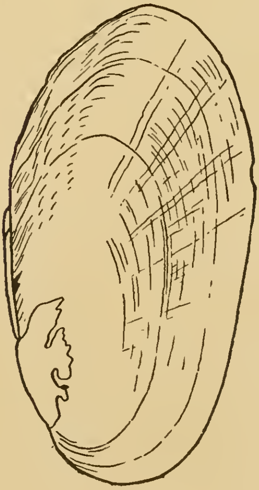

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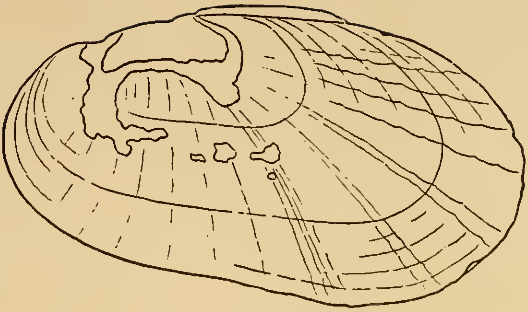

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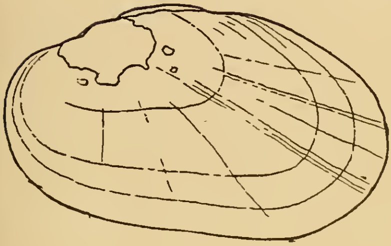

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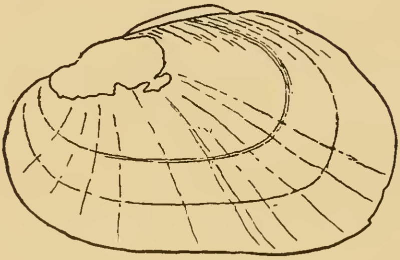

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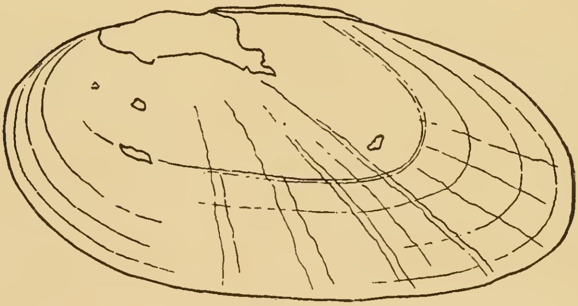

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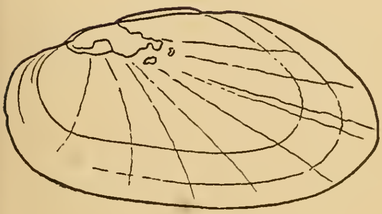

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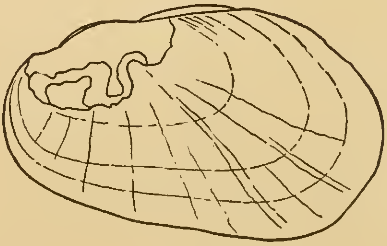

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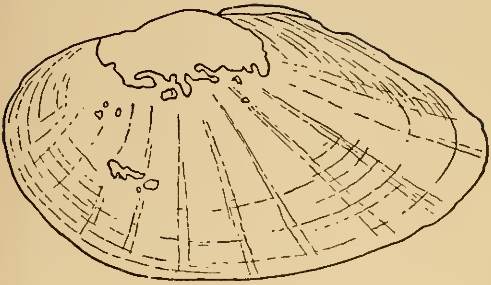

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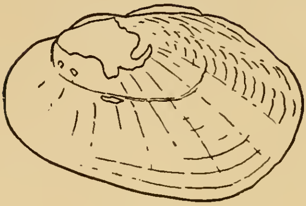

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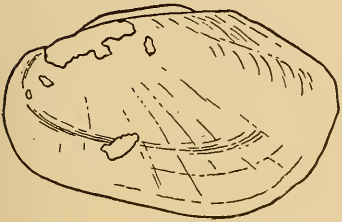

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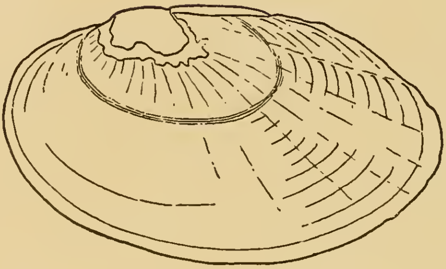

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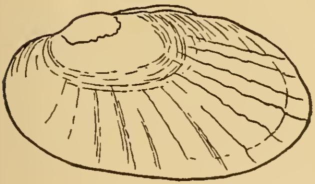

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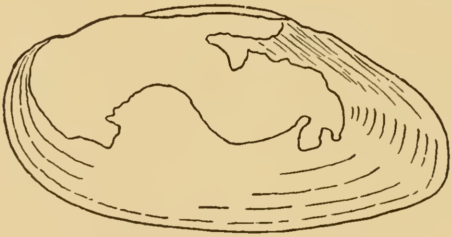

