

# NEW PEARLY FRESH WATER MUSSELS FROM SOUTH AMERICA.

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By WILLIAM B. MARSHALL,

*Assistant Curator, Division of Mollusks, United States National Museum.*

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This paper is based upon three sendings to the United States National Museum of naiads from South America. They are:

A collection made by Dr. C. Wythe Cooke, of the United States Geological Survey, in the Province of Santander, United States of Colombia. This has yielded a new species, *Diplodontites cookei*, which necessitates the erecting of a new genus for its reception, and another new species, *Anodontites colombiensis*.

Another lot comes from Dr. Henry Pittier, of the Bureau of Plant Industry of the United States Department of Agriculture, which, among other things, contains a new species, *Anodontites pittieri*, from Venezuela.

In addition to these there are also here described five new species, *Diplodon subcylindricus*, *D. subquadratus*, *D. arcuatus*, *D. trivialoides*, and *Monocondylaea felipponei*, from Uruguay. These are part of a splendid series of specimens recently donated to the United States National Museum by Dr. Florentino Felippone, of Montevideo.

## DIPLODONTITES, new genus.

Naiads without lateral teeth and with pseudocardinal teeth of the character of those *Diplodontites cookei* herein described and as yet the only known species of the genus. The sinulus is like that of the genus *Anodontites*.

The most important features of this genus lie in the hinge characters. The triangular sinulus and the absence of lateral teeth distinguish it from the genus *Diplodon*, while the presence of pseudocardinal teeth distinguish it from the genus *Anodontites*. On the other hand, the possession of the pseudocardinals may indicate some relationship to *Diplodon* while the nature of the sinulus may indicate some relationship to *Anodontites*. Thus, by shell characters, it stands between the two genera mentioned. In North American naiads a somewhat similar condition is found. Some of these have pseudo-

cardinals and laterals, some have pseudocardinals only, and others have neither.

*Genotype.*—*Diplodontites cookei*, new species.

**DIPLODONTITES COOKEI, new species.**

Plate 1, figs. 1, 3, 7, 8, 10; plate 3, fig. 4.

Shell moderately thick, elliptical in outline, rounded anteriorly and posteriorly. Slightly gaping in front, posterior dorsal margin lightly arched, the dorsal ridge rather full and rounded, beaks moderately elevated (so eroded that any sculpture that may have existed is lost). Periostracum clothlike, dull, closely adhering, showing no tendency to peel. Color yellowish olive, the posterior dorsal area of each valve with 10 radiating greenish stripes. Radiating sculpture consisting of a number of clearly defined impressed lines which are nearly equally spaced and between which are many microscopic radiating slightly waving, striae—about 40 of these striae between each pair of impressed lines. With sufficient magnification each of these striae is seen to consist of innumerable granules. Concentric sculpture consisting of many irregular, slightly raised minor lines of growth, which are interrupted by each of the radiating impressed lines, between each pair of which the concentric lines bend downward in directions radiating from the beaks, crinkling and drooping like festooned drapery. To the naked eye this festooning is hardly visible, but under a lens it becomes one of the most striking features. Three principal stages of growth are indicated. Color of interior varying from whitish to pinkish, moderately iridescent, anterior adductor scar impressed, deep at its upper end, posterior scar but lightly impressed. Sinulus triangular like that of *Anodontites*. No lateral teeth in either valve. Right valve with three pseudocardinal teeth, the front one being strongest, high and triangular, the second low and longer, the posterior one indistinctly differentiated from the hinge plate. The socket between the first and second is large, deep, triangular, the socket between the second and third is a lengthened narrow groove, its bottom and walls with many sharp defined lines of growth. Left valve also with three pseudocardinal teeth, the front one nearly obsolete, the middle one being very large and triangular, the posterior one long and low. The socket between the first and second is very deep, that between the second and third is similar to the corresponding socket in the right valve and has similar growth markings. Prismatic border narrow, greenish-olive, minutely granulous.

