

Campeche. Maury considers  
*ostrearum* Conrad.

Chenkan.  
Campeche, Chenkan, south of  
(and very highly colored), San  
Not as prominently spinose as

Progreso.  
Campeche.  
Progreso, Chenkan, near Sabancuy.  
Campeche, Chenkan.  
*striatum* Say. Campeche.  
as Menke. Campeche.  
Campeche.  
Campeche, Chenkan, between

Campeche.  
i. Chenkan, near Sabancuy.  
Progreso, Chenkan, Sabancuy.  
Progreso, Chenkan, San Lorenzo.  
Progreso.  
Reeve. This form is found abundantly  
but am not assured of its identity

Chenkan, Sabancuy.  
*da* Say. Chenkan, between Chen-

Scarce, Chenkan.  
Rare, Progreso, Chenkan.  
Near Sabancuy. Closely allied  
*ricanum*.

Very abundant especially around  
fished by fishmongers and used as

*osciatum* Born. Campeche, Chen-

*Lucapinella limatula* Reeve. Uncommon, Chenkan.  
*Fissuridea alternata* Say. Progreso, Chenkan, near Sabancuy.  
*Fissuridea alternata* Say var. *dysoni* Reeve. Chenkan, Sabancuy.  
*Submarginula octoradiata* (Gmelin) Adams. Scarce, Campeche, San Lorenzo.

UNIONIDAE FROM THE REELFOOT LAKE REGION IN WEST TENNESSEE

BY DR. A. E. ORTMANN

The following report is founded primarily upon the collections made by the writer during the "Geo. H. Clapp Expedition to Reelfoot Lake" of the Carnegie Museum in August, 1924. It includes localities in Reelfoot Lake proper;<sup>1</sup> further

<sup>1</sup>Blue Basin, Lake Co. (N. W. shore); Bluebank, Lake Co. (South end); and Samburg, Obion Co. (East shore).

in the Bayou de Chien, Walnut Log, Obion Co. (tributary entering the lake near its northern end; and North Fork Obion River, Union City, Obion Co. (a tributary of the Mississippi receiving the waters of Reelfoot Lake).

This material was supplemented by specimens collected in July, 1925, in the lake (near Samburg) by Mr. Steven B. Crossley, who acted as guide during the expedition of 1924. The latter specimens arrived in part alive.

From this region we possess only one previous list of mussels, collected by S. N. Rhoads in 1895, and published by H. A. Pilsbry and S. N. Rhoads (P. & R.) (Proc. Acad. Philadelphia 48, 1896, pp. 500-506). The Reelfoot Lake shells of this list are from Samburg, Obion Co.; but there are a few also from Wolf River, Raleigh, Shelby Co. (near Memphis), a locality probably with ecological conditions similar to those of Obion River. Most of the species of this list have been found by myself, and several have been added. The following enumeration includes all forms known from these western parts of Tennessee (Mississippi Embayment and Mississippi Bottoms).

1. *Fusconaia flava* (Rafinesque).—Union City, one gravid female, with the diameter of 47% of the length. This is a typical representation of the species (See Ortmann, Proc. Americ. Philos. Soc. 59, 1920, p. 282), and has also a reddish-brown epidermis and reddish naere.

A species belonging generally to small streams, found preëminently in the Ohio drainage (and that of the Great Lakes). Present in small streams tributary to the Cumberland; entirely absent in the Tennessee drainage.

2. *Fusconaia flava trigona* (Lea).—Union City, one male and one female, with the dia. of 58 and 57%. Thus these specimens are distinctly more swollen than the specimen of *flava*, and fall under the var. *trigona*, as defined by me. Since their obesity is not very great, and since the beaks are not remarkably elevated, they could not be called var. *undata* (Barnes).

This form represents *F. flava* farther downstream in the Ohio system. It is also represented west of the Mississippi, but these forms require further study.

3. *Megalonaia gigantea* (Barnes).—Union City, abundant.

A species of the larger rivers of the Interior Basin.

4. *Plectomerus trapezoides* (Lea).—Union City, one female. Reported by P. & R. from Samburg.

A southern species, which seems to have its metropolis in the tributaries of the Mississippi in the Mississippi Embayment.

5. *Amblema costata* Rafinesque.—Union City, not rare. The specimens at hand have the diam. of 44 and 45%, which thus is below the maximum obesity (47%) given for this form by Ball (Ecology 3, 1922, p. 134). As I have pointed out (Amer. Midland Natural. 9, 1925, p. 333), this should better be changed to a higher figure.

Widely distributed in the Interior Basin, preferring the smaller streams.