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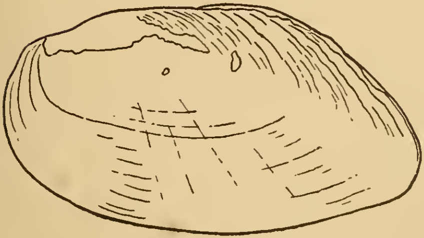

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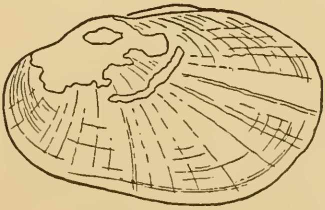

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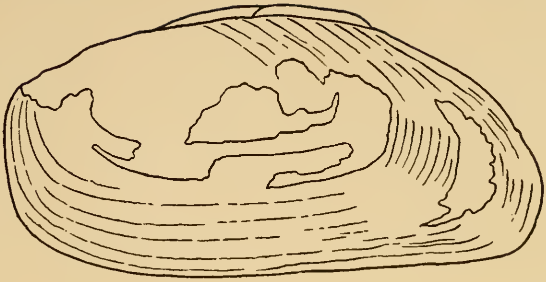

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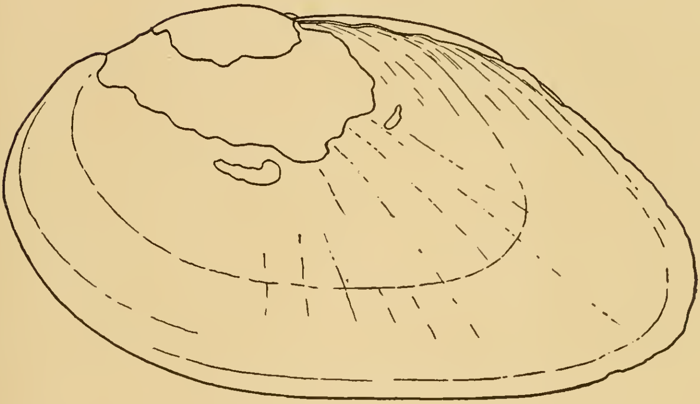

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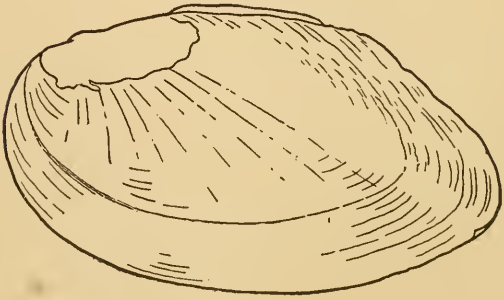

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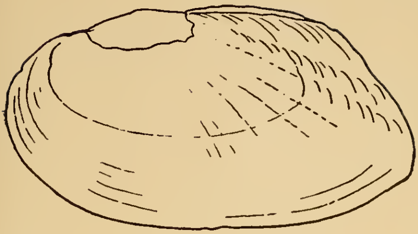

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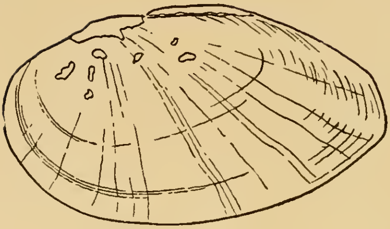

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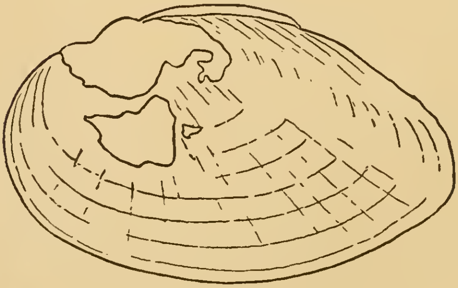

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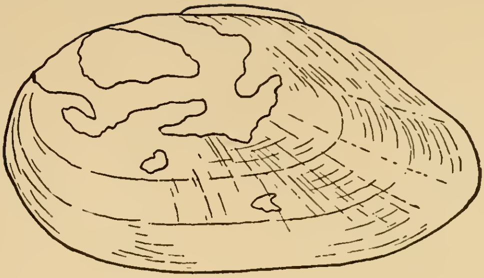

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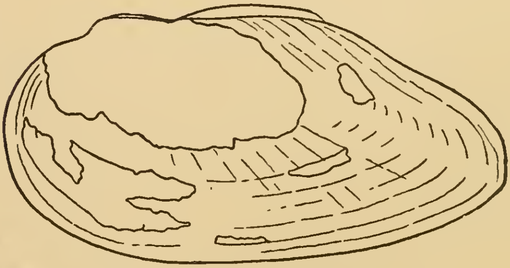

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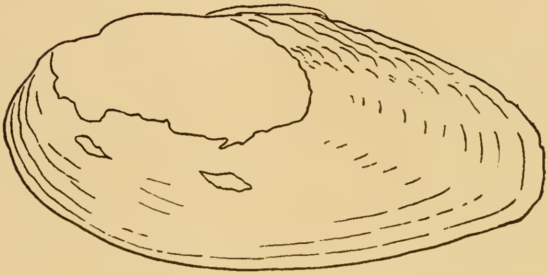

