

THE MUSSELS (UNIONACEA: BIVALVIA) OF OKLAHOMA - PART I - AMBLEMINEAE

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Keys and distributional data for the subfamilies, tribes, and genera and species of the subfamily Ambleminae known from Oklahoma are presented. *Megaloniais gigantea*, *Tritogonia verrucosa*, *Plectomerus dombeyanus*, *Amblema plicata*, *Fusconia ozarkensis*, *F. flava*, *F. undata*, *F. ebena*, *Quadrula cylindrica*, *Q. quadrula*, *Q. metanevra*, *Q. nodulata*, and *Q. pustulosa* are discussed. Photographs of the species are included.

INTRODUCTION

The naiad, or mussel, fauna of Oklahoma has never been treated in a single work on a statewide basis for the benefit of non-experts, field biologists, and other workers involved with planning and water usage. Isley's (1) work on the fauna of eastern Oklahoma is, although considerable portions of the taxonomy are out of date, still a useful publication but often difficult to obtain. Other publications with direct bearing on the Oklahoma unionid fauna are relatively few in number. Chronologically arranged, those papers include the following. Call (2) reported 13 unionid species from Oklahoma (mostly eastern), Ferris (3) reported 8 species from Oklahoma City without additional comments, and Baker (4) recorded 16 species from several creeks and the Chikaskia River near Tonkawa and Williston, Oklahoma. Frierson (5) made collections of *Lampsilis rafinesqueana* at Moodys, Oklahoma and Strecker (6) reported on the distribution of 8 species of clams in the Red River, following which there were no additional (except Isley's work) papers published on Oklahoma unionids until the mid-1950's.

In 1956, Riggs and Webb (7) conducted a population study on Lake Texoma mussels, and Sublette (8) investigated the macrobenthos, including 5 unionids, in the same lake. Branson (9) reported *Proptera capax* from the Verdigris River, a record which shall be discussed in a later contribution, and 11 species from the Spring-Neosho drainage in 1966 (10) and *Glebulula rotunda* from Grand Lake in 1969 (11). Valentine's and Stansberry's (12) important paper on the mussel fauna of the Lake Texoma and the Red River region appeared in 1971; the

same year, Branson (13) reported *Lampsilis luteola* from Haw Creek near Page, Oklahoma. Branson (14) discussed the pelecypod fauna of the Ouachita Mountain drainages, and White (15) and White and White (16) delineated changes in the Poteau River and Lake Texoma faunas, respectively. In the last five years, Richard Johnson, of Harvard University, has published several important monographs on the North American unionid fauna, two of which (17, 18) concern Oklahoma species.

The present contribution provides distributional data for the unionid clams of Oklahoma and keys and illustrations for their identification. Figure 1 illustrates some basic valve features that are required for using the keys contained herein.

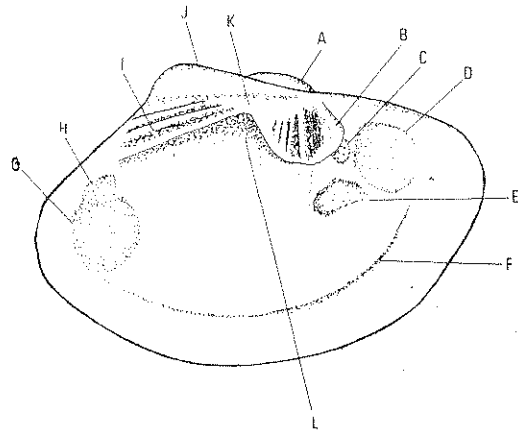


FIGURE 1. Left valve (stylized) of a unionid clam. A = umbo (beak), B = pseudocardinal teeth, C = anterior pedal retractor muscle scar, D = anterior adductor muscle scar, E = protractor muscle scar, F = pallial line, G = posterior adductor muscle scar, H = posterior pedal retractor muscle scar, I = ligament, J = lateral teeth, K = interdentum, L = umbonal cavity.