The type (Cat. No. 341473, U.S.N.M.), measures: Length 53 mm., height 32 mm., diameter 20 mm. It and two other specimens and an odd valve come from a tributary of the Rio Colorado (which in turn becomes tributary to the Rio Magdalena), in the Province of San-

tander, Colombia. They were presented by Dr. C. Wythe Cooke, of the Geological Survey, who collected them in April, 1920, and in whose honor the species is named.

The sculpture of the exterior is remarkable and of great beauty. The radiating striae between the impressed radiating lines are of a fineness rarely if ever equaled in shells with the rude structure of the naiads.

**DIPLODON SUBCYLINDRICUS, new species.**

Plate 2, figs. 1, 2; plate 3, figs. 1, 2, 11.

Shell long, nearly elliptical, anterior end regularly rounded, posterior end nearly regularly rounded but obscurely bluntly angled near the lower side, ventral and dorsal margins subparallel. Both the anterior and posterior ridges full and rounded, the descent to the dorsal margins very abrupt, giving the shell a gibbous form. Beaks not very high, with 15 rather coarse radiating ribs. Surface rather smooth, with many concentric lines of growth. Periostracum closely adhering, slightly glossy. Color nearly uniform chestnut. Nacre silvery white. Pseudocardinals of right valve two, platelike, very long, the inner one beginning near the beak and reaching almost to the adductor scar, the outer one nearly as long, slightly overtopping the inner one. Left valve with but one pseudocardinal which is very long, somewhat paddle-shaped, very thin and slightly bent upward. Right valve with one lateral tooth which is somewhat distant from the beak and has its posterior end roughened. Laterals of left valve quite distant from the beak, short, inconspicuous.

The type (Cat. No. 341375, U.S.N.M.) measures: Length 82 mm., height 35 mm., diameter 42 mm. It comes from Arroyo Manga, Department of Montevideo, Uruguay. Other specimens in the collection, all from Uruguay, are as follows: A right valve from the Department of Canelones (Cat. No. 335776); a specimen from Arroyo Sauco in the same Department (Cat. No. 331282); a right valve from Maldonado, Department of Maldonado (Cat. No. 335775). All the above-mentioned specimens were collected and presented by Dr. Florentino Felippone.

The nearest relative of this species is *Diplodon piceus* Lea, which however, is much smaller, proportionally thicker, has a black epidermis, and differs in the character of the teeth.

**DIPLODON SUBQUADRATUS, new species.**

Plate 2, figs. 6, 8; plate 3, figs. 8-10.

Shell subquadrate, moderately inflated, moderately thick, broadly truncated posteriorly, narrowly truncated anteriorly. Anterior and posterior dorsal areas compressed as if pinched, posterior ridge

rounded, descending abruptly to the dorsal area. Escutcheon very narrow, anterior margins flexuous and with a broad lunule unevenly divided, the portion in the right valve being the larger. Dorsal margin arched, ventral margin rounded, angular at the front and back ends. Periostracum closely adhering, unctuous, rather glossy. Color nearly uniformly dark chestnut, very obscurely divided into a lighter anterior and darker posterior portion. Beaks very full and high, eroded, but retaining vestiges of sculpture consisting of stout, radiating ribs. Surface of shell crudely concentrically striated, very obscurely radiated with faint impressed lines, rest periods not very prominently marked. Nacre silvery white. Lower pseudocardinal tooth of right valve thin, high, long, and curved, the upper cardinal minute, groove between the two long, broad, and deep. Anterior pseudocardinal of left valve wedge-shaped, thick and large, the posterior one small and low, the groove between the two being small and shallow and narrow. Lateral teeth of both valves much bowed, the right lateral being very stout and high. Laterals of left valve subequal, the groove between them broad and deep.

The type (Cat. No. 335774, U.S.N.M.) measures: Length 68 mm., height 55 mm., diameter 33 mm. It comes from Paysandu, Uruguay, and was presented by Dr. F. Felippone.