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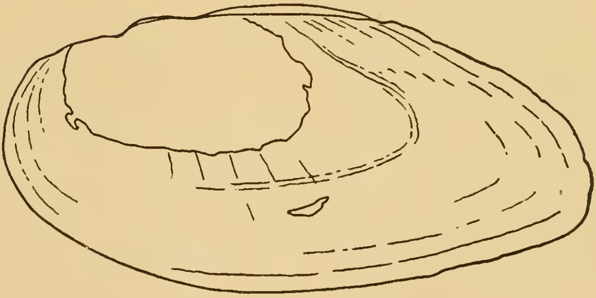

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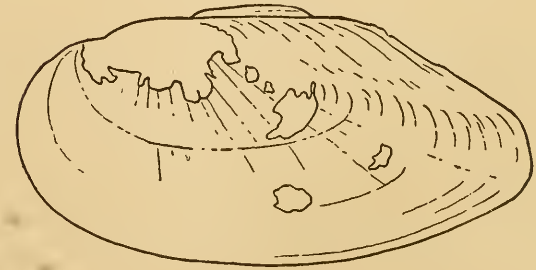

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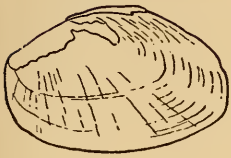

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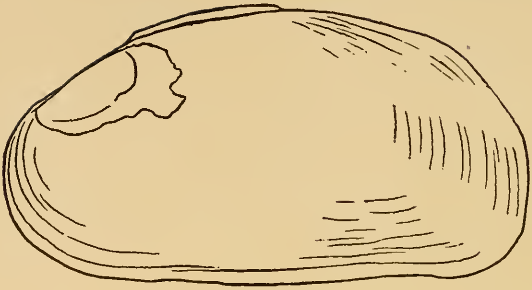

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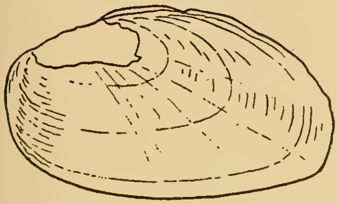

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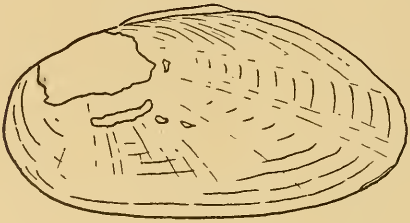

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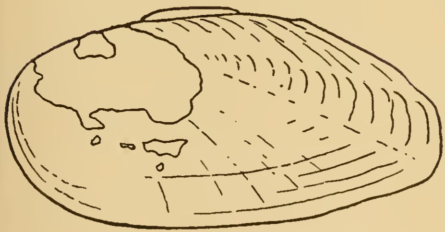

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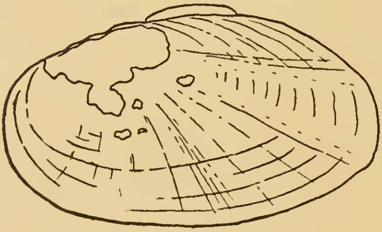

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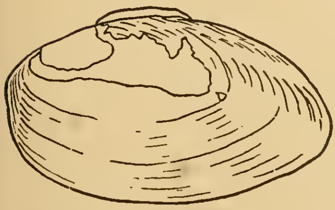

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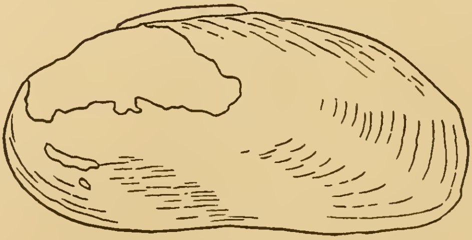

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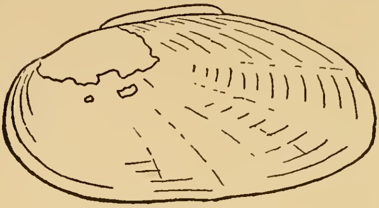

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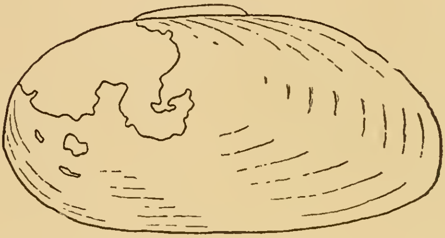

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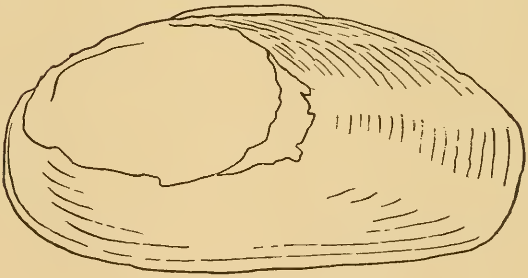

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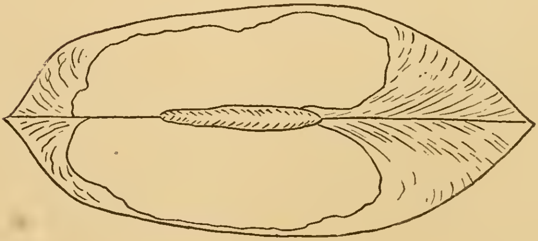