KEY TO SUBFAMILIES AND TRIBES OF OKLAHOMA UNIONIDAE

- 1 a. Glochidia incubated in all four gills (appear swollen in gravid females) Ambleminae
- b. Glochidia incubated only in outer gills, the inner ones not swollen in gravid females Unioninae

KEY TO TRIBES, GENERA AND SPECIES OF AMBLEMINAE

- 1 a. Shell large (140-160 mm in length, 60-75 mm high) and moderately inflated; rhomboid, with very low beaks that bear double-looped ridges that continue as nodules along the posterior shell ridge; epidermis dark brown to black; pseudocardinals very heavy and coarse; lateral teeth long and straight; nacre usually white, Tribe Megalonaadini *Megalonaia gigantea* Figure 2
- b. Shell smaller, lacking double-looped ridges on beaks that continue as nodules on the posterior shell ridge Tribe Amblemini 2
- 2 a. Posterior slope of shell distinctly corrugated or ridged 3
- b. Posterior slope of shell not corrugated or ridged 7
- 3 a. Shell about twice as long as high and rhomboidal; surface with distinct pustules 4
- b. Shell not twice as long as high and not rhomboidal (except in *Plectomerus*); surface lacking distinct pustules 5
- 4 a. Shell with a distinct posterior ridge but lacking a diagonal row of large pustules; nacre usually purplish (sometimes pink) *Tritogonia verrucosa* Figure 3
- b. Shell with a low posterior ridge and a diagonal row of large pustules anteroventral to the ridge; nacre white *Quadrula cylindrica* Figure 4
- 5 a. Shell ovoidal, rounded, or elongated; posterior end rounded or ovoid; nacre white 6
- b. Shell elongated and rhomboidal with a truncated posterior end; nacre pale

- purplish to brownish *Plectomerus dombeyanus* Figure 5
- 6 a. Shell sculpturing extends anteriorly in front of beaks; beaks with double-looped ridges *Megalonaia gigantea* Figure 2
- b. Shell sculpturing does not extend anteriorly in front of beaks; beaks lacking double-looped ridges *Amblyma plicata* Figure 6
- 7 a. Surface of shell smooth; marsupial ova sacs leaflike and white *Fusconaia* 8
- b. Surface of shell rugose and/or pustulose; marsupial ova sacs nearly cylindrical and pinkish or reddish *Quadrula* 11
- 8 a. Shell ovoidal to triangular; beaks more or less centrally placed 9
- b. Shell rhomboidal in outline; beaks anteriorly placed *Fusconaia ozarkensis* Figure 7
- 9 a. Beaks very prominent and swollen; shell triangular and heavy; teeth very heavy 10
- b. Beaks not exceptionally prominent and swollen although shell is often triangular; teeth only moderately heavy *Fusconaia flava* Figure 10
- 10 a. Posterior ridge and median sulcus distinct; shell disk not regularly expanded to ventral margin *Fusconaia undata* Figure 8
- b. Posterior ridge only weakly developed; median sulcus lacking; shell disk regularly expanding from beaks to ventral margin *Fusconaia ebena* Figure 9
- 11 a. Shell disk with a median sulcus and posterior ridge 12
- b. Shell disk lacking a median sulcus and posterior ridge 13
- 12 a. Posterior ridge high, usually bearing 3 to 5 large, raised pustules; many scattered pustules elsewhere; often with greenish chevron-shaped marks; median sulcus shallow, not reaching beaks *Quadrula metanevra* Figure 11
- b. Posterior ridge low, lacking enlarged

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pustules; few to many pustules (sometimes lacking) on disk; never with greenish chevrons; median sulcus well developed from beaks to ventral margin

. *Quadrula quadrula* Figure 12

13 a. Shell disk bearing two rows of enlarged pustules that diverge from the beak region; shell uniformly colored without green rays

. *Quadrula nodulata* Figure 13

b. Shell disk with more or less randomly distributed and enlarged pustules (rarely wanting); often with a broad green ray on beak area

. *Quadrula pustulosa* Figure 14

ANNOTATED LIST

Tribe Amblemini

This tribe includes five genera of Oklahoma mussels distributed primarily in the eastern half of the state. All of them have relatively heavy, thick valves and large, well-developed pseudocardinal teeth. The glochidia are incubated in all four gills (19).

Genus *Amblema*

Although Isley (1) and others reported various species, either as members of this genus or as *Quadrula*, Burch (19) and Johnson (18) indicated that all those names are synonyms of *Amblema plicata*, the only species occurring in Oklahoma.

Amblema plicata (Say 1817) Figure 6

Oklahoma distribution: larger creeks and main streams in the Verdigris, Neosho, Boggy, Clear Boggy, Blue, Kiamichi, Little, Chikaskia, Canadian (4, 1), Poteau (15), and Mountain Fork (14) river systems.