This shell is related to both *Diplodon gratus* Lea and *patelloides* Lea. It differs from both in the squarish form, the truncated front and rear, the very full and high beaks which are nearly cordate, the broad lunule, the pinched and flexuous anterior portion and to a lesser extent in the character of the teeth. The shell has a cordate appearance, which in the young stage must be more marked than in the adult.

**DIPLODON ARCUATUS, new species.**

Plate 1, figs. 4, 6; plate 2, figs. 7, 10; plate 3, fig. 3.

Shell subrotund, moderately solid, much inflated, the greatest diameter being located posterior to the beaks, narrowed and shortly rounded anteriorly, very broad and very widely rounded posteriorly, the posterior dorsal area broad and sloping and wedge-shaped. Beaks in front of the highest point of the shell, facing forward, eroded but bearing indications of having had several coarse radiating ribs. Periostracum thick, nearly uniformly blackish brown throughout, with very faint indications of radiating striae. Surface of shell roughened by a number of rude, elevated concentric lines of growth. Interior pale pinkish flesh-color, lightly pearly (much pearly luster probably lost). Anterior adductor scars deeply impressed, posterior scars superficial. Hinge line greatly arched. Right valve with two pseudocardinal teeth located in front of the beak, the inner one lamelliform, very long and very high, the outer

one very small, the pit between the two teeth at a considerable distance from the beak. Left valve with a long, thin, tongue-like pseudocardinal. Right valve with a very short, high, curved lateral tooth. Left valve with two lateral teeth, the groove between them long and shallow, the inner tooth thin and high, the outer tooth thin, low, and obscure. Upper edges of the teeth minutely crenulated. Prismatic border very narrow.

The type (Cat. No. 341376, U.S.N.M.) measures: Length 39 mm., height 34 mm., diameter 23 mm. It comes from Barra de Sacra, Department of Paysandu, Uruguay, and was collected and presented by Dr. Florentino Felippone.

Externally this shell in a general way resembles *Diplodon disculus* Lea, except that it is much more inflated and has no indication of a posterior wing. The external features which attract attention are its inflation, the flattened, sloping posterior dorsal area, the apparent tilting forward of the umbonal area and the uniform dark color of the periostracum. Internally the shell widely differs from any hitherto known *Diplodon*. In the character of the hinge line and teeth it does not fall into any of the groups into which the genus has been arranged and for the present it must be the sole occupant of a new group.

**DIPLODON TRIVIALOIDES, new species.**

Plate 1, figs. 12, 14; plate 2, figs. 3, 5; plate 3, fig. 12.

Shell subelliptical in outline, moderately inflated behind the middle, rather thin posteriorly, somewhat thickened anteriorly, rounded and narrower and slightly gaping in front, obliquely truncated and obscurely sinuated behind. Dorsal margin slightly arched; ventral margin oblique, nearly straight; body of shell broadly but slightly compressed from the beaks to the middle of the ventral margin; posterior ridge wide, inflated, evenly rounded; posterior dorsal slope with two obscure, broad and shallow radial grooves. Color brownish olive and greenish, with very obscure lighter rays; a fairly well-marked light ray from the beaks to a point just behind the middle of the ventral margin divides the coloring into two parts, the anterior portion being the lighter in color. Beaks full and high, well forward, concentrically striated, and with a number of heavy radiating ribs, those on the anterior and posterior areas being somewhat threadlike. Periostracum closely adherent, smooth, unctuous, with a dull gloss. Cavity of shell moderately deep. Posterior cardinal tooth of right valve high, its surface crenulated. Anterior right cardinal thin, long, inconspicuous. Cardinal of left valve narrow, its lower end buttressed to the upper edge of the adductor scar. Right lateral high, thin, winglike, crenulated. Left laterals close together, outer one small, inner one rising to promi-

nence behind, both with the edge crenulated. Nacre white, pearly, but not very iridescent.