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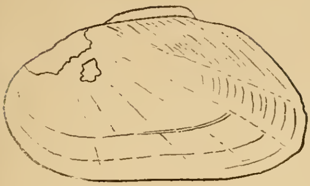

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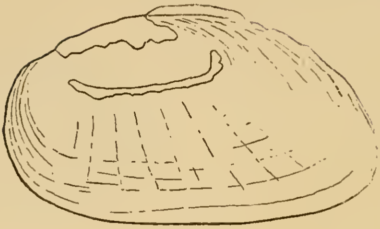

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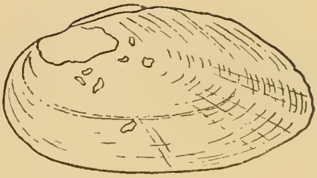

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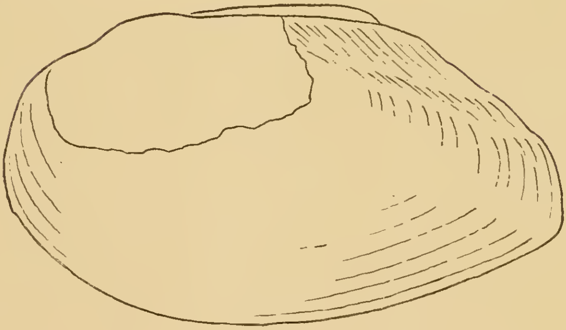

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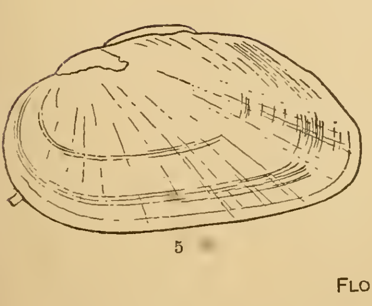

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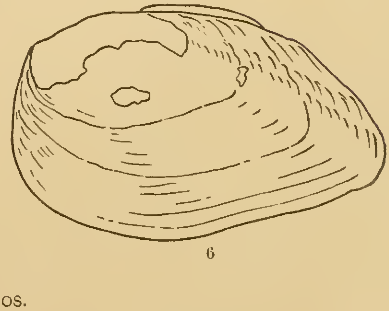

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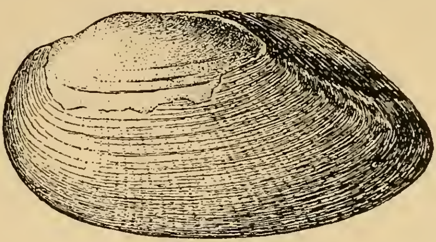

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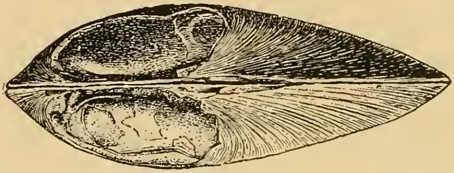

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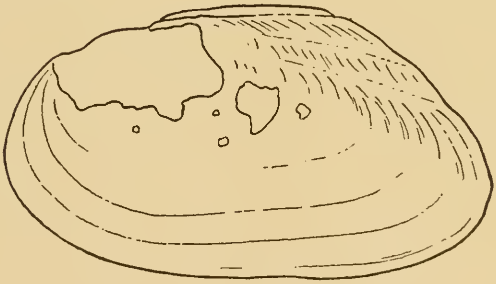

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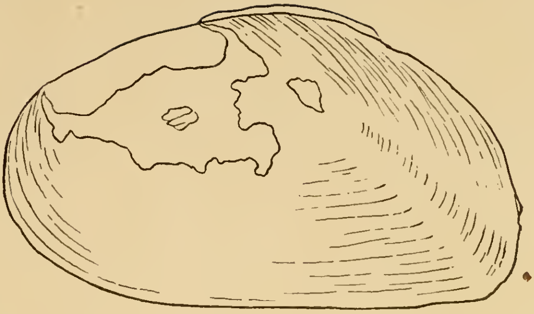

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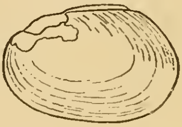

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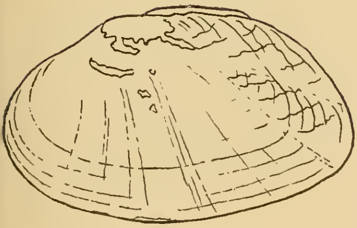

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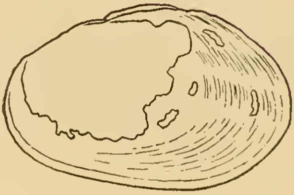