6. *Amblema peruviana* (Lamarck).—Not found by myself, but reported by P. & R. (as *U. plicatus* Lea.) from Samburg.

This is a form of very large rivers and quiet water, possibly passing into the *A. costata* of the smaller rivers. Its presence in Reelfoot Lake should be expected.

7. *Quadrula pustulosa mortoni* (Conrad).—Union City, abund-

ant. Reported by P. & R. (as *U. turgo*).

This form differs from the form found in the Cumberland and Tennessee rivers. It is well developed in the Ohio drainage, for instance, which is ashy-green. It is found, for instance, in the *pustulosa* (in which there is no sharp line on the dorsal surface). In northern Arkansas it intergrades, chiefly with the form which it has in shape (more or less). The specimens from northern Arkansas are more tawny and have a broad ray.

This seems to be a form of the Mississippi Embayment. It is fully understood. It is an absolute synonym of *Quadrula* (Lea) seem to be known from Pearl and Chickasa rivers and Mississippi.

*Quadrula pustulosa* (Lea) Samburg. I have not seen it. I do not think that that form is *mortoni*.

8. *Quadrula quadrata* (Lea) Samburg. I have seen it. It has sent four specimens to P. & R. report this. The dia. of the specimens is 60%, and thus they are *quadrata* (Dia. under 50%, 1925, p. 331). In the latter (77 to 86%), and the tubercles, as well

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ant. Reported from Wolf River, Raleigh, Shelby Co., by P.  
& R. (as *U. turgidus* Lea).

This form differs from typical *pustulosa* of the Ohio, Cumber-  
land and Tennessee drainages in the subquadrate outline, the  
well developed posterior ridge, and—in its typical phase, as  
found, for instance, in Louisiana—in the color of the epidermis,  
which is ashy-greenish-brown, without the broad green ray of  
*pustulosa* (in which the epidermis is more or less tawny). Yet  
no sharp line can be drawn between the two forms. From  
northern Arkansas (White River and St. Francis River) I have  
intergrades, chiefly in the color of the epidermis, which fre-  
quently show the broad green ray of *pustulosa*, and also approach  
it in shape (more rounded, with indistinct posterior ridge).  
The specimens from Obion River are much like those from  
northern Arkansas: their shape is that of *mortoni*, but the color  
is more tawny and has, at least in younger specimens, the  
broad ray.

This seems to be a southern representative of *Qu. pustulosa* in  
the Mississippi Embayment. It is very variable, and not yet  
fully understood. *U. nodiferus* Conr. (Jackson, La.) apparently  
is an absolute synonym. *Qu. sphaerica* (Lea) and *refulgens*  
(Lea) seem to be local phases of this, belonging to the Amite,  
Pearl and Chickasawhay (Pascagoula) drainages in Louisiana  
and Mississippi.

*Quadrula pustulosa* (Lea) has been reported by P. & R. from  
Samburg. I have not seen specimens from Reelfoot Lake, and  
do not think that the true *pustulosa* is found in the lake; prob-  
ably it is *mortoni*.

8. *Quadrula quadrula* (Rafinesque) var.—Bluebank, Lake  
Co. I have seen dead shells at Samburg, and S. B. Crossley  
has sent four splendid specimens (alive, males) from the lake.  
P. & R. report this, as *U. asperrimus* Lea, from Samburg.

The dia. of the six specimens at hand is between 55 and  
60%, and thus they are considerably more obese than normal  
*quadrula* (Dia. under 52%, see: Ortmann, Amer. Midl. Natural.  
9, 1925, p. 331). In height they agree fairly well with the  
latter (77 to 86%), and also in the moderate development of  
the tubercles, as well as in color (brownish, with greenish tints,

when younger). They are by no means the southern *Qu. aspera* (Lea), as might be suspected from the locality, for the latter has smaller, more numerous and more crowded tubercles, and is generally less swollen. *Qu. quadrula fragosa*, which is rather swollen, has stronger tubercles, and is more elevated.

My specimens resemble the form *contraryensis* Utterback (Lake Contrary, St. Joseph, Mo., see: Amer. Midl. Natural. 4, 1916), but the latter has much weaker sculpture. I should call attention to the fact that the figure of the smaller specimen of *U. nobilis* Conrad (Journ. Acad. Philad. 2, 1854, pl. 27, f. 2) closely resembles my two younger specimens. This figure has been declared by Simpson (1914, p. 323) to represent *U. apiculatus* Say, but I believe that the two figures given by Conrad (figs. 2 and 3) might very well belong to the same form, fig. 3 probably representing an old, somewhat deformed specimen (possibly a female?). The forms grouping around *Qu. quadrula* (*quadrula*, *fragosa*, *aspera*, *nobilis*, and also *apiculata*) and their interrelations require revision.