The type (Cat. No. 335770, U.S.N.M.) measures: Length 55 mm., height 33 mm., diameter 21 mm. It is one of a lot of four specimens from Arroyo Bellaco, Department of Paysandu, Uruguay. Cat. No. 340887 includes another specimen from the same locality. Cat. No. 340886 includes one specimen from the Uruguay River at Paysandu. Cat. No. 335771 includes one specimen from Arroyo la Boyado, Department of San Jose, and Cat. No. 335772 includes a single valve from Arroyo Canelon Chico, Department of Canelones, Uruguay. All the specimens were received from Dr. Florentino Felippone of Montevideo.

As the name indicates, this species is closely related to *Diplodon trivialis* Simpson, from which it differs chiefly in the character of the umbos. Fortunately the sculpture of the beaks of the types of both *trivialis* and *trivialoides* is sufficiently well preserved to show that they differ markedly, the sculpture of the former being fine radial threadlike raised lines, while the sculpture of the latter consists of coarse radial ribs. *Trivialoides* is also closely related to *peculiaris* Lea, from which it differs in form and in character of periostracum. The four specimens in the type lot are remarkably uniform in all details and any one might have served as the type.

In the natural condition of the shell the division into two areas of color is not very striking; but if the shell be cleaned with oxalic acid, this characteristic becomes one of the most noticeable features of the species.

ANODONTITES PITTIERI, new species.

Plate 1, figs. 9, 11; plate 2, figs. 9, 12; plate 3, fig. 6.

Shell high, roundly subquadrate, compressed, rather thin, slightly thicker at the middle than at the ends. Valves closed all round. Convexity nearly equally rounded, without a clearly defined posterior ridge, with several obsolete radiating ribs on the posterior dorsal area, these ribs with faint indications of green coloring. Anterior portion of surface vernicose. Posterior portion dull and much roughened by concentric lamellae of periostracum. Middle portion with several radiating, faintly impressed lines and several radiating rufflings of the periostracum. Principal rest periods six, indicated by dark concentric lines. Vicinity of the beaks flesh color, rest of shell dark straw color, deepening to light chestnut in front. Nacre pinkish and slightly pearly, in the cavity of the shell, brilliantly iridescent at the adductor scars and in a band just above the prismatic border. Interior everywhere finely radiately striated except on the prismatic borders. All adductor scars superficial, not appreciable to touch. Prismatic border very broad, occupying one-seventh of the height of

the shell, and of a livid, slightly greenish hue, minutely granulous. Sinulus very large, distinctly hooked at its lower end.

The type (Cat. No. 339954, U.S.N.M.) measures: Length 50 mm., height 35 mm., diameter 17 mm. It comes from Guaremales, Venezuela, and was collected by Dr. Henry Pittier of the United States Department of Agriculture. This species is named in honor of Dr. Henry Pittier, whose explorations in tropical America have greatly enriched the National Museum's collections.

This species classifies next to *A. tortilis* Lea, of which *A. luteolus* Lea and *A. schomburgianus* Sowerby are supposed to be synonyms. *A. pittieri* has a more chunky form, a pinkish nacre instead of bluish, has a prismatic border about three times as wide and has a much larger sinulus which has a distinct hook at its lower end. The anterior adductor scars of *tortilis* are deeply impressed, while those of *pittieri* are entirely superficial.

ANODONTITES COLOMBIENSIS, new species.

Plate 1, fig. 5; plate 2, figs. 13, 14; plate 3, figs. 5, 13, 14.

Shell large, thick, elongate, moderately inflated, prominently constricted from the beaks to the ventral margins. The ventral margins deeply incurved, valves widely gaping from the point of construction of the ventral margin to the anterior end. Dorsal margin regularly and highly arched, posterior portion of the shell elongated and drawn obliquely downward. Both ends regularly rounded. Posterior dorsal ridge inflated, rounded, with no indication of an angular tendency. Periostracum thick, dull, cloth-like, closely adhering. Entire surface roughened by many fine irregular wrinkles and puckers radiating from the beaks. A similar wrinkling is obscurely seen in the nacre, especially in the portion between the mantle scar and the ventral border. Color uniform dark chestnut with several radiating green stripes on the posterior dorsal area. Interior dull, very slightly pearly, livid, with touches of green in the posterior portion and salmon-colored tints in the deeper portion of the valves, the remainder bluish. Anterior adductor scars deeply impressed, posterior scars well impressed but not deep. Sinulus rather large with a distinct hook at its lower end. Prismatic border narrow, widest at the posterior ventral end, of a dark olive green color.