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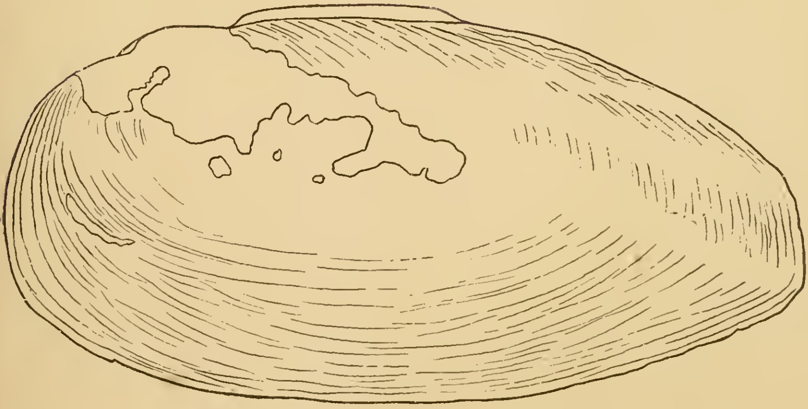

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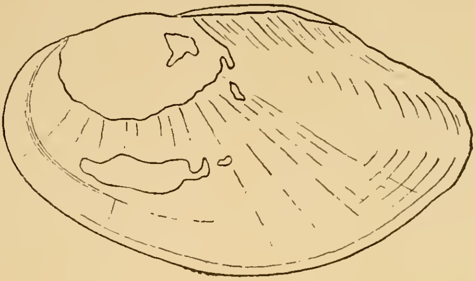

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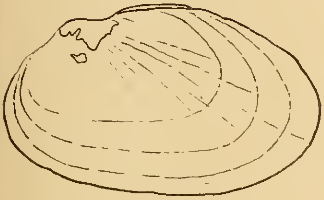

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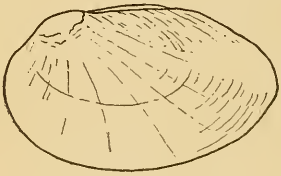

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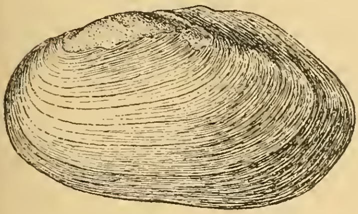

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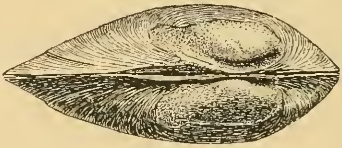

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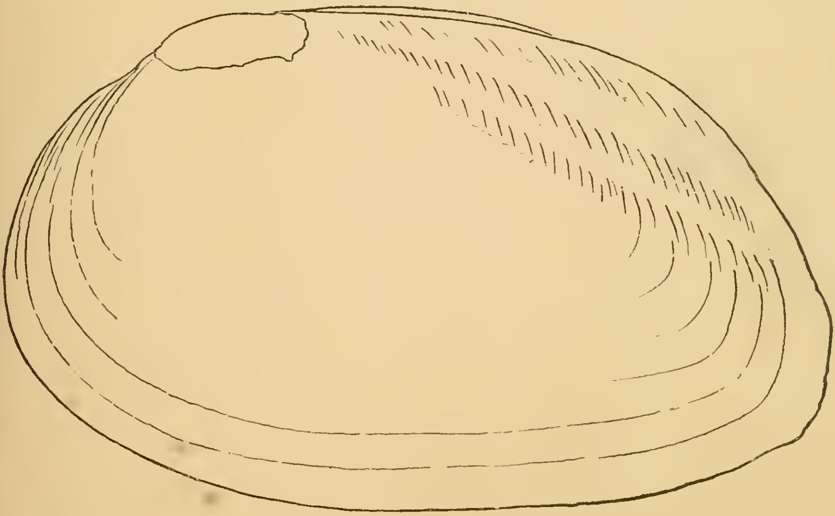

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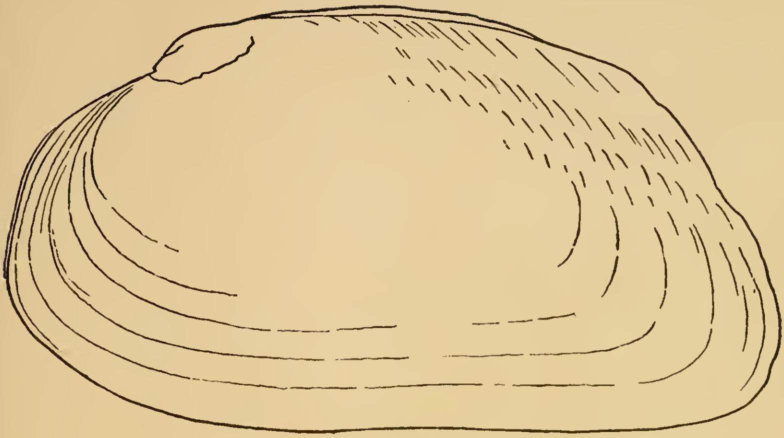

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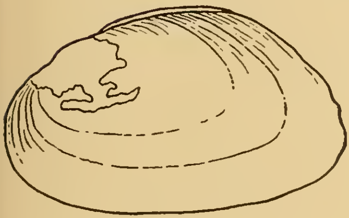

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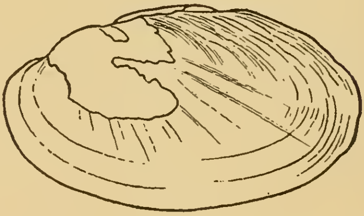