As pointed out by Valentine and Stansbury (12), *A. plicata* is a highly variable species, ranging from nearly black or brown to rich mahogany brown in periostracum coloration. The corrugations vary from three to five or six. Typically, the habitat is sandy, gravel or small rocks, but small populations sometimes occur in mud bottoms, as in the Neosho and Verdigris rivers, where it is often the dominant mussel present. Synonyms are: *Unio perplicatus* Conrad 1841, *Unio (Amblema) plicata* Say 1817, *Amblema costata* Rafinesque 1820,

Unio (Amblema) peruvianus Lamarck 1819.

Genus *Fusconaia*

The diagnostic features of *Fusconaia* are principally ones of the soft anatomy. The soft parts are usually pigmented yellowish to orange-red (12) and the ova are also pigmented red, gray, or black, according to species. Two species are known definitely from Oklahoma and two others are probable.

Fusconaia flava (Rafinesque 1820) Figure 10

Oklahoma distribution: Blue River (14, 12, 1), Little River drainage (12, 1), Poteau River (15, 1), Illinois River (14), Boggy, Kiamichi, Verdigris, Neosho, and Chikaskia rivers (1).

Quadrula rubignosa (Lea 1829), *Quadrula hebetata* (Conrad 1836), *Q. cerina* (Conrad 1838), and *Unio rubidus* Lea 1861 are synonyms (18). This riffle-dwelling species is easily confused with the next species, but it has bright red or orange ova instead of gray or black ones.

Fusconaia ebena (Lea 1831) Figure 9

Oklahoma distribution: This species has not been reported from Oklahoma (12). However, since it has a more or less general distribution in the Mississippi River system (18), I have included it here to facilitate identification. It should be sought in the Illinois, Kiamichi, and Little River systems.

Fusconaia undata (Barnes 1823) Figure 8

Oklahoma distribution: Neosho River at Miami, Ottawa County (18), Blue River (12), Verdigris, Neosho, and Kiamichi rivers (1).

This clam should be also sought in the Illinois River, and the population status in the Blue River in Johnston County determined. Valentine and Stansbury (12) reported the species from that stream based upon a single battered valve, suggesting that it may have been dropped there by fishermen. Johnson (18) listed the synonymy for this species as: *Unio trigonus* Lea 1831, *Unio friersoni* Wright 1896, *Fusconata askewi* (Marsh 1896), *F. selecta* Wheeler 1914, and *Quadrula undata* (Barnes 1823).

Fusconaia ozarkensis (Call 1887) Figure 7

Oklahoma distribution: Unknown at present.

Johnson's (18) record for this medium-sized clam from the Spring River in southwestern Missouri makes it likely that the species occurs in Oklahoma and Kansas. The subtrapezoidal shell with its strongly anterior umbos, and smoothish, yellowish-brown periostracum with many narrow but obscure greenish rays on the central part of the shell disk (18) easily distinguish this *Fusconaia* from any of the other Oklahoma species.

Genus *Plectomerus*

This monotypic, rather wide-ranging genus is restricted to the Mountain Fork and Little River drainages of southeastern Oklahoma.

Plectomerus dombeyanus (Valenciennes 1827) Figure 5

Oklahoma distribution: Little River (1) and larger tributaries (12) and the Mountain Fork River near its mouth, McCurtain County (14).

Plectomerus trapezoides (Lea 1831) and *Quadrula trapezoidea* (Lea 1831) are synonyms (18).

Genus *Quadrula*

This highly variable genus is represented in Oklahoma by five species. The shell is often brightly colored and ornamented by various types of sculpturing.

Quadrula cylindrica (Say 1817) Figure 4

Oklahoma distribution: Neosho River, Ottawa County (18), Little, Verdigris and Neosho rivers (1), and relict in Mountain Fork and Blue rivers (14).

This species occurrence in the Little River is scarce to rare, and the population is likewise sparse. A synonym is *Unio strigilatus* Wright 1989 (18).

Quadrula metanevra (Rafinesque 1820) Figure 11

Oklahoma distribution: Kiamichi River, McCurtain County (14), Verdigris and Neosho rivers (1).

This beautiful clam is very susceptible to fine silt in its habitat. It is entirely restricted to eastern Oklahoma, mostly to

relatively clear, swift streams. A synonym is *Unio wardii* Lea 1861 (18).

Quadrula nodulata (Rafinesque 1820) Figure 13

Oklahoma distribution: Poteau River, LeFlore County (15), Verdigris and Poteau rivers (1).