The type (Cat. No. 341472, U.S.N.M.) measures: Length 82 mm., height 37 mm., diameter 26 mm. It and three other specimens come from a tributary of the Rio Colorado in the Province of Santander, United States of Colombia, and was collected and presented by Dr. C. Wythe Cooke. The Rio Colorado becomes tributary to the Rio Magdalena and is in the Caribbean drainage system. This

is on the western slope of the Cordillera Oriental and is separated by high mountains from the great areas drained by the Orinoco and Amazon River systems.

Externally this shell closely resembles many of the arched specimens of the common *Margaritana margaritifera* of the Northern Hemisphere. Its relation to *Anodontites* of the *tenebricosus* group is quite evident and its nearest ally in that group is *A. clessini* Fischer. The constriction in this species is much more marked than in any of the other species of the group. The degree of constriction increases with the age of the shell. One specimen, apparently quite old, is much more constricted than the type.

The character of the periostracum is very peculiar on account of the great number of fine wrinkles. At first glance these wrinkles appear to be due to shrinkage, but the great number of them would call for an amount of shrinkage that would seem to be unreasonable. The occurrence of similar wrinkles, though in obscure form, in the nacre indicates that they arise from the structure of the animal and are not due to shrinkage. All four of the specimens at hand are wrinkled in the same way.

MONOCONDYLAEA FELIPPONEI, new species.

Plate 1, figs. 2, 13; plate 2, figs. 4, 11; plate 3, fig. 7.

Shell much inflated, subrotund in form, narrowed anteriorly, very wide and nearly squarely truncate posteriorly. Posterior dorsal ridge rounded, not angled, but the ridge thrown into prominence by a radiating line of dark color. Ventral edge broadly rounded, obscurely angled at its middle and at its posterior end. Anterior end slightly gaping. Posterior margin nearly at right angles with the dorsal margin. Periostracum thick, clothlike, without gloss, its surface much roughened by numerous concentric lamellae. Color dark olive green. Interior somewhat iridescent, with a more or less rosy tinge throughout, which is more marked in the middle portion. Parts of the interior with a greenish tinge. Anterior adductor scar deeply impressed, posterior scar superficial. Hinge line undulating, the single tooth in each valve knoblike. Prismatic border very broad ventrally, very narrow elsewhere.

The type (Cat. No. 340663, U.S.N.M.) measures: Length 33 mm., height 27 mm., diameter 19 mm. It comes from Barra del Arroyo Sacra, Department of Paysandu, Uruguay, and was collected and presented by Dr. Florentino Felippone.

This species is quite different from any *Monocondylaea* hitherto described. It seems to stand intermediate between *M. paraguayana* Lea and *M. franciscana* Moricand.



## EXPLANATION OF PLATES.

## PLATE 1.

All figures except 5 and 10 reduced one-third.

- FIG. 1. *Diplodontites cookci*, new species. Right valve.  
 2. *Monocondylaca felipponei*, new species. Left valve.  
 3. *Diplodontites cookci*, new species. Left valve.  
 4. *Diplodon arcuatus*, new species. Right valve.  
 5. *Anodontites colombiensis*, new species. External sculpture  $\times$  about 6.  
 6. *Diplodon arcuatus*, new species. Left valve.  
 7. *Diplodontites cookci*, new species. Left valve.  
 8. *Diplodontites cookci*, new species. Right valve.  
 9. *Anodontites pittieri*, new species. Right valve.  
 10. *Diplodontites cookci*, new species. External sculpture  $\times$  about 24.  
 11. *Anodontites pittieri*, new species. Left valve.  
 12. *Diplodon trivialeoides*, new species. Right valve.  
 13. *Monocondylaca felipponei*, new species. Right valve.  
 14. *Diplodon trivialeoides*, new species. Left valve.