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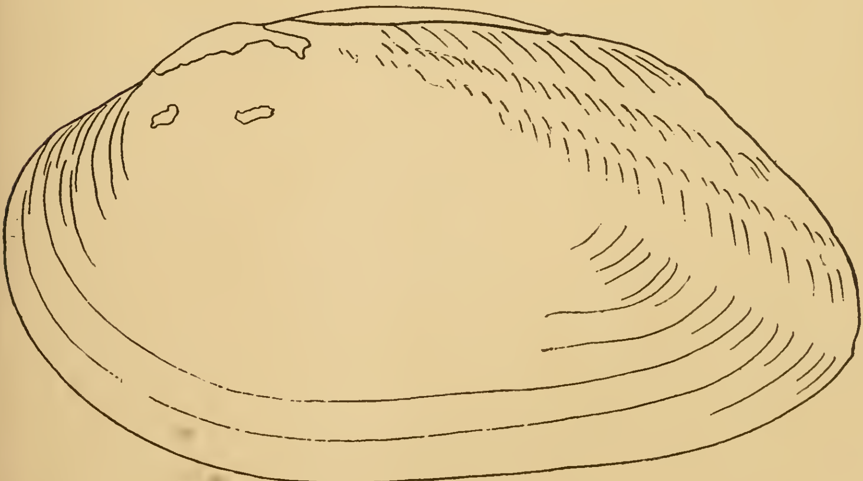

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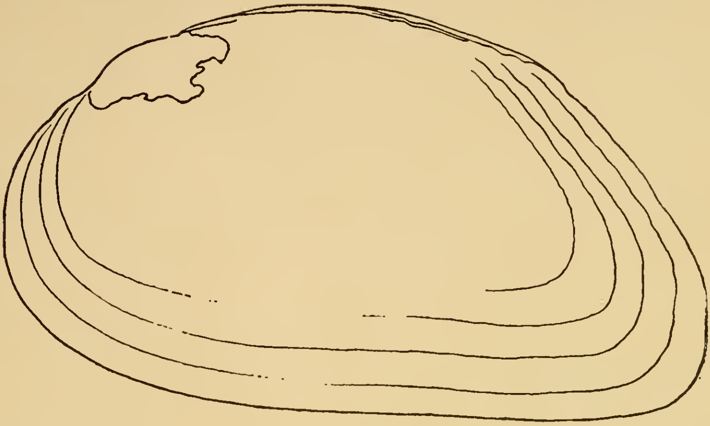

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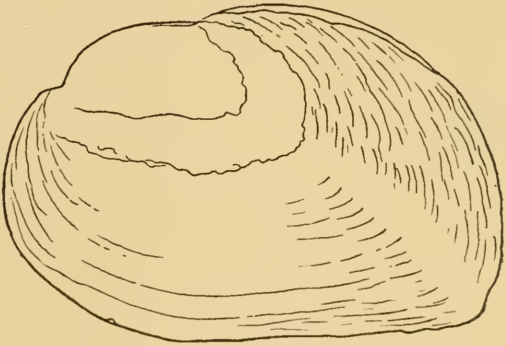

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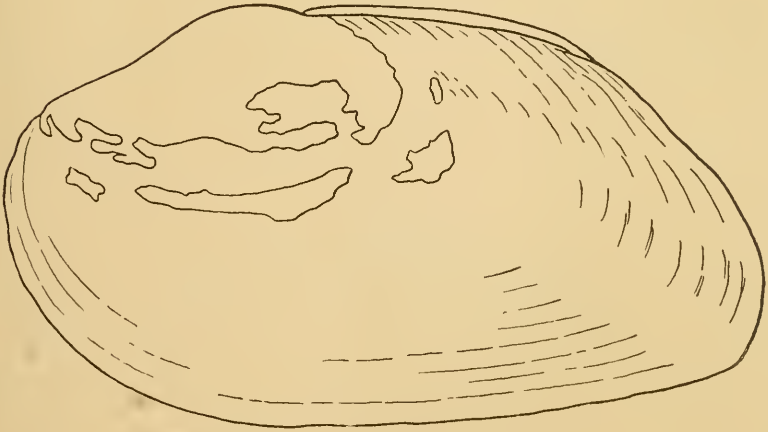