The species probably occurs in the Mountain Fork and Illinois rivers. Johnson (18) lists *Unio (Quadrula) pustulatus* Lea 1831 as a synonym.

Quadrula pustulosa (Lea 1831) Figure 14

Oklahoma distribution: Poteau River (15), Lake Texoma (16), Illinois and Mountain Fork rivers (14), Spring River (10), Red, Washita, Blue, Boggy, Kiamichi, Little, Arkansas, Verdigris, Neosho, Poteau and Chikaskia rivers, and Cache Creek, Wichita Mountain area (1), Chikaskia River (4), and "Oklahoma City" (3).

As mentioned by Valentine and Stansbery (12), "this is one of the most bewilderingly variable species in Oklahoma", which probably accounts for the relatively long series of synonyms (18): *Obliquaria bullata* Rafinesque 1820, *Unio schoolcraftensis* Lea 1834, *Unio kienerianus* Lea 1852, *Unio asperatus* Lea 1861, *Unio refulgens* Lea 1868.

Quadrula quadrula (Rafinesque 1820) Figure 12

Oklahoma distribution: Poteau River (15), Lake Texoma (7, 8, 12, 16), Red, Washita, Blue, Boggy, Kiamichi, Little, Chikaskia, Neosho and Verdigris rivers (1), Chikaskia River (4), "Oklahoma City" (3).

Also highly variable (12), this species has various synonyms (18): *Unio rugosus* Barnes 1823, *Unio (Quadrula) lachrymosus* Lea 1828, *Unio (Quadrula) fragosus* Conrad 1836, *Unio asper* Lea 1831, *Unio prasinus* Conrad 1834, *Unio (Quadrula) nobilis* Conrad 1854. To this list should be added *Quadrula forsheyi* (Lea 1859).

Genus *Tritogonia*

This very widespread monotypic genus extends into Oklahoma in clear-water situations westward to the Wichita Mountains, with hiatuses in the distributional pattern.

Tritogonia verrucosa (Rafinesque 1820) Figure 3

Oklahoma distribution: Poteau River (15), Lake Texoma (16), Poteau, Mountain Fork and Kiamichi rivers (14), Blue, Kiamichi, Little and Mountain Fork rivers (12), Spring River (10), "Oklahoma City" (3), Boggy, Kiamichi, Little, Verdigris, Neosho, Chikaskia rivers and Cache Creek, Wichita Mountains (1).

This species, aptly often called the "pistol grip" clam, is susceptible to settleable solids, hence is missing from very turbid rivers. A synonym is *Unio (Tritogonia) tuberculatus* Barnes 1823 (18). Isley (1) listed it as *T. nobilis* (see above).

Genus *Megaloniais*

These are the largest and heaviest fresh water clams in North America. There are three species in the United States (12), only one of which occurs in Oklahoma.

Megaloniais gigantea (Barnes 1823) Figure 2

Oklahoma distribution: Poteau River (15), Kiamichi River (12), Blue, Boggy, Kiamichi, Verdigris, Neosho and Poteau rivers (1).

An uncommon species in Oklahoma waters, this large species was an important button clam in past decades. Johnson (18) listed as synonyms the following: *Elliptio nervosa* Rafinesque 1820 and *Unio (Quadrula) heros* Say 1829.

CONCLUDING REMARKS

The next two contributions will, in the same format, present keys, distributional data, and photographs for the remaining genera and species of the Unioninae, tribes Pleurobemini, Anodontini, and the Lampsilini.

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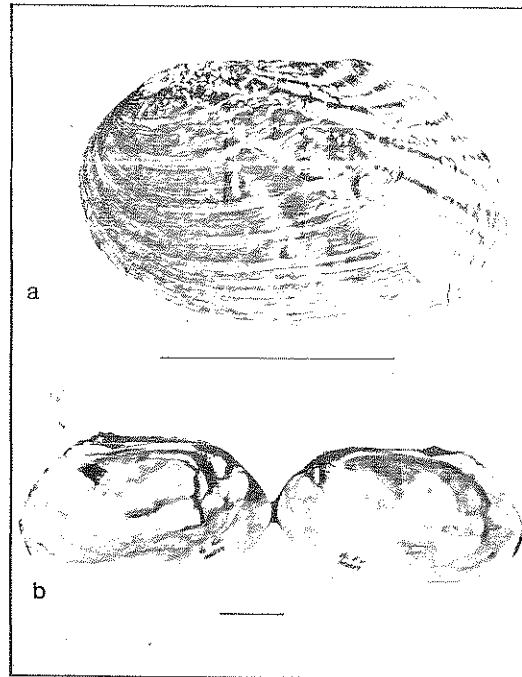


FIGURE 2. *Megaloniais gigantea*. a = external view, scale line = 89 mm; b = internal view, scale line = 43 mm.