*Qu. quadrula* is abundant in larger rivers of the Interior Basin, passing southward into *aspera*. It seems to develop several local or ecological modifications.

9. *Quadrula verrucosa* (Rafinesque).—Union City, abundant. Reported by P. & R. from Wolf R., Raleigh, Shelby Co.

A species of immense distribution in nearly all of the Mississippi drainage, and also in streams running to the Gulf, from Alabama to Texas. I found several specimens with purplish nacre, a color seen chiefly in the southern part of the range.

10. *Arcidens confragosus* (Say).—Union City, two males. Reported from the lake at Samburg by P. & R.

A species centering in its distribution in the Mississippi Embayment, and thence advancing into the lower, sluggish parts of the larger rivers, frequently found in ponds and lakes.

11. *Lasmigona complanata* (Barnes).—Union City, one male.

The center of the area occupied by this species lies in the middle of the Interior Basin, in the quieter waters of the largest rivers, and also in ponds, lakes and canals. Under favorable conditions, the range extends well towards the headwaters, chiefly in a northerly direction, where it has crossed over into

the St. Lawrence drain to the Mackenzie Basin. It extends to the Gulf Coast.

12. *Anodonta imbecillis*.—Not rare. Two specimens reported from Crossley. Reported from

of tremendous distribution in the region, and over the Gulf of the Atlantic Coastal Plain.

13. *Anodonta grandis*.—Samburg; Bayou de la Grande Samburg by P. & R. (as about twenty immature specimens).

The specimens collected in the *gigantea*, which is merely a form of *A. grandis* in lakes with muddy bottoms, and also in the local form with, *A. corpulenta* Conrad. The young ones to the lake.

The range of *A. grandis* is to that of *A. imbecillis*, and is extremely variable, and includes several local and ecological races.

14. *Anodonta suborbicula*.—One specimen in the Blue Bayou. Sent several larger ones.

Apparently a typical form of the Interior Basin, where it is extending down the Mississippi.

15. *Truncilla truncata* (Say).—but reported by P. & R. from

Widely distributed over the Mississippi Embayment and the Gulf. Found under very diverse conditions, as well as in ponds and lakes. Lake.

16. *Leptodea fragilis* (Rafinesque).—Also in Wolf R., Raleigh, Barnes).

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*ryensis* Utterback Midl. Natural. 4. lpture. I should smaller specimen 1854, pl. 27, f. 2.

This figure has represent *U. apica* given by Conrad same form, fig. 3 formed specimen und *Qu. quadrata iculata* and their

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City, one male. species lies in the ers of the largest Under favorable he headwaters, rossed over into

the St. Lawrence drainage, and is said to extend even into the Mackenzie Basin. It also goes down the Mississippi Embayment to the Gulf Coastal Plain in the Alabama drainage.

12. *Anodonta imbecillis* Say.—Bayou de Chien, Walnut Log, not rare. Two specimens from the lake have been sent by S. B. Crossley. Reported from the lake at Samburg by P. & R.

Of tremendous distribution from Texas to the Great Lakes region, and over the Gulf Coastal Plain to the southern parts of the Atlantic Coastal Plain. Chiefly in quiet waters.

13. *Anodonta grandis gigantea* (Lea).—Lake at Bluebank and Samburg; Bayou de Chien at Walnut Log. Reported from Samburg by P. & R. (as *grandis* Say). S. B. Crossley has sent about twenty immature specimens.

The specimens collected correspond most closely to the var. *gigantea*, which is merely an ecological form, belonging to ponds and lakes with muddy bottom. It is close to, possibly identical with, *A. corpulenta* Cooper, and *A. stewartiana* Lea (chiefly the young ones to the latter).

The range of *A. grandis* is enormous, corresponding largely to that of *A. imbecillis*, also preferring mostly quiet waters. It is extremely variable, and has developed a great number of local and ecological races, which are not yet fully understood.

14. *Anodonta suborbiculata* Say.—I found only one young specimen in the Blue Basin of the lake, but S. B. Crossley has sent several larger ones. Reported from Samburg (P. & R.).

Apparently a typical lake-form, centering in the middle of the Interior Basin, where the three large rivers unite, and extending down the Mississippi Embayment to Louisiana.

15. *Truncilla truncata* (Rafinesque).—Not found by myself, but reported by P. & R. from Samburg (as *U. elegans* Lea).

Widely distributed over the Gulf Plain, through the Mississippi Embayment and the Interior and Great Lakes Basins, found under very diverse conditions, in swiftly running water as well as in ponds and lakes. It is to be expected in Reelfoot Lake.