## PLATE 2.

All figures reduced one-third.

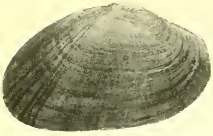
- FIG. 1. *Diplodon subcylindricus*, new species. Left valve.  
 2. *Diplodon subcylindricus*, new species. Right valve.  
 3. *Diplodon trivialeoides*, new species. Left valve.  
 4. *Monocondylaca felipponei*, new species. Left valve.  
 5. *Diplodon trivialeoides*, new species. Right valve.  
 6. *Diplodon subquadratus*, new species. Left valve.  
 7. *Diplodon arcuatus*, new species. Left valve.  
 8. *Diplodon subquadratus*, new species. Right valve.  
 9. *Anodontites pittieri*, new species. Left valve.  
 10. *Diplodon arcuatus*, new species. Right valve.  
 11. *Monocondylaca felipponei*, new species. Right valve.  
 12. *Anodontites pittieri*, new species. Right valve.  
 13. *Anodontites colombiensis*, new species. Left valve.  
 14. *Anodontites colombiensis*, new species. Right valve.

## PLATE 3.

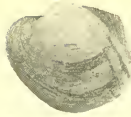
All figures reduced one-third.

- FIG. 1. *Diplodon subcylindricus*, new species. Right valve.  
 2. *Diplodon subcylindricus*, new species. Left valve.  
 3. *Diplodon arcuatus*, new species. Dorsal view.  
 4. *Diplodontites cookci*, new species. Dorsal view.  
 5. *Anodontites colombiensis*, new species. Dorsal view.  
 6. *Anodontites pittieri*, new species. Dorsal.  
 7. *Monocondylaca felipponei*, new species. Dorsal view.  
 8. *Diplodon subquadratus*, new species. Right valve.  
 9. *Diplodon subquadratus*, new species. Left valve.  
 10. *Diplodon subquadratus*, new species. Dorsal view.  
 11. *Diplodon subcylindricus*, new species. Dorsal view.  
 12. *Diplodon trivialeoides*, new species. Dorsal view.  
 13. *Anodontites colombiensis*, new species. Right valve.  
 14. *Anodontites colombiensis*, new species. Left valve.