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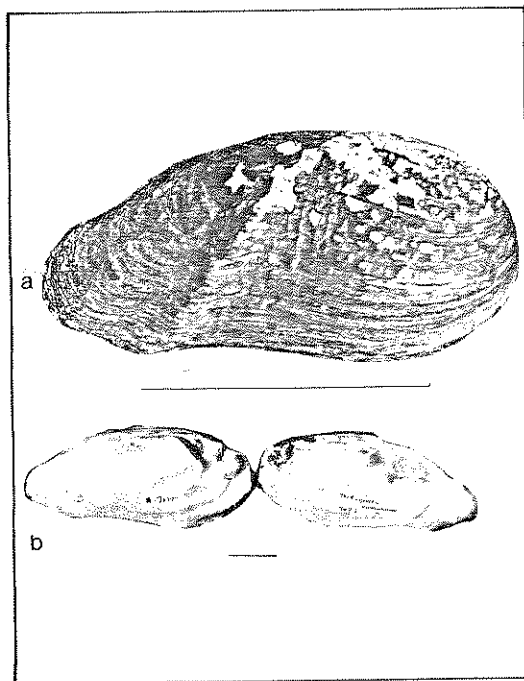


FIGURE 3. *Tritogonia verrucosa*. a = external view, scale line = 90 mm; b = internal view, scale line = 34 mm.

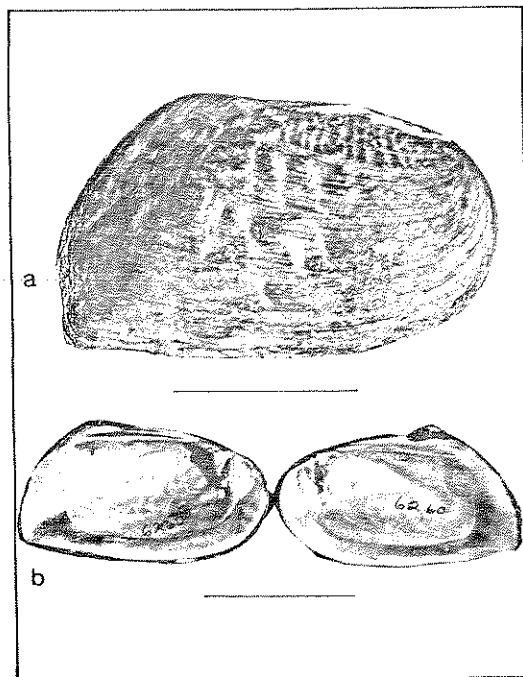


FIGURE 5. *Plectomerus dombeyanus*. a = external view, scale line = 42 mm; b = internal view, scale line = 48 mm.

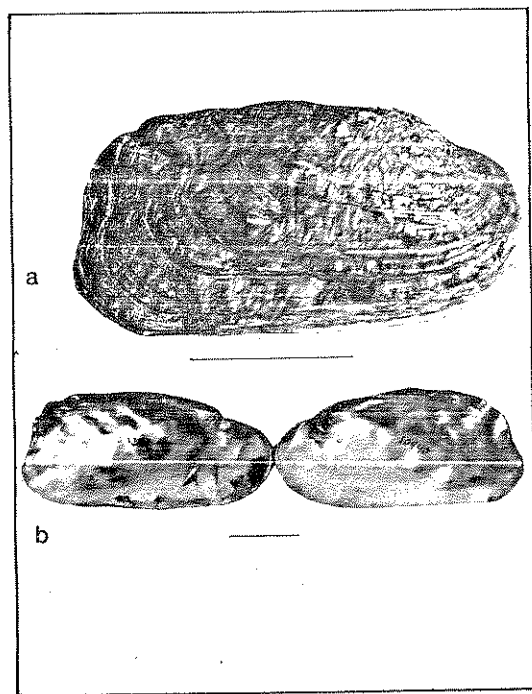


FIGURE 4. *Quadrula cylindrica*. a = external view, scale line = 33 mm; b = internal view, scale line = 26 mm.