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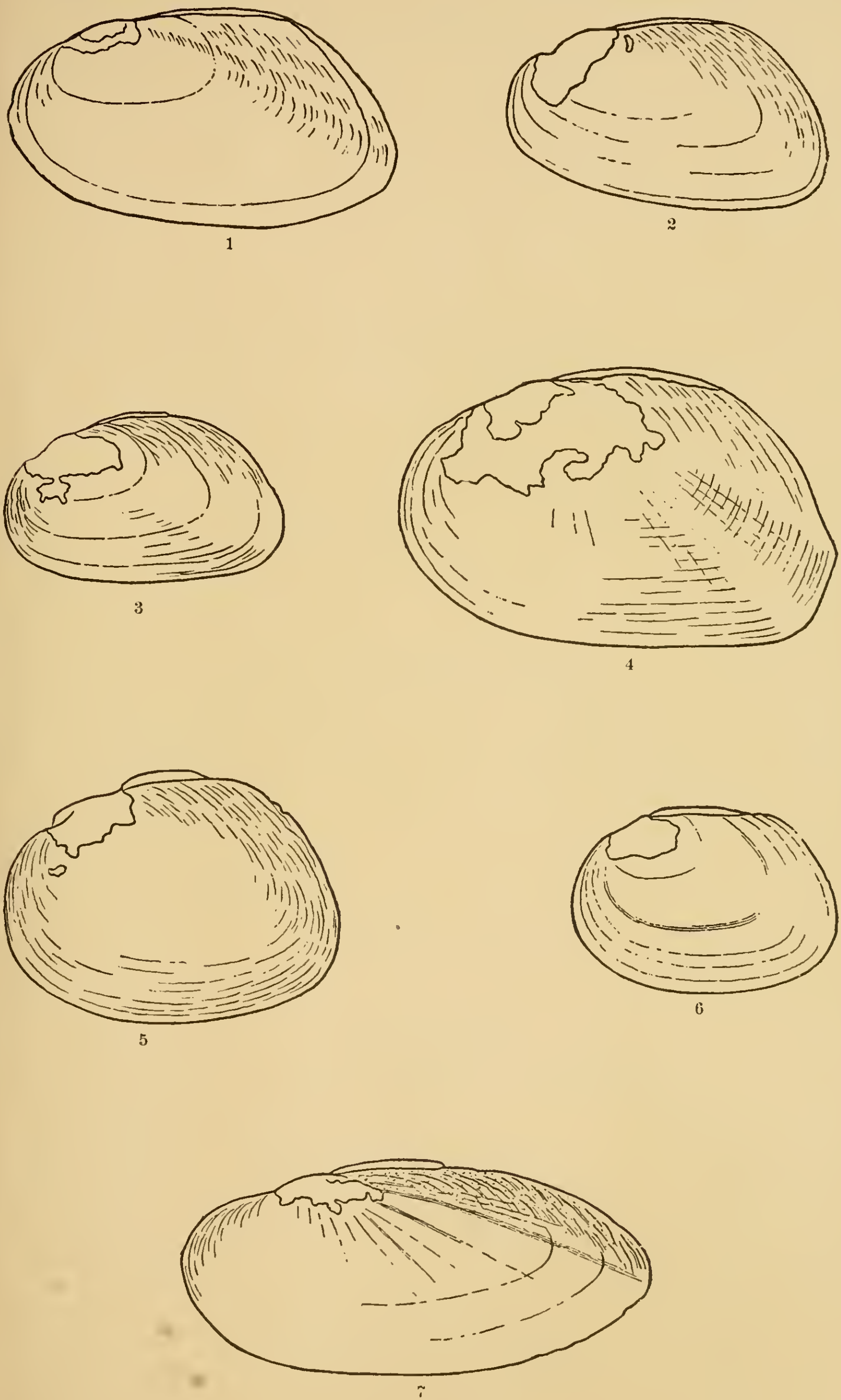

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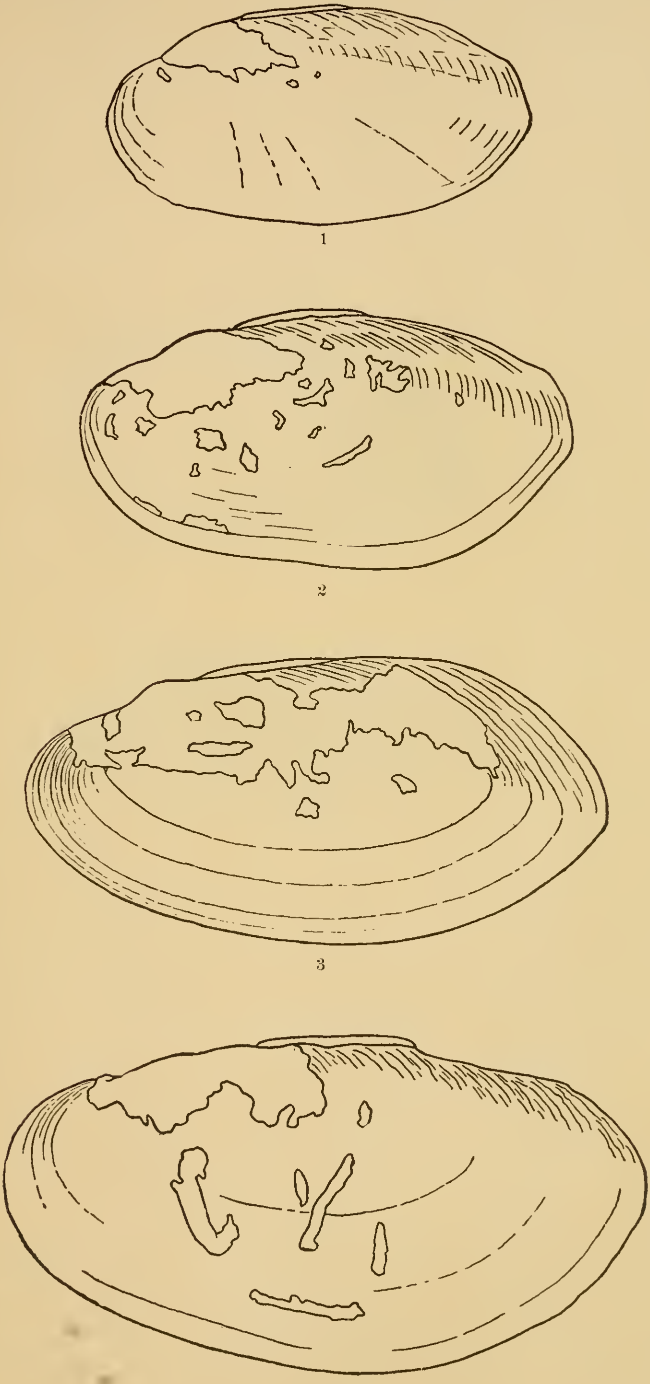