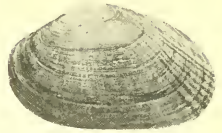




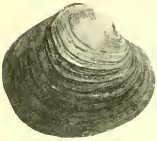
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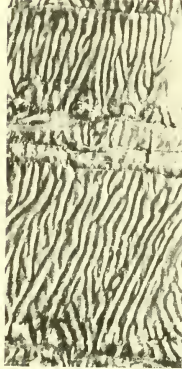
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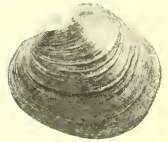
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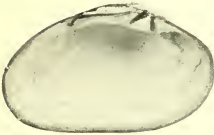
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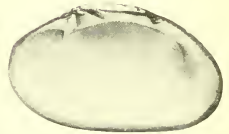
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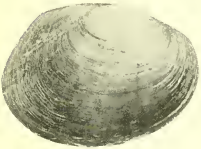
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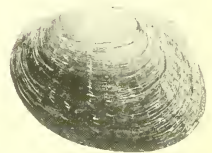
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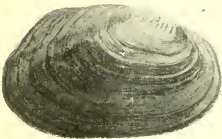
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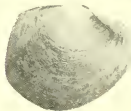
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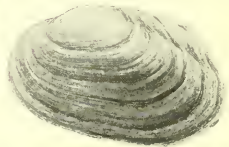
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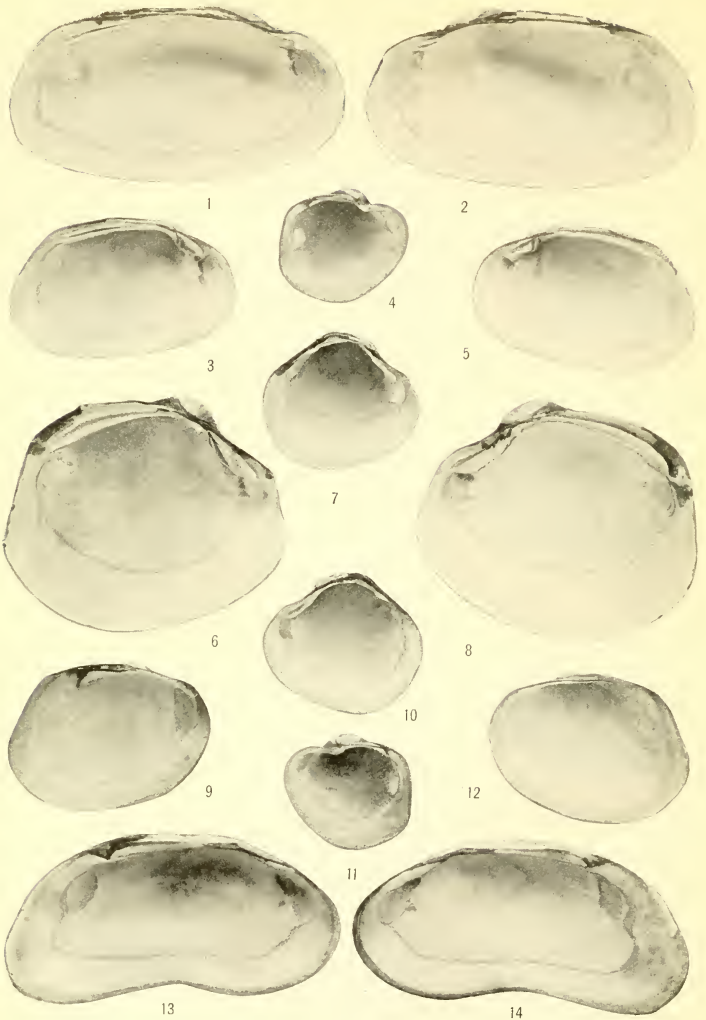
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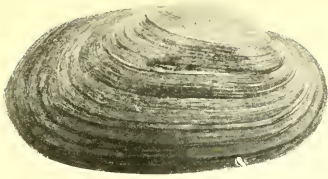
SOUTH AMERICAN FRESH WATER MUSSELS.

FOR EXPLANATION OF PLATE SEE PAGE 9.

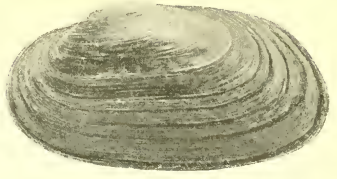


SOUTH AMERICAN FRESH WATER MUSSELS.

FOR EXPLANATION OF PLATE SEE PAGE 9.



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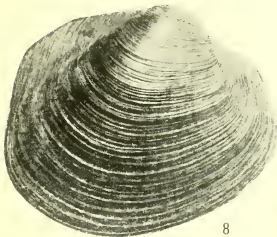
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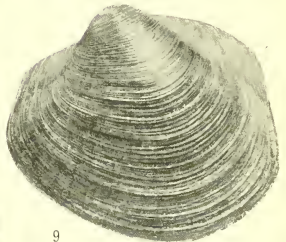
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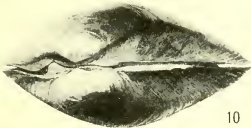
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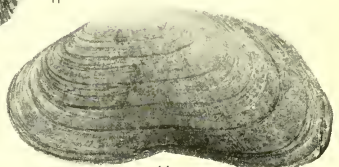
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SOUTH AMERICAN FRESH WATER MUSSELS.

FOR EXPLANATION OF PLATE SEE PAGE 9.