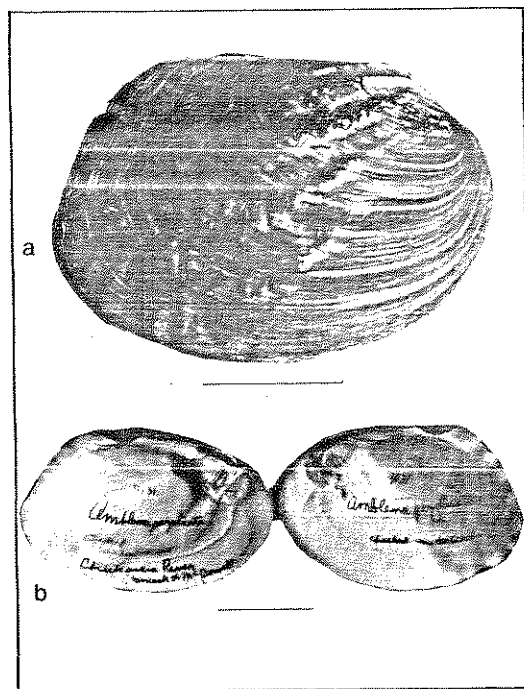


FIGURE 6. *Amblema plicatu*. a = external view, scale line = 33 mm; b = internal view, scale line = 46 mm.

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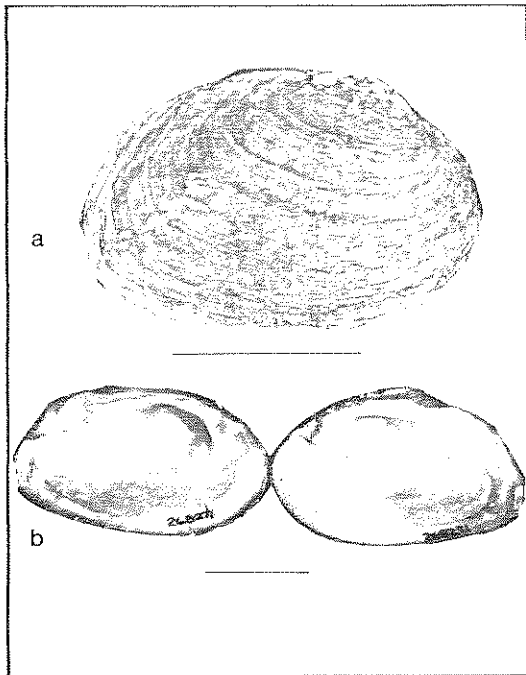


FIGURE 7. *Fusconaia ozarkensis*. a = external view, scale line = 38 mm; b = external view, scale line = 23 mm.

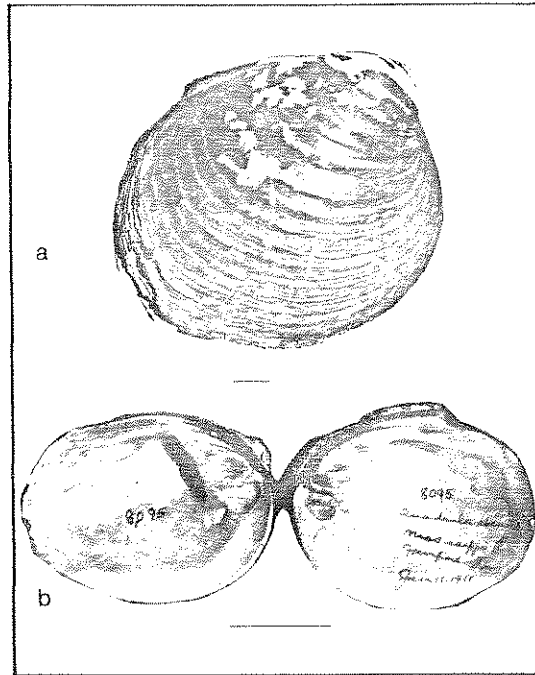


FIGURE 9. *Fusconaia ebena*. a = external view, scale line = 27 mm; b = internal view, scale line = 30 mm.