16. *Leptodea fragilis* (Rafinesque).—Union City, one female. Also in Wolf R., Raleigh, Shelby Co. (P. & R., as *U. gracilis* Barnes).

On the Gulf Plain from Alabama to Texas, up the Mississippi Embayment into the Interior Basin and that of the Great Lakes. Also this species is found in both running water and in lakes.

17. *Proptera purpurata* (Lamarck).—Not found by myself, but reported from Wolf R., Raleigh, Shelby Co. (P. & R.).

Represents the *P. alata* (Say) of the Interior Basin in the South, on the Coastal Plain from Alabama to eastern Texas. In the northern parts of the Mississippi Embayment (in Missouri), it seems to pass into *P. alata*. It is common in the state of Mississippi, just south of the locality in western Tennessee.

18. *Carunculina parva* (Barnes).—Lake at Bluebank, one gravid female. Reported from Samburg (P. & R.).

My specimen is typical, and sharply distinct from those of the next species.

Most abundant in the central parts of the Interior Basin, crossing over to the Great Lakes. Known also from southern localities as far as Texas. There are related forms in Alabama, Georgia and northern Florida, which may be simply local races of this. The species prefers quiet waters.

19. *Carunculina texasensis* (Lea).—Lake at Bluebank and Samburg, not rare. Reported from Samburg by P. & R.

Generally supposed to represent *C. parva* in the South, from Texas and Alabama up to the Mississippi Embayment to southern Illinois and Indiana. It may intergrade with *C. parva*, but in Reelfoot Lake the two are perfectly distinct. A species of quiet waters.

20. *Micromya lienosa* (Conrad).—Union City, two males.

Distribution very similar to that of *Car. texasensis*, chiefly in its northward extension. In Alabama, however, it goes considerably more eastward (to Georgia and S. Carolina), although in a somewhat different form (*concestator* Lea). Also in its main range it varies a good deal; my specimens agree very well with others from Mississippi and Arkansas; they are of good size, have the epidermis blackish, and the nacre whitish or with purplish tint.

21. *Ligumia subrostrata* (Say).—Lake at Bluebank and Sam-

burg, not rare, a number from Samburg by P. & R.

From the Coastal Plain into the Mississippi Embayment into the Interior Basin, restricted to quiet water.

22. *Lampsilis anobolus* (Say).—Very abundant. Probably from Shelby Co., given by P. & R. also to this variety.

All my specimens reported from this time, when Pillsbury and I were in the region, have not been separated from this variety. In the central parts of the Interior Basin and the Coastal Plain from the latter region, the form *anobolus* local forms turn up. It is found in quiet water and sandy bottom, but also in stronger current from the sandy-muddy bottom of steadily flowing water.

23. *Lampsilis ovata saturata* (Lea).

This form, which is not recorded for *saturata* east of the Mississippi, is rather of *L. ovata ventricosa* characteristic of the Mississippi and eastern Texas, and in the latter region gradually changes into *L. ventricosa*. On the other side of the Alabama River drainage. The record for *saturata* east of the Mississippi.

If we add to the above record for *saturata* (Swainson) from "Horn Lake" given by Lea<sup>1</sup> (as *Anodonta saturata*) a complete list of all Naiades of the Mississippi River in

<sup>1</sup> There is a station "Horn Lake" on the state line, south of Memphis, in

burg, not rare, a number sent by S. B. Crossley. Reported from Samburg by P. & R.

From the Coastal Plain (Texas to Alabama) up the Mississippi Embayment into the central parts of the Interior Basin, restricted to quiet water of large rivers, ponds and lakes.

22. *Lampsilis anodontooides fallaciosa* (Smith).—Union City, very abundant. Probably the record for Wolf R., Raleigh, Shelby Co., given by P. & R. (as *U. anodontooides* Lea) refers also to this variety.

All my specimens represent the typical *fallaciosa*. At the time, when Pilsbry and Rhoads published their list, this had not been separated from the main species. The latter and the variety are almost co-extensive in their range, which covers the central parts of the Interior Basin, the Mississippi Embayment and the Coastal Plain from Texas to Florida. However, in the latter region, the form *fallaciosa* seems to be absent, while other local forms turn up. Elsewhere, *fallaciosa* seems to be the form of quiet water and sandy-muddy bottom, while *anodontooides* is found in stronger current and gravel. Thus my specimens are from the sandy-muddy bottom of Obion River, with slowly, but steadily flowing water.

23. *Lampsilis ovata satura* (Lea).—Union City, one male.