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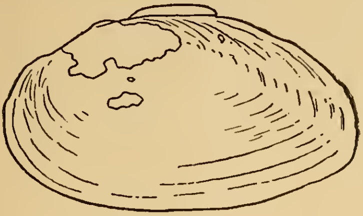

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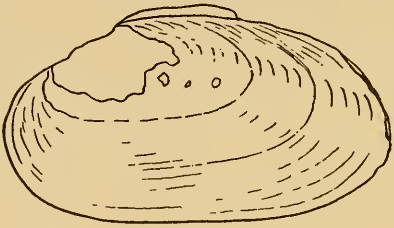

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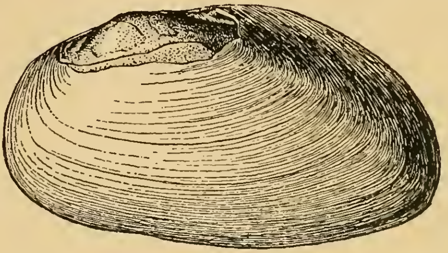

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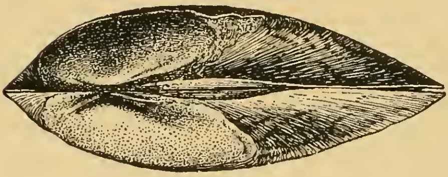

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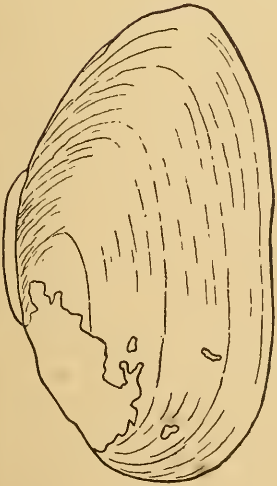

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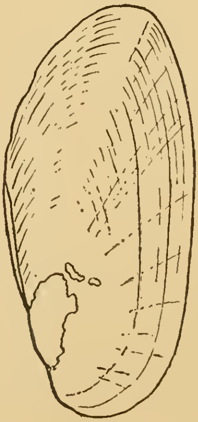

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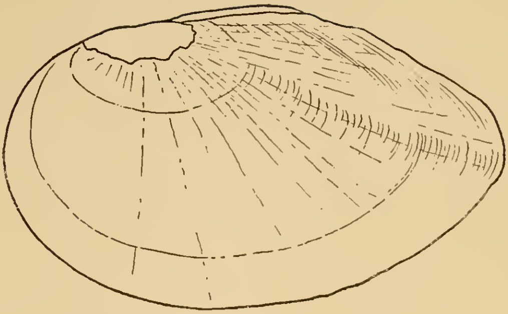

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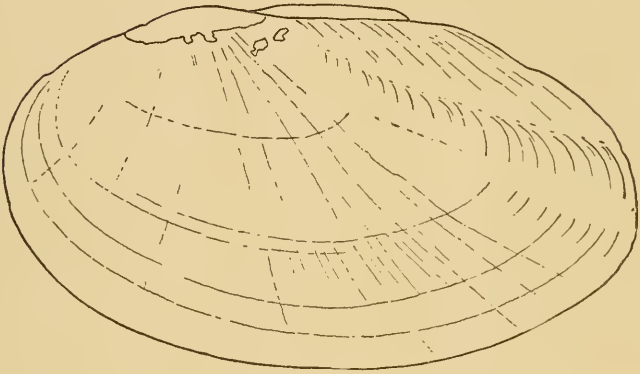

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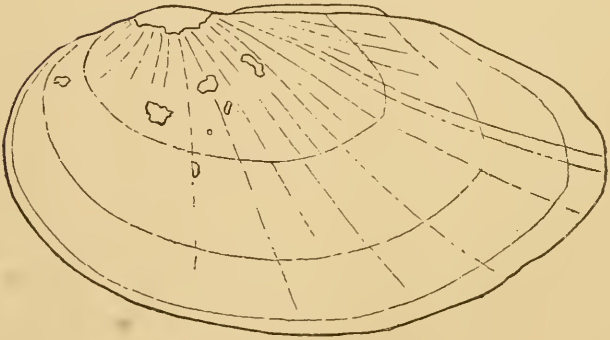

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