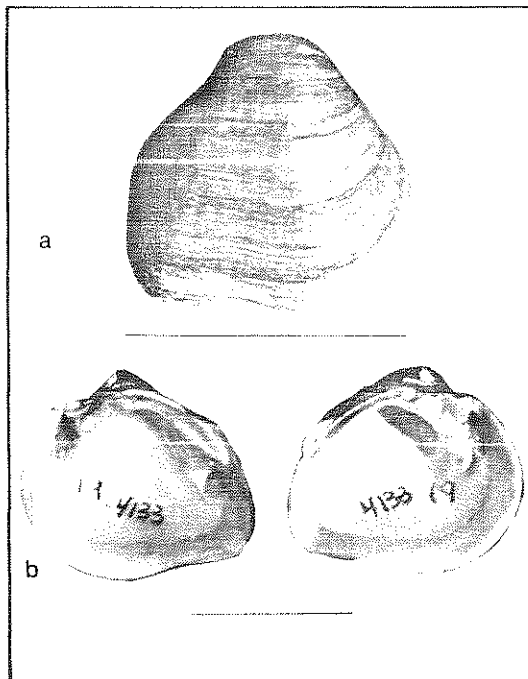


FIGURE 8. *Fusconaia undata*. a = external view, scale line = 40 mm; b = internal view, scale line = 26 mm.

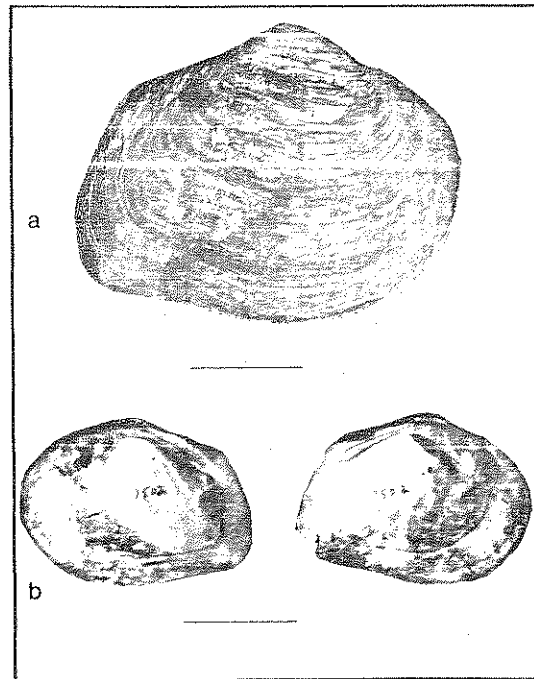
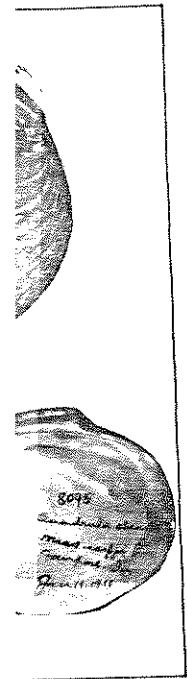
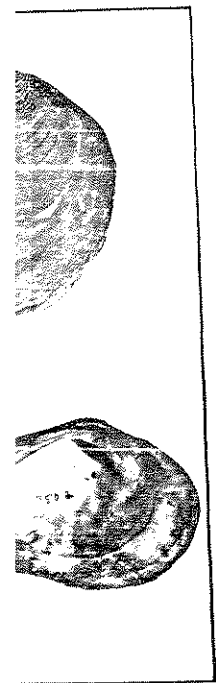


FIGURE 10. *Fusconaia flava*. a = external view, scale line = 23 mm; b = internal view, scale line = 33 mm.



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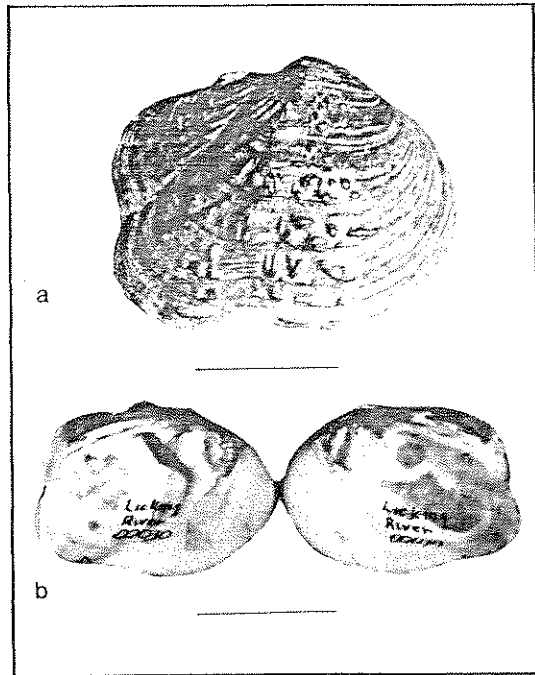


FIGURE 11. *Quadrula metanevra*. a = external view, scale line = 31 mm; b = internal view, scale line = 16 mm.

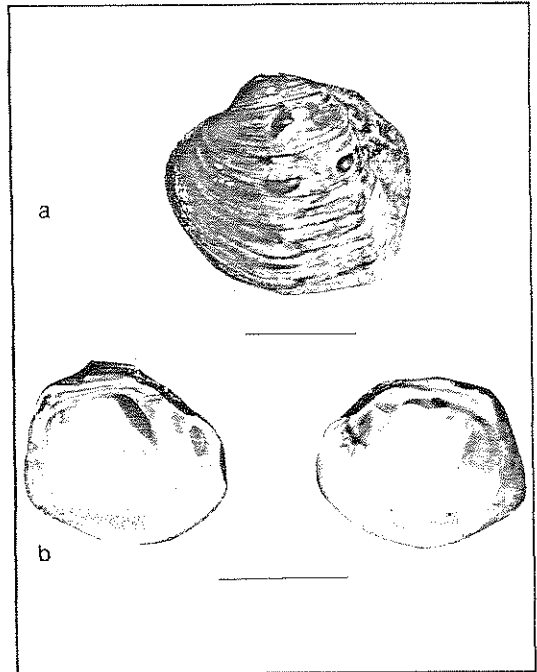


FIGURE 13. *Quadrula nodulata*. a = external view, scale line = 20 mm; b = internal view, scale line = 19 mm.

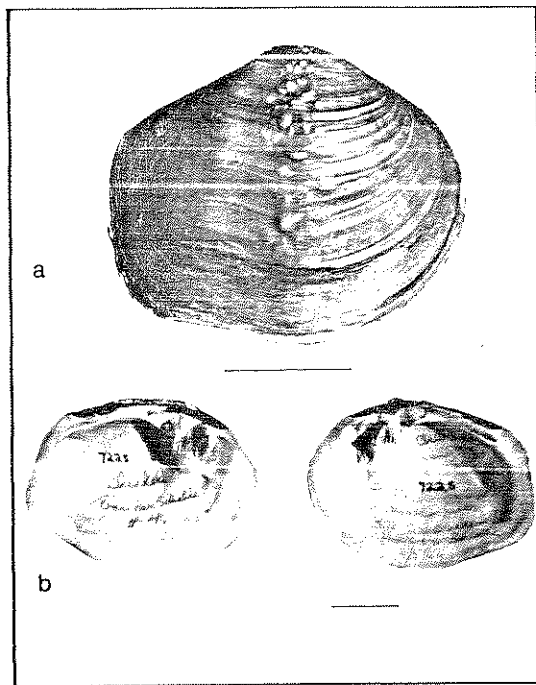


FIGURE 12. *Quadrula quadrula*. a = external view, scale line = 26 mm; b = internal view, scale line = 29 mm.

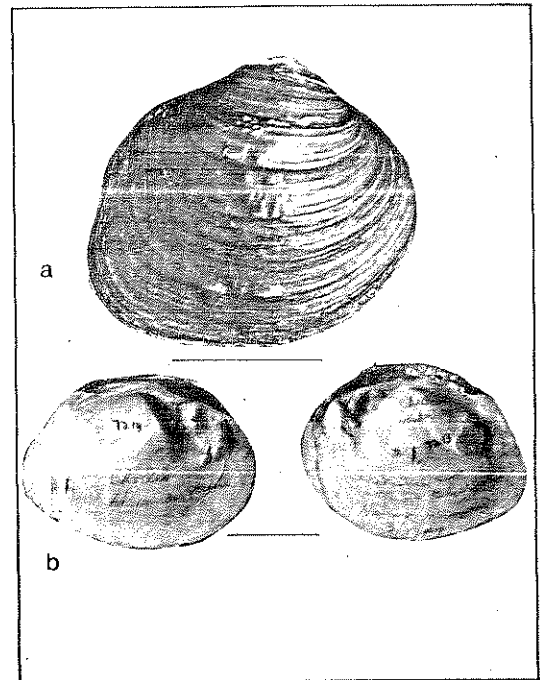


FIGURE 14. *Quadrula pustulosa*. a = external view, scale line = 34 mm; b = internal view, scale line = 35 mm.