This form, which is not a direct descendant of *L. ovata*, but rather of *L. ovata ventricosa* of the Interior Basin, seems to be characteristic of the Mississippi Embayment, south to Louisiana and eastern Texas, and intergrades in northern Arkansas with *ventricosa*. On the other hand, in the state of Mississippi, it gradually changes into *L. excavata* (Lea), typical for the Alabama River drainage. The present locality is the most northern record for *satura* east of the Mississippi.

If we add to the above list the record of *Strophitus rugosus* (Swainson) from "Horn Lake Creek, Shelby Co., Tenn.", given by Lea<sup>1</sup> (as *Anodonta shafferiana*), we have here a complete list of all Naiades ever reported from the direct drainage of the Mississippi River in western Tennessee. The contrast

<sup>1</sup>There is a station "Horn Lake" on the Ill. Centr. R. R. just across the state line, south of Memphis, in De Soto Co., Miss.

Texas, up the Mississippi and that of the Great both running water and

—Not found by myself, Shelby Co. (P. & R.).

the Interior Basin in the Alabama to eastern Texas Mississippi Embayment (in Mississippi). It is common in the locality in western Ten-

Lake at Bluebank, one (P. & R.).  
ly distinct from those of

ts of the Interior Basin, known also from southern related forms in Alabama, may be simply local races.

Lake at Bluebank and Samburg by P. & R.

*parva* in the South, from Mississippi Embayment to south-ergrade with *C. parva*, but ly distinct. A species of

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*Car. texasensis*, chiefly in na, however, it goes con-and S. Carolina), although *stator* Lea). Also in its specimens agree very well Kansas; they are of good l the nacre whitish or with

ke at Bluebank and Sam-

with the fauna of other parts of the state of Tennessee is remarkable. The number of forms is surprisingly small, and yet there is a high percentage of shells, which are peculiar to the Mississippi Embayment. This fact should be kept in mind, for it is important in the study of the development of the Naïad faunas of North America.

THE ACANTHODORIDIDAE OF THE CALIFORNIA COAST

BY F. M. MAC FARLAND

(Concluded from page 65)

ACANTHODORIS COLUMBINA sp. nov. Plate II, Figures 5, 9, 10, 11; Plate III, Figures 1, 2, 5.

Six individuals of this form were collected at low tide in reef pools at Moss Beach, near Montara Point, San Mateo County, California, on July 26, 1922. A second collecting trip to the same locality on May 3, 1923, failed in securing any more of this interesting new species.

The animal has the plump, nearly oval outline characteristic of the Acanthodorids. The foot is completely covered by the wide, thick border of the mantle, save for the tip of the tail. The dorsum is covered everywhere with closely-set, slender, tapering papillae, reaching 1.5 to 2.0 mm. in length, and giving it a soft, velvety appearance. This is rather deceptive, however, for the body is firm to the touch, the mantle being everywhere filled with slightly curved calcareous spicules (Pl. III, fig. 2) interlacing in various directions. Each papilla is reinforced by a group of spicules, mainly lengthwise in arrangement, and nearly filling it. These extend well down into the dorsum, and are strengthened by others added at lower levels, so that each papilla contains a firm, skeletal framework, precluding anything more than slight movement of its apical half. The margins of the rhinophore openings are similarly reinforced.

The ground color of the dorsum is a dusky, brownish mauve. The papillae are tipped with lemon yellow, and each one is more or less deeply shaded with brown, and none of them are

white. The stalks of the rhinophores are small, with small, lemon-yellow spots between and on the plates of a deep, vinous-red color, as are the upper margins of the mantle. The beginnings of their main branches are white, rounded nodules. A yellow line edges the ventral margin. The ventral surface is toward a yellowish grey. The line disappears, but the other is served for some time.

The largest specimen measured freely, 32 mm. in length, 15 mm. in height, the others being but a

The head is of the usual veliform manner, and produced into a triangular, or even squarish form. The foot margin is single in front, and tends but slightly beyond the

The rhinophores are directly attached to the body, and are foliate with from 22 to 26 long, thin-edged sheaths into which the rhinophore is inserted. The sheath margins bear a series of longer and shorter processes on the dorsum.

The branchial plumes are long and bipinnate, and are arranged in a fan-like form on each papilla, the area bearing them being of the same form and color to those of the other papillae (Pl. III, fig. 2) are slender and slightly bent as to the ends, and are 1.5 to 2.0 mm. in length, though the ends are slightly bent as to the ends. No traces of branching were observed.

The pseudo-peritoneum is covered with black dots, mainly in the muscular ingluvies is borne on the pharyngeal bulb as a